VIII. *On the Anatomy of* Balænoptera rostrata. *By* ALEXANDER CARTE, *A.M., M.D. Univ. Dubl., F.R.C.S.I., M.R.I.A., F.L.S. Lond., Hon. Mem. Imp. Zool. and Bot. Soc. Vienna, &c., and* ALEXANDER MACALISTER, *M.D., L.R.C.S.I., Demonstrator of Anatomy R.C.S.I. Communicated by* W. H. FLOWER, *F.R.S.*

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OPPORTUNITIES for the careful dissection of the larger Cetaceans are so rare that the memoirs on their structure are still very imperfect. Hitherto the greater part of our information on the softer tissues of these animals has been due to the investigations of HUNTER, KNOX, JACOB, ESCHRICHT, REINHARDT, and LILLJEBORG; and even these distinguished anatomists have left their results more or less incomplete, partly owing to the infrequency of the captures, and partly to the numerous difficulties attendant on making a minute and careful investigation of creatures so unwieldy.

The capture of a small cetacean on the Irish coast off Clogher Head, a fishing-station near Drogheda, about 30 miles north of Dublin, having afforded a favourable opportunity of making some further examinations into the anatomical details of one of the species, we willingly took advantage of it; but owing unfortunately to the length of time that elapsed from the period of the capture of the animal before it came into our possession, we were not able to make an examination of the brain and spinal cord, which we regret, as it would have added to the completeness of this communication.

The animal was captured on the 8th of May, 1863, by a fisherman, in whose nets it had become entangled, and after having been exhibited for a few days to the public at Drogheda, it was for a similar purpose brought to Dublin, where, after the lapse of a fortnight, we were enabled to procure it for anatomical examination, which we commenced on the 20th, after first having obtained, through the kindness of Mr. WILLIAM H. BAILY, of the Geological Survey, an accurate drawing of the external form of the animal, which was made on a scale of one inch to the foot. This drawing is reproduced on one of our Plates, an explanation of which will be found at the end of the paper.

On examination the animal proved to be the Piked Whale of PENNANT, *Balæna rostrata* of O. FABRICIUS, or that described by LACÉPÈDE and CUVIER as *B. acuto-rostrata* or *Baleine museau-pointu*, and identical with the *Balæna minimus borealis* or *Rorqualus minor* of KNOX, *Pterobalæna minor* of ESCHRICHT, *Balænoptera rostrata* of GRAY, *B. Eschrichtii* of RASCH.

Our specimen was considerably larger than that described by KNOX, but in most other respects agreed with the description he has given of that individual.

Its body, though robust, was not quite so large in proportion to its length as in the animal caught at Cherbourg, whose girth, as recorded by LACÉPÈDE, was 10′ 2″, its length being 15′ 10″. The proportion existing between these two measurements in the present specimen was as 9 to $18\frac{5}{9}$, which will be seen to approximate closely to the proportionate measurements of KNOX's specimen, in which the girth was to the length as 9 to 17; and it differed but little from the same relative dimensions of the fœtus described by ESCHRICHT, which he states was 1′ $6\frac{3}{4}$″ in circumference and 3′ in length; while, on the other hand, it differed considerably in these proportional measurements from the specimen described by HUNTER, in which the girth of the animal was less than a third of its length.

External Form.

From the central line of its greatest circumference, which was about 2 feet behind the posterior border of the anterior extremity or paddle, the body gradually tapered forwards to the level of the posterior canthus of the eyelids, from whence it narrowed much more rapidly to the anterior extremity of the snout, without any indication of the frontal convexity which has been represented on the forehead of a fœtus of this species by ESCHRICHT, and figured in the first volume of the 'Untersuchungen über die Nordischen Wallthiere,' Tab. VI. fig. 1.

The outline of the head was much more pointed in front, when seen in profile, than when viewed from the dorsal aspect; the difference being due to the great lateral width of the interval between the rami of the lower jaw at their point of greatest convexity, which caused the transverse diameter of this portion of the head to be greater than the vertical. The contour lines of these aspects likewise differed, as when viewed from above they were curved, whereas when seen on its lateral aspect the head appeared more decidedly wedge-shaped with straighter borders. The point of greatest lateral convexity in the inferior maxillæ was situated about 21 inches behind the symphysis.

Posterior to the before-mentioned point of greatest width the body commenced to taper backwards, and as it merged into the tail was altered from its cylindrical form, and became in section somewhat lozenge-shaped, with its major axis directed from the dorsal to the ventral surface.

This alteration in the figure of the body at its caudal extremity was due to the presence of a slight dorsal and ventral ridge, the former of which was continued from behind the posterior edge of the dorsal fin, and extended down to the notch that separated the lobes of the tail; this ridge at its origin was rather obscure, but as it approached the tail became somewhat more distinct.

As in all the species of *Balænoptera* and its allied genera, a dorsal protuberance or fin existed, which in outline was the shape of a scalene triangle, its apex being directed backwards, its anterior edge convex, and its posterior falcate.

HUNTER conjectured the use of this appendage to be to prevent the animal rotating in the water*.

* But little value is to be attached most probably to the precise position of the dorsal fin, as a means of distinguishing species, as from the descriptions of the different individuals recorded it would appear to vary considerably. Dr. GRAY states that it is placed about two-thirds of the length of the entire body from the point

No parasites were discoverable on the external surface of the animal.

The integument on the geniothoracic surface of the body was arranged in a series of longitudinal folds or plicæ, which at their origins, immediately beneath the rami of the lower jaw, were flat and inconspicuous, but as they extended down towards the thoracic region they became enlarged and much more numerous; subsequently, as they approached the abdominal parietes, they decreased in number but increased in width, being finally lost in the neighbouring skin.

The arrangement of these folds was by HUNTER very appropriately compared to the bands of a ribbed stocking. There were fifty-four of them on the thoracic surface; the average depth of the furrow or interval between each of them measured about three-eighths of an inch, and on stretching the skin, which this peculiar arrangement greatly facilitated, the outline of each rib or band was somewhat rectangular, thus ; five of them, on the anterior or geniothoracic region of the body, occupied a space of 3 inches, whereas the same extent of surface posteriorly, or towards the pudendal outlet, contained but three such folds. The subcutaneous tissue being highly elastic, rendered the skin in this region very distensible

No bristles were found at the extremity of the snout, as described by KNOX in the specimen of the same sex examined by him in 1839.

The epidermis was extremely thin and easily separable, coming off in delicate flakes.

The colour of the animal on the back was of a dark bluish black, merging gradually into a pale pinkish white on the thorax and abdomen. The pectoral extremities or flippers were of the same bluish-black colour, with a pinkish-white band crossing the central part of each of them. The tail was of a uniform dark blackish hue on both surfaces.

The eye was situated above and a little in front of the commissure of the lips; it was comparatively small and oval in shape, with the major axis running parallel to that of the body of the animal.

The external auditory foramen was a very minute, oval, slit-like pore situated on a line with the commissure of the lips, and about $7\frac{1}{2}$ inches behind the posterior angle of the eye.

The external nares or blowholes occupied the summit of the head, but were not elevated above its general surface; they were two, curved, linear, slit-like outlets, each of them about $4\frac{1}{2}$ inches long, running in the direction of the long axis of the body, with their convexities turned towards the mesial line; these semilunar orifices were separated

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of the nose; according to the measurements given by KNOX it would appear that in his specimen it was situated nearer to the tail, and in the animal figured by HUNTER it is represented as being placed still further back; in the present instance, on the other hand, this protuberance was situated anterior to the position mentioned by Dr. GRAY.

Upon the situation of this fin ESCHRICHT founds the distinction between his two varieties, *Grœnlandica* and *Bergensis*, with the latter of which our specimen seems to agree, not in this point alone, but likewise in another character of that variety, viz. the non-coalition of the lateral processes of the fifth and sixth cervical vertebræ.

Dr. GRAY also refers to the position of this fin as being situated posterior to a line drawn perpendicularly upwards from the pudendal fissure. In the present case it was placed vertically over this outlet.

from each other by a straight median sulcus, which commenced about 1 inch in front of the anterior commissures of the semilunar nasal outlets, and fell short of their posterior commissures by about the same distance, thus  ; it was about $\frac{1}{2}$ an inch in depth, and its use was evidently to facilitate the approximation of the lips of the nares.

No hairs were discernible in the immediate vicinity of these outlets, as existed in the specimen described by Eschricht and Reinhardt; on the contrary, the skin in this situation was smooth and polished.

The pudendal fissure was situated a little posterior to where the abdominal folds terminated, at a point on the ventral surface coincident with a perpendicular line let fall from the dorsal fin; it opened by a longitudinal slit or sulcus, which was bounded on each side by thick and rounded labia on the central line of the abdomen. Into this the orifices of the urethra, vagina, and rectum opened; the urethra being situated most anteriorly, the rectum at some distance posteriorly, and between them the vagina.

The umbilicus also lay in a small slit-like furrow, at the distance of about $6\frac{1}{2}$ feet anterior to the fork or commissure of the tail.

External and parallel to the pudendal fissure were two other sulci, in which the nipples of the mammary glands were concealed, but owing to the immaturity of the animal these glands were not well developed.

The mouth and fauces were lined by mucous membrane of a pale pinkish colour, which was arranged in longitudinal folds similar to those on the geniothoracic region of the animal; this membrane, together with the mylohyoid muscle and skin, formed the wall of the great submaxillary pouch, which from the elastic nature of its component parts, was capable of great distention; this enabled the animal to take into its mouth a large quantity of water containing such substances as constituted its food; the latter was retained in the mouth by the straining mechanism of the baleen plates, while the superfluous water was expelled by the contraction of the pouch.

The number of baleen plates was about 280 in each upper jaw, or 560 in all. The longest blades were placed at the posterior third of the long axis of the jaw, and measured $3\frac{1}{2}$ inches in length on their outer border; from this point they gradually decreased, both anteriorly and posteriorly, to the length of about 1 inch, finally passing into coarse bristles about $\frac{1}{4}$ inch in length. Each plate was somewhat triangular in outline, and was attached to the jaw by its base or shortest side, which was imbedded in the basal pulp, and measured $1\frac{3}{4}$ inch in length. The outer margins were long and curved, their concavity directed outwards; this curve was greatest at the centre and continued very well marked to the anterior extremity, but diminished towards the posterior end, where the outer margins of the plates became comparatively straight from above downwards; the inner borders of the plates were fringed by bristles, which were coarse towards the apex of each plate, but became much shorter and finer towards the internal margin of the wreath. Each plate was curved transversely, the concavity being directed backwards; the inner margin of each lamina, just where it came in contact with the subsidiary plates, had, however, a slight inclination forwards.

The subsidiary plates varied in number from one to six or seven for each pulp ridge, and occupied an extent of from $\frac{3}{4}$ in the centre to $\frac{1}{4}$ of an inch in front, and towards the pharyngeal end they disappeared by merging into a series of short and fine bristles.

The matrix or intermediate pulp was thick, tough, fibrous, and vascular.

In colour the blades were pale yellow, becoming slightly bluish at the base; on removing the pulp from the base of each lamina, the latter was divisible into an external horny whitish yellow cortical substance, and an inner fibrous or bristly portion of a purplish-blue colour; this layer, by protruding beyond the external lamella, formed the terminal fringe of bristles.

On removing the pulp from the attached margin of the baleen plates, it became obvious that just at the point of contact between the larger laminæ and the subsidiary plates, the bases of both were transversely united for about half a line in extent, and a similar transverse union existed at every interval between the different blades.

The following Table contains the measurements of the animal as compared with those of HUNTER and KNOX:—

	Specimen.		Hunter's.		Knox's.	
	ft.	in.	ft.	in.	ft.	in.
Total length of the animal from point of snout to the bifurcation of the tail	13	11	17	0	9	11
Total length from point of snout to extreme point of fluke of tail	14	4				
Width of tail	2	10	5	0	2	$8\frac{6}{8}$
Length of upper jaw from point of snout to the commissure of the lips	2	$4\frac{1}{2}$	3	3		
Length of lower jaw from the symphysis to the commissure of the lips	2	9	......		2	0
Distance from point of snout to the anterior angle of the eyelids	2	$4\frac{1}{2}$	3	4		
Length of the long axis of the eye	0	$2\frac{1}{2}$	0	$2\frac{1}{2}$		
Distance from the point of the snout to the anterior boundary of the flippers or pectoral extremities	4	4				
Length of flippers, external to integuments	1	11	2	4	1	3
Greatest width of flippers	0	$6\frac{1}{2}$	0	9		
Distance between the flippers measured across the thorax	2	3				
Distance from the point of the snout to anus	8	10				
Height of dorsal fin or fluke	0	6				
Length of dorsal fin	0	9	1	0		
Distance from the bifurcation of the tail to the posterior edge of dorsal fin or fluke	4	4	......		2	10
Distance from point of snout to the anterior commissure of cloaca	8	4				
Length of the meatus of cloaca	1	2				
Distance from the bifurcation of tail to the posterior commissure of cloaca	4	4	4	4		
Length of mammary sulci	0	3				
Length of blowholes or external nares	0	$4\frac{1}{2}$				
Length of median sulcus between external nares	0	5				
Distance between the posterior extremities of the blowholes	0	$2\frac{1}{2}$				
Distance between the anterior extremities of the blowholes	0	$\frac{3}{4}$				
Girth of the body, taken 2 feet behind the flippers, the largest part	6	9	5	0	5	2
Girth at the junction of the tail with the body	1	$6\frac{1}{2}$	1	0		
Length of the cranium, taken on palate-surface	3	1	......		2	11
Breadth of the cranium, taken at the articulation of the lower jaw	1	5	......		1	3
Length from the hamular process of the sphenoid bone to the foramen magnum	0	6	......		0	$6\frac{1}{2}$

TABLE (continued).

	Specimen.	Hunter's.	Knox's.
	ft. in.	ft. in.	ft. in.
Length of lower jaw	2 11	......	2 8
Length of longest plate of baleen	0 9	......	0 4
Length of transverse processes of nineteenth vertebra from tip to tip	1 2½	......	0 11
Length of first rib	1 3		
Length of third rib	2 2	......	1 10
Length of fourth rib, the longest	2 3½		
Length of eleventh rib, the last rib	1 6		
Length of scapula, transverse diameter	0 7½	......	0 6½
Length of scapula, longitudinal diameter	0 11¾		
Length of the humerus	0 5½	......	0 4½
Breadth of the humerus at central part	0 3		
Length of radius	0 8½	......	0 7¼
Length of ulna	0 7¼		
Length of carpus, metacarpus, and longest digit	......	......	0 9
Number of cervical vertebræ	7	7	7
Number of dorsal	11	......	11
Number of lumbar and caudal	28	......	30
Number of ribs	11	......	11
Number of chevron or V-shaped bones	7		
Chevron bones commenced at	32 33	......	31

Skeleton.

The cranium, viewed from above, was considerably flattened; its shape was somewhat that of an elongated isosceles triangle, having its apex at the extremity of the intermaxillary bones, and its base corresponding to a line drawn from the anterior border of one glenoid process to that of the other; its length was a little more than twice its breadth, and its component segments, with the exceptions of the petrous and tympanic, were extremely soft and spongy in structure.

The occipital bone was made up of the combined interparietal, supraoccipital, exoccipital, and basioccipital elements; it was the largest of all the cranial bones, and consisted, first, of a broadly expanded superior portion, irregularly triangular in outline, which formed almost the entire roof of the skull; its somewhat rounded apex extended forwards to articulate with the posterior edge of the frontal: the external margins overlapped those of the parietals and frontals, and the basal line, which extended from the extremity of one exoccipital to that of its fellow of the opposite side, formed the posterior boundary of the cranium; this margin was irregular in outline and lay on a plane posterior to the foramen magnum, which latter was situated at the junction of the basilar and calvarial portions; it was oval in shape, and measured 1¾ inch in its vertical by 2½ inches in its transverse diameter; it was bounded laterally by the condyles, which approximated inferiorly, where they were separated only by a sulcus whose breadth varied from half an inch at its widest, to one-eighth of an inch at its inferior and narrowest part. The condyles were ovoid in shape, and extended backwards and outwards; their superior rounded extremities formed the boundaries to the inferior and lateral halves of the foramen magnum, and were thickly covered with incrusting cartilage, but no synovial membranes intervened between them and the atlas. There were no condyloid foramina. The calvarial portion was convex posteriorly towards the foramen magnum, and was marked by an obscure central protuberance, from which very faintly marked ridges were traceable running forwards and outwards. More anteriorly a blunt median ridge existed, which was bounded on either side by a superficial concavity for muscular attachments. Its inner or cerebral surface was concave generally, but presented a prominent median ridge, which was deeply grooved on the right side for the superior longitudinal sinus.

The basioccipital portion of the bone projected forwards to meet the posterior border of the basisphenoid; it was marked by a ridge on each side, where it articulated with the bullate tympanic bone; its inferior surface was also rough and concave, for the attachment of the anterior cervical muscles; its cerebral surface was slightly concave in the antero-posterior direction, and presented a transverse ridge, where it united with the body of the sphenoid bone.

Each exoccipital element extended outwards from the external border of the foramen magnum and terminated by articulating with the mastoid or squamous bone; it presented a rough surface posteriorly and inferiorly for muscular attachments, and was separated from the condyles behind by a deep notch, which formed the posterior boundary of the jugular foramen.

The squamous bone was irregular in shape, and was composed of, first, a large, somewhat crescentic glenoidal process, the inferior surface of which was concave, and formed a large but shallow cavity for the articulation of the lower jaw; its anterior extremity was nearly in contact with the orbital plate of the frontal, and the posterior extended backwards on a level with the anterior border of the occipital condyles; to this the sterno-mastoid and several other muscles were attached. A deep sulcus, perhaps the homologue of the digastric groove, existed internal and posterior to the process, giving origin to the depressor muscle of the lower jaw; this sulcus ran backwards and outwards, and was separated from a second groove, which existed on its outer side for the reception of the posterior and external process of the periotic bone, by a sharp ridge which ran in the same direction; the posterior border united with the lateral process of the occipital bone by an extensive surface, which extended as far as the posterior superior angle of the parietal. The lateral aspect of this process was convex in front and concave posteriorly and superiorly; inwards or towards the temporal fossa it was deeply hollowed, where it was continuous in front and above with the squamous plate, from which it was separated below and anteriorly by a large fissure.

The squamous plate was slightly convex, its temporal surface looked upwards and outwards; it was a narrow slip of bone and united anteriorly, by suture, with the posterior border of the parietal, and a small portion of the basisphenoid, which was here to be seen intermediate between the other bones forming the temporal fossa. Inferiorly and in front the squamous plate was continued into a pyramidal mass, which was directed forwards to meet the posterior border of the pterygoid bone, the outer edge of which it overlapped. The temporal surface was smooth, and its inferior aspect presented an oval aperture which transmitted the Eustachian tube inferiorly, and the tensor tympani muscle superiorly; the former passed into the upper part of the tympanic cavity, the latter hooked round a spur of bone which lay immediately external to the border of the former. On its inner surface the squamous bone was deeply excavated for the accommodation of the petrous element, and its cerebral surface was smooth and concave *

The alisphenoid or pterygoid bone exhibited three aspects. First, an inferior or pterygoid, which consisted of two osseous plates, external and internal, separated by a deep ovoid cavity, the pterygoid fossa; the external plate was united with the petrous or periotic and mastoid bones by suture, the latter of which overlapped it; and the anterior part of the former was received into a pyramidal depression formed by the meeting of the mastoid and pterygoid bones. The internal plate was thick behind, extended further back than the external, and met the lateral ridge on the basioccipital; this plate formed the inner boundary of the posterior nares, and was convex from before backwards on its inner aspect; above and internally it met the outer edge of the vomer, into a groove in which it sent a sharp vaginal ridge forming a schindylesis articulation. The pterygoid plates united below to form a round blunt hamular† process, about an inch and a half in length, which was directed backwards and slightly outwards. In front of the pterygoid bone a series of lamellæ projected, which interlocked with a similar series of plates on the palate-bone. The second or temporal surface was somewhat triangular in outline and rounded along its upper edge; this surface was concave outwards, it articulated with the parietal in front, with the mastoid posteriorly and above, and with the temporal aspect of the basisphenoid anteriorly. The inner or cerebral surface was smooth, and appeared concave in front, where it formed the floor of the sphenoid fissure.

The basisphenoid presented on its upper or cerebral surface a central hollow or groove, sella turcica, in which appeared four small foramina; this fossa was bounded in front by a very small roundish eminence, the rudimentary middle clinoid, or, more correctly, olivary process; and posteriorly by a similarly diminutive posterior clinoid; the posterior edge of the bone presented an elevated transverse ridge, which marked its union with the basioccipital bone. Midway between the external edge and the sella turcica, on each side, a foramen was seen, from which a narrow canal was traceable downwards, backwards, and outwards, and opened on a small triangular surface of this bone externally between the basioccipital and the alisphenoid. This vascular channel represents the canal of Vesalius. In front of the sella turcica a transverse suture was situated, which separated the anterior or presphenoid element from the basisphenoid. Still more anteriorly the former was grooved for the optic nerves and commissure; as this groove extended outwards and forwards on each side, it was formed into a foramen by a thin scale of bone which completed it superiorly and posteriorly, and appeared to

* For a description of the petrous bone, vide "The Organ of Hearing."

† Eschricht and Reinhardt mention that this process is scarcely distinguishable, which description does not accord with the present specimen.

be the representative of the anterior clinoid process. The optic foramen was situated on a plane anterior to the sphenoidal fissure, which latter was formed by the frontal and sphenoid bones. Anterior to the optic foramina and groove a slight ridge extended transversely, in front of which the ethmoidal process was continued forwards to the posterior border of the cribriform plate of the ethmoid bone. The inferior surface of the basisphenoid was connected behind with the basilar process of the occipital; in front it was overlapped by the posterior expanded part of the vomer, and the alisphenoid covered it on each side; laterally it was concealed by the mastoid and alisphenoid bones, with the exception of a small irregular-shaped portion situated in the temporal fossa between these latter and the parietal bones.

The parietal bone was irregularly quadrilateral in outline, having two surfaces and four edges. The external or temporal surface was concave posteriorly and convex in front, and formed the inner wall of the temporal fossa. The superior surface was convex and the most extensive; it articulated with the occipital, the external table of which overlapped it, but its internal table formed with the latter a serrate suture; more anteriorly this edge became thickened into a small wedge-shaped triangular process, and lay between the frontal bone in front and the occipital behind; from this a flat, thin scale of bone was continued forwards lying on the outer side of the frontal, on which it gradually attenuated to its anterior edge. Some of the small lamellæ of this bone that indigitated with similar plates on the side of the occipital, anteriorly approached their fellows of the opposide side, but did not come into actual contact. The posterior edge was thicker and almost straight, and was situated at the posterior part of the temporal fossa; it extended downwards and forwards, and united by a plane edge with the anterior margin of the squamous plate of the temporal bone. The inferior edge was the shortest; it ran forwards to articulate with the small lateral part of the basisphenoid (before described) that formed a portion of the inner wall of the temporal fossa; from this the margin was continued downwards and forwards to articulate with the upper edge of the great wing of the alisphenoid, which was overlapped by it posteriorly, but in turn was more superficial in front. The anterior inferior border was deeply hollowed for the reception of the orbital plate of the frontal, and was continued forward as the thin scale of bone before mentioned, that ended in the blunt anterior angle. The inner or cerebral surface was concave, and formed a large part of the superior lateral boundary of the cranial cavity.

The ethmoid bone consisted, first, of a cerebral surface, or cribriform plate, situated between the frontal and sphenoid bones; it presented a median ridge (crista-galli), on each side of which existed three or four deep depressions perforated by foramina for the exit of the olfactory nerves. Secondly, in the interior of the nares it presented four irregularly shaped turbinated bones that were situated internal and superior to the nasal canals; these bones were soft and spongy, and were separated from each other by three meatuses posteriorly, but anteriorly they communicated in common with the air-passages. Thirdly, the ethmoid presented an orbital surface or os planum situated beneath the orbital plate of the frontal and extending back as far as the anterior border of the pterygoid bone; the groove for the nasal nerve lay between this bone and the base of the vomer, with which latter this plate was closely united. Fourthly, the large nasal lamella, situated in the median line; it was thicker below than above, and was fitted into the deep longitudinal channel excavated in the vomer.

The superior maxillary bone in shape resembled a ploughshare, having its apex somewhat rounded in front, and its base behind. It presented four surfaces, one external or facial, a second internal or nasal, a third inferior or palatine, and a fourth posterior. The external or facial surface was triangular in outline, slightly convex and smoothish; it was prolonged upwards and backwards into a nasal process, which articulated by foliaceous indigitations with a similar arrangement of osseous plates on the frontal bone. This surface was marked by eight or nine irregularly placed foramina, from which channels passed outwards and downwards for the transmission of blood-vessels, &c. to the baleen plates; the infraorbital foramen was large and situated at the junction of the nasal process with the body of the bone; from this a canal passed, at first downwards and outwards, then backwards and inwards; through this canal the superior maxillary nerve and vessels made their exit to supply the integument and muscles on the side of the snout. The inner or nasal surface was slightly concave, and was directed upwards and inwards; it was furrowed for the intermaxillary bone above, and presented a groove for the upper edge of the vomer, which was overhung by a sharp bony ridge: two oblique foramina, which passed inwards and forwards into the base of the bone, were visible here; these were for the transmission of the nutrient vessels. The inferior or palatine surface was deeply concave, and exhibited fifteen oblique apertures, the orifices of channels for the transmission of blood-vessels which passed in various directions, radiating and grooving the surface of the bone.

The posterior temporo-frontal surface or base was irregular, and divided into two unequal surfaces by large excavated vascular foramina communicating with the apertures already described on the various other surfaces; the upper plane articulated with the frontal and formed the anterior boundary of the temporal fossa; the lower was free, and passed under the supraorbital plate of the frontal bone without coming into actual contact with it. The upper or nasal edge was marked by a shallow groove for the intermaxillary bone; the posterior border, for about one-sixth of its extent, was sharp and harmonized with the outer edge of the nasal bone. The inner or palatine edge was concave, and its anterior four-fifths overlapped the vomer; its posterior fifth was deeply hollowed, and was covered by the palate-bone. The outer edge was sharp and convex, and was prolonged into a blunt zygomatic spur, behind which it extended downwards and backwards below the level of the bone for $3\frac{1}{2}$ inches, where it formed the anterior border of the orbit; this spur was separated from the outer edge by a deep groove, and above internally its continuation formed the anterior boundary of the temporal fossa.

The vomer was a long deeply channelled or spout-like bone, concave on its upper aspect, narrowing anteriorly, and convex beneath, forming a blunt median ridge that lay between and separated the superior maxillæ, where it assisted in forming the roof of the mouth. This ridge was sharp behind, rounded in front, and partially covered by the palate-bones posteriorly; in front it was overlapped by the superior maxillaries: the external edge of each lateral plate fitted into a groove which was situated on the nasal aspect of that bone. Posteriorly it became very thin and flattened, and was separated from the basisphenoid by a small interval, into which the rudimentary rostrum was projected. On either side it united by schindylesis with the base of the internal pterygoid process, where it formed the upper and internal wall of each posterior naris; more anteriorly it united with the frontal, sending a small process between that bone and the pterygoid, which entered into the suture between the palate, alisphenoid, and frontal bones; still further forwards its outer edge united with the ethmoid by harmonia. The deep channel on the upper surface was occupied posteriorly by the nasal lamella of the ethmoid bone, more anteriorly, in the recent state, a thick firm fibrocartilage completed the septum narium, and occupied this sulcus as far forwards as the extremity of the bone.

The palate-bone was quadrilateral in outline and exhibited two surfaces. First, a superior or vomerine, which presented a ridge that fitted into a groove on the vomer; and second, an inferior or palatine surface, which was smooth and concave, and formed the posterior superior wall of the palate. Of the edges of the palate-bone, the posterior was convex and presented a series of plates, by which it was articulated to the anterior surface of the alisphenoid by a similar arrangement of lamellæ. The inner border was smooth and rounded behind, where with its fellow of the opposite side it formed the inferior boundary of the posterior nares; its outer edge was sharp, and was adapted to the contiguous surface of the superior maxilla, and the anterior border was short and flat.

The intermaxillary bone was long, narrow, and somewhat twisted; anteriorly it was triquetrous, but its posterior third was flattened and presented but two surfaces. Its external surface was convex anteriorly, but as it passed backwards, the bone being, as it were, twisted on its long axis, this surface finally looked directly inwards, where it also became concave to accommodate the opening of the anterior nares. For the anterior two-thirds of its length its internal surface was concave from side to side, broad in the centre, gradually narrowing anteriorly to the point of the upper jaw, and behind to a sharp ridge, which represented this surface on the posterior third of the bone. The inferior surface was also laterally concave and channelled deeply behind for the reception of the upper edge of the superior maxilla; one vascular foramen, looking downwards and forwards, was found on the outer surface of the left bone only.

The three edges bounding these surfaces were sharp, convex, and irregular; posteriorly the bone was flattened and formed a single lamina, which was fitted into a sulcus in the frontal, internal to the nasal process of the superior maxilla, and external to the nasal bone; its anterior part or apex projected for nearly 3 inches in front of the superior maxilla.

Each nasal bone was a five-sided mass of light, spongy, osseous tissue, resembling a blunt wedge with the narrowest end posteriorly; its posterior surface was furrowed into a number of deep narrow longitudinal sulci for the accommodation of the articular lamellæ of the frontal bone; the inferior surface was grooved along its posterior border to articulate with the nasal ridge of the frontal, which projected forwards as a shelf to support this extremity; it united externally by a flat surface with the intermaxillary, and internally by a similar facet with its fellow of the opposite side; the anterior and upper surface was convex, and was broader below than above.

The inferior maxillary was a curved elongated bone composed of a condyle, coronoid process, and ramus. The condyle was divided into two unequal segments by a transverse sulcus; the upper portion was much the larger, and articulated on a plane anterior to the occipital condyles with the glenoid cavity of the squamous bone, through the interposition of a large fibrocartilaginous interarticular cushion; but, as stated by HUNTER, no true synovial membrane was found in this articulation, although the existence of a double synovial sac has been demonstrated in *B. mysticetus* by ESCHRICHT and REINHARDT. The lower portion formed about one-fourth of the entire condyle, and gave insertion to the posterior set of fibres of the depressor muscle of the lower jaw. A shallow sigmoid notch, 6 inches wide, separated the condyle from the coronoid process, which latter was prominent and directed upwards and outwards, its posterior margin being $2\frac{3}{4}$ inches and the anterior 2 inches in height, where it gave insertion to the tendon of the temporal muscle.

The projection of this bony process is one of the distinctive characters of this species.

Below the centre of the sigmoid notch and on the inner surface of the bone the orifice of the inferior maxillary canal, for the transmission of the nerves and vessels, was situated; this canal continued through the ramus, sending off numerous branches which opened ultimately by seven oblique foramina in a regular series along the upper border of the external surface of the bone. A series of similar but smaller canals, about twenty in number, with their orifices directed forwards, perforated the internal surface close to its upper edge. The rami were firmly united by a dense fibrocartilage at the symphysis. The lower jaw projected beyond the intermaxillary bones for about 2 inches, and the transverse width between the rami, taken at the point of their greatest convexity, which was about 1 foot 7 inches from the symphysis, exceeded the transverse width of the superior maxillaries, measured from the same place, by about 9 inches; and each ramus towards its anterior extremity exhibited a slight tendency to that torsion which is so distinctly marked in the lower jaw of *B. mysticetus*; and at the symphysial end there was a distinct fissure, the remains of the channel for the distal extremity of the Meckelian cartilage.

The lachrymal bone was in outline a scalene triangle with rounded angles; its external border was the thickest and somewhat concave, its upper margin being raised into a well-defined ridge, the other sides being thinned off like a wedge; the inferior surface was nearly flat, corresponding in shape to the superior surface of the external angular process of the superior maxilla, and its superior surface, which was rough and slightly convex internally, underlay the anterior portion of the orbital plate of the frontal, where the lachrymal was wedged in between these two bones.

The malar or zygomatic bone was slender and somewhat rib-like or falcate; it formed the inferior boundary of the orbit, and was broader behind than in front; its anterior border articulated with the external orbital or zygomatic spine of the superior maxilla; its wider or posterior extremity was flattened, and fitted in between the anterior border of the glenoid process of the squamous bone and the posterior angular process of the frontal, where a digital depression existed for the reception of the former. In outline the bone presented a curve which was much sharper in front than behind.

The external aperture of the bony orbit which was formed by the frontal, squamous, malar, and lachrymal bones, measured $4\frac{1}{2}$ inches in length by $3\frac{1}{4}$ in breadth.

The cervical vertebræ were seven in number.

The first, or atlas, was an irregular bony ring, somewhat oval in outline, $5\frac{3}{4}$ inches in height, having two surfaces, the anterior of which presented two lateral, reniform, shallow concavities, for the reception of the condyles of the occipital bone; these were separated from each other by a shallow groove with slightly elevated edges; this in the recent state was occupied by the anterior atlanto-occipital ligament. The neural arch was angular in shape, with its apex terminating in a very short neural spine, directed backwards; the neurapophyses were separated from the articular surfaces by a deep semicircular channel for the transmission of the suboccipital artery. The transverse processes, short and stout, stood out on each side about the centre of the transverse axis of the bone external to the articular depressions, their upper edges being directed forwards and upwards; the entire width of the vertebra across these processes was $7\frac{3}{4}$ inches.

The posterior surface presented two reniform convex articular facets, which corresponded in outline with the articular cavities on the anterior aspect; these articulated with corresponding depressions on the anterior surface of the axis, and were separated posteriorly from the neurapophyses by a very shallow groove or depression, for the transmission of the second pair of cervical nerves. The neurapophyses arched backwards and coalesced to form a very rudimental neural spine.

On each side of the external surface of this vertebra an oblique ridge ran backwards and upwards from the superior and external angle of the transverse process to a small tubercle (zygapophysis) which overhung the groove that gave exit to the second cervical nerves. This ridge gave attachment to the rectus capitis lateralis. There was no anterior tubercle on the ventral aspect of the body of this bone.

The second, or axis, consisted of a very narrow body irregularly elliptical in outline with two surfaces, the upper of which presented a central hemispherical elevation (odontoid process), and which, when the bone was placed *in situ*, occupied the anterior semicircular space between the articular facets of the atlas. This eminence was partially separated from the body of the axis by a well-defined fissure, situated transversely in the posterior wall of the body of the vertebra, where the osseous incrustations or epiphysial disks of two vertebræ were distinctly visible, separated from each other by a rudimental articular surface, thus bearing out the theory promulgated by Professor OWEN, that the central elevation of the axis vertebra is in reality the homologue of the centrum or body, not of this segment, to which it would now seem to belong by osseous coalescence, but of the atlas. This theory is further evidenced by the fact that the odontoid process appears to have three points of ossification; first, a small irregular detached piece of bone imbedded in the apex of the elevation, and which represents the upper epiphysial disk of the atlas; secondly, a point of ossification, but much larger, in fact forming the greater part of the odontoid process, and coalescing anteriorly and laterally with the upper surface of the axis; and thirdly, a small flat thin plate which formed the upper boundary of the transverse fissure, before noticed as existing in the posterior wall of the body or centrum of the bone.

Surrounding the hemispherical eminence, there was a crescentic-shaped depression, which received the posterior articular surfaces of the atlas.

The posterior surface of the body of the axis was concave, and in outline irregularly elliptical; it was slightly grooved posteriorly. The neurapophyses arched backwards and terminated in a bifid neural spine, which was more robust than that of the atlas. The oblique or articular processes (zygapophyses) were small, with nearly circular facets situated towards the bases of the neurapophyses, with their articular surfaces directed backwards, downwards, and inwards. The diapophyses were large and robust, and projected from the sides of the centrum. The pleurapophyses were also well developed, and, together with the diapophyses, formed nearly three-fourths of an oval, which in the recent state was completed by interposed cartilage; the spaces thus enclosed in this vertebra measured about $1\frac{3}{8}$ inch in diameter.

The remainder of the cervical vertebræ were in outline somewhat similar to the axis, but their bodies were much more compressed in the antero-posterior direction. Their parapophyses extended from the sides of the anterior portions of each centrum forwards and outwards, diminishing in length to the seventh or last cervical, where they were merely rudimental. The lateral processes (diapophyses) were much longer but less robust than the parapophyses, and those of the third, fourth, and fifth were directed backwards, while the other two arched forward from the bases of the neurapophyses; these, in conjunction with the parapophyses anteriorly and sides of the centrum, internally formed an oval-shaped space, which in the recent state was completed by fibrocartilage uniting the extremities of the parapophyses to those of the diapophyses. The zygapophyses resembled both in shape and position those of the axis. In consequence of the lateral extension of these processes, motion in the cervical region was greatly restricted; this, however, when we take into consideration the economy of the animal, was of little moment as compared to the protection afforded by these bony arches to the important vascular sinuses, which in the recent state were lodged in these cavities on each side of the neck, and which were formed by the interlacement of numerous vessels from the vertebral and carotid arteries, inosculating freely with each other and producing a beautiful example of a rete mirabile.

There were eleven dorsal vertebræ. The first closely resembled the last cervical, except that its centrum was thicker, and was furnished with longer and more robust and compressed diapophyses.

The remainder of the dorsal vertebræ had their lateral processes more horizontally placed and more elongated, those of the anterior six being directed forwards, while those of the eighth to the eleventh pointed backwards, and those of the seventh projected at right angles with the axis of the body of the vertebra; these processes were thickened at their free extremities, where they articulated with the ribs; their neural spines were flattened and somewhat quadrilateral in outline, with their free extremities directed, those of the second and third upwards, and the others backwards and upwards, each of them becoming gradually more decumbent and elongated as they descended towards the lumbar region. The zygapophyses were prominent and directed forwards; rudimentary parapophyses were developed in the first and second dorsals, similar to those described by LILLJEBORG in a female skeleton preserved in the Museum at Bergen. The bodies became more robust as they descended towards the lumbar region, and were all obtusely carinated on their inferior surfaces*.

The neural canal, which in the cervical and upper dorsal regions had its greatest diameter in the transverse direction, in the lower dorsal region gradually diminished in calibre, and its major axis changed its direction from transverse to vertical.

The bodies of the lumbosacral and caudal vertebræ were mostly solid and massive with flat and thin lateral processes, which gradually became shorter and thicker as they approached the tail. Those of the first lumbosacral vertebræ were directed transversely outwards, those from the second to the twelfth were inclined forwards, those of the thirteenth and fourteenth looked directly outwards, and the remainder were turned forwards; at the nineteenth the lateral processes were entirely suppressed. Their neural spines gradually increased in length to the middle of this region, and then rather rapidly diminished towards the tail, the seventh caudal being the last that possessed a spine. The centrums presented on their anterior surface a bluntish keel, which gradually increased in prominence to the thirteenth; those of the twelve lower caudal were perforated on each side of their dorsal aspect by a canal which opened on the ventral surface in a depression situated external to the articular surfaces for the chevron bones. The crest on the anterior aspect of the caudal vertebræ was bifid, the lateral ridges being separated by a central longitudinal groove, which was pierced about the central part of each centrum by two foramina.

The articular processes or zygapophyses of all the lumbo-sacral vertebræ articulated with each other, while those of the caudals were free.

The foramina on the dorsal aspect of the sixteenth vertebra was situated at the root of the transverse process, but when these processes ceased to exist, these apertures perforated the sides of the centrum on the dorsal aspect.

* This differs from the description of LILLJEBORG, who says that none of the dorsal vertebræ are ridged on the lower side of the corpus.

The chevron or inferior spinous bones were seven in number, each being composed of the two lateral branches which inferiorly coalesced and formed the hæmal spine. Of these segments the second was somewhat larger than the first, in which latter, the hæmal spine, though less prominent inferiorly, was more elongated posteriorly, with its inferior or free edge, in outline, more elliptical; the hæmal spines of the remainder, with the exception of the last, in which it was entirely suppressed, were more or less circular, rounded, and decreased in prominence as they receded from the second. These bones commenced to be articulated at the intervertebral space between the thirty-second and thirty-third vertebræ, and ceased at the intervertebral space between the thirty-ninth and fortieth.

The eight terminal caudal vertebræ were destitute of a spinal canal, which was merely represented by a shallow groove, and their centrums were mere bony cubes with their angles rounded off.

The ribs, eleven in number, were bony arcs, thicker, flatter, and somewhat more spongy in texture at their sternal than at their vertebral extremities. The heads were articulated with the transverse processes of the dorsal vertebræ through intervening cartilage, and from each capitulum a bony ridge passed outwards to the angle or tubercle on each.

The head of the first rib was simple and undivided, and its shaft was flatter and wider than the others. The fourth was the longest, measuring along its convex border 2 feet 3 inches, and also the most curved. The heads of all the posterior ribs were marked by a slight sulcus, and the fourth and fifth had a distinct tubercle placed about 2 inches external to their heads, but this process ceased to exist on the four posterior ribs.

The sternum was a light flat porous bone, irregularly heart-shaped; it was notched in front and prolonged posteriorly into a bluntish extremity. Mr. FLOWER describes the shape of this bone, in the animal examined by him, as being that of an elongated cross; this difference may possibly be due to the different age of the two animals. The first ribs alone were articulated to this segment.

The ischiatic bones existed as mere rudimentary fibrocartilaginous bodies about 6 inches long, of an arcuated or sigmoid shape, narrowing to their inferior extremities; they were imbedded in the muscles of the abdomen, and were placed perpendicularly beneath the first chevron bones.

The scapula was triangular and flattened, slightly concave on its subscapular aspect, where it presented four very superficial diverging furrows; the dorsum was likewise slightly concave and perforated by a few vascular foramina towards the neck; the external border was rounded and concave, blunt towards the glenoid cavity, becoming sharper towards the posterior angle; the posterior or vertebral edge was curved and porous, being, in the recent state, bordered with cartilage; the anterior edge was nearly straight and bevelled off obliquely towards the dorsum, forming an extremely narrow marginal surface, separated from the proper dorsal surface by a slightly raised edge that was bounded at its external third by a prominent flattened recurved acromion process, which was about 3 inches long by $1\frac{1}{8}$ inch in breadth on its outside. The glenoid cavity was shallow, rough, and ovoid in outline, with its larger extremity towards the external edge, straighter along the subscapular than the dorsal border; its margins were rounded and covered with fibrocartilage. Anteriorly this cavity was bounded by a blunt coracoid eminence $\frac{3}{4}$ of an inch long, tipped with cartilage, which received the insertion of the suprascapular ligament. In structure this bone was cancellous and soft towards the superior border, and denser towards the glenoid cavity.

The humerus was a flattened irregularly club-shaped bone; its head, roughly rounded, was united to its shaft by cartilage, its area being much greater than that of the glenoid cavity, and its long axis lying in the antero-posterior direction. The shaft was compressed in front and convex behind, presenting several rough facets for muscular attachments; in those on the posterior surface were inserted the supraspinatus, infraspinatus, and deltoid above, the first occupying the most external position, the second placed internally, and the third below and intermediate. From the posterior border of this surface the external head of the triceps arose, and lower down on the shaft the humerus was slightly hollowed to give origin to the extensor digitorum communis. The anterior surface presented internally a tubercle for the subscapularis, behind which extended an obscure ridge for the teres major; above and externally the humeromastoid was inserted. The lower extremity presented two elliptical articular surfaces, so placed as to produce an obtuse angle with each other, the radial or larger surface looking downwards and outwards, the ulnar upwards and inwards. These surfaces were not covered by synovial membrane, as described in *B. mysticetus* by ESCHRICHT and REINHARDT.

The radius was a flattened, curved, elongated bone; its humeral head was oval, with its long axis placed transversely; the lower extremity was slightly dilated to correspond with the carpal bones.

The ulna was likewise an elongated slightly curved bone, flattish, and separated from the radius by a small interosseous space. These bones at the proximal and distal extremities were in contact, and connected in the recent state by fibrocartilage.

The humeral extremity of the ulna was larger than its carpal, and presented a prominence on its internal side, the olecranon process, which in the recent state supported a large triangular mass of cartilage from which the three flexor muscles arose, and into which the triceps was inserted.

Of the carpal bones there were only four perfectly ossified, and in shape these were spherical, varying in diameter from $\frac{1}{2}$ to a $\frac{1}{4}$ of an inch. The metacarpals were four in number, and ranged from 1 to $1\frac{1}{8}$ inch in length, the second being the longest. The phalanges were, as well as could be ascertained, four in each of the central digits, and three in each of the lateral ones.

ESCHRICHT and other authors have enumerated a larger number of phalanges as belonging to individuals of this species, but as in the present specimen the terminal extremities of the digits were purely cartilaginous, it was difficult to determine the precise number of rudimentary phalanges in each. According to LILLJEBORG the typical numbers are in the first digit four, in the second seven, in the third six, and in the fourth three; the fifth digit, and the hooked-like carpal bone connected to it, mentioned by ESCHRICHT as being present in the fœtus of this species, could not be detected.

Muscles.

On removing the integument from the anterior and lateral part of the body, the following muscles were exposed to view.

Pectoralis major was a flat, triangular, or fan-shaped muscle covering the anterior surface of the wall of the thorax. It arose from the anterior border and inferior surface of the sternum, from the sternal cartilaginous extremities of the five anterior ribs, and from the dense fibrous aponeurosis which covered the muscles of the abdomen; its line of origin extended backwards for about 3 feet posterior to the anterior or cervical border of the sternum, to within about a foot of the umbilicus. The anterior fibres passed directly outwards, the middle and posterior ran forwards and outwards, all converging to form a very broad flat tendon, which, crossing the anterior wall of the axilla, was inserted into the anterior portion of the head of the humerus; some of the lower fibres, especially those arising from the abdominal aponeurosis, were connected with the integuments and fascia which covered and formed the outer boundary of the axilla; the tendon of this muscle was separated from the front and inner part of the head of the humerus by a small synovial bursa, and its external margin covered the long respiratory nerve, which, accompanied by a large artery and vein, passed to the serratus muscle; this nerve, a branch of the brachial plexus, with its accompanying long thoracic vessels, lay between the anterior border of the serratus magnus and the greater pectoral; the artery and vein ran backwards on the side of the thorax and abdomen, the vein emptying itself into the subclavian by turning over the edge of the first rib.

The lessor pectoral was absent, but beneath the pectoralis major a cellular lamina existed which separated this muscle from the following.

The intercostales, twenty on each side, were arranged in two sets, external and internal; the former ran downwards and outwards, the latter in the opposite direction, or upwards and inwards.

On removing the dense integument and thick cervical fascia from the front of the neck, the platysma myoides could be seen only in the median line.

Sternomastoid.—This muscle arose by two fleshy heads, one about 2½ inches wide, from the middle line of the sternum, and from the cartilaginous extremities of the first two ribs. The second head, somewhat rounded in shape, took its origin from the external part of the first rib; these two heads soon coalesced, and their united fibres ran upwards, and converging, formed a tendon which passed over the external pterygoid muscle, and was inserted into the mastoid process of the squamous bone.

Omohyoid.—A large monogastric flat muscle lay beneath the last named, and arose tendinous from the upper surface of the coracoid process and from the anterior border of the scapula; it passed forwards and inwards to be inserted into the lower surface of the posterior cornu of the body of the os hyoides, crossing over the middle portion of the carotid artery and jugular vein.

Scalenus anticus.—A round muscle; it arose about 4 inches from the sternal end of the first rib; its fibres ran upwards and outwards to be inserted into the anterior surface of the transverse process of the upper cervical vertebræ; in its course it covered the axillary vessels, and the cervicalis ascendens passed along its external border.

In *Globiocephalus Svineval*, Gray, the scalenus anticus was attached to the first and second ribs in front of their angles, and was inserted into the transverse process of the first cervical vertebra.

Mastohumeral was pyramidal in shape; it arose from the transverse process of the anterior cervical vertebræ, and from the paramastoid process; its fibres passed downwards and outwards, converging to form a long round tendon that, towards the head of the humerus, became flattened prior to its insertion, which was into the anterior and internal part of that bone; from this point a tendinous expansion was continued in front of the humerus: this muscle probably represents the trachelo-acromial of quadrumana and other mammals, somewhat similar to the levator claviculæ which is often developed as an anomaly in Man; a branch of the cervical plexus of nerves pierced the belly of this muscle.

The sternohyoid muscle was long and flat, measuring 6 inches in length by 2 inches wide; it arose from the upper border of the sternum, and passing upwards and outwards was inserted into the lower border of the body of the os hyoides.

No sternothyroid muscle was found, although it exists in other Cetaceans. In the *Globiocephalus Svineval* it arose from the back of the inner part of the cartilage of the first rib, and was inserted into an angular line on the ala of the thyroid cartilage, the direction of its fibres being upwards and inwards, and in its course overlapping the carotid vessels.

Thyrohyoid was a flat quadrilateral muscle; it arose from the external and superior border of the thyroid cartilage, passing forwards and outwards to be inserted into the internal half of the superior cornua of the os hyoides; in *G. Svineval* the origin of this muscle was from an oblique line on the ala of the thyroid cartilage, and its insertion was into the posterior border of the body of the os hyoides.

The thyroid body was a large thin somewhat triangular or, rather, V-shaped mass enclosed in a fibrous capsule and about 6 inches in length, from before backwards, having its apex directed downwards and backwards towards the thorax, almost reaching to the bifurcation of the trachea; its upper border or base corresponded to the inferior portion of the thyroid cartilage, and concealed a part of the lateral edge of the cricoid, being itself overlapped by the sternohyoid muscles. Large superior thyroid branches of the carotid artery were traceable into it, but no inferior thyroids were seen. In *Globiocephalus Svineval* these vessels exist and attain a large size.

Superior to the depressor muscle of the lower jaw and posterior to the articulation of that bone with the glenoid cavity, the portio dura of the seventh pair was situated; this nerve, after passing through a large oval foramen in the pterygoid bone, ran directly outwards and divided into three branches. First, the anterior or motor division wound round the superficial surface of the fibrocartilage of the lower jaw, where it bifurcated, sending one branch to the depressor maxillæ inferioris, and the second to the temporal and masseter muscles. Second, the posterior branch; this ran backwards for about 1 inch and divided into two, one of which pierced the mastohumeral muscle and joined some filaments of the cervical nerves; the other branch supplied the muscles about the shoulder-joint. The third, or internal branch of the portio dura, passed upwards and inwards to supply the muscles of the neck, some filaments from it being distributed to the integuments situated around the fibrocartilaginous ear-pedicle.

From the integument surrounding the external orifice of the ear there passed inwards a round dense fibrocartilaginous cord about $\frac{1}{2}$ an inch in diameter and $4\frac{1}{2}$ long; this structure was surrounded by a fibrous investment, and was traceable winding round and behind the mastoid process to the tympanic cavity, to the wall of which its deep-seated extremity was firmly attached.

Occupying the inferior or superficial part of the interspace between the rami of the lower jaw in the anterior part of the middle line was a condensed fibrous expansion, which extended forwards as far as the symphysis, and was bifurcated posteriorly at the middle point of the lower jaw, giving attachment to the following muscle.

Mylohyoid or compressor of the inframaxillary pouch.—This muscle, broad, thin, and flat, arose from the inner edge of the inferior border of the lower maxilla as far back as its angle, and anteriorly from the aponeurosis just described; the fibres passed inwards, converging and interlacing towards the mesial line, where they met, and were inserted in common with the corresponding portion of the muscle of the opposite side.

In structure this muscle resembled a platysma myoides or panniculus carnosus, or, more correctly speaking, was of a dartoid character, being composed of fine muscular fibres and areolar tissue permeated by numerous blood-vessels. Its use was by its contraction to compress and thereby empty the submaxillary pouch. The inferior or posterior fibres of this muscle ran downwards as far as the lower part of the pouch, and some of them were traceable backwards in the median line, forming a kind of subcutaneous muscular expansion on the anterior surface of the abdomen; this, however, did not expand laterally in the cervical region, and hence that portion of the neck external to the inner margin of the sternomastoid muscle had no superficial muscular investment.

Longus colli.—On the anterior surface of the spine, after removing the trachea, œsophagus, and inframaxillary pouch, there existed an enormous muscular mass corresponding to the longus colli, longus atlantis, and rectus capitis anticus muscles, and in part also to the scalenus posticus and medius and supracostalis muscles. This mass arose by three heads, the most internal from the anterior or, more correctly, inferior surfaces of the bodies of the five posterior cervical and two anterior dorsal vertebræ; this portion represented the longus colli muscle. The middle portion arose from the outer part of the first rib by a short fleshy mass and by a longer and flatter portion, which, descending over the thorax, was connected below and behind with the external oblique and rectus abdominis muscles posteriorly, and appeared to be the combined equivalent of the scalenus medius, rectus sternalis, and supracostalis muscles. The most external or superficial fibres arose from the posterior portion of the three anterior ribs. The fibres of these three portions converged, and uniting formed a single inseparable musculotendinous mass which was inserted into the basilar process of the occipital bone extending as far forwards as the posterior orifices of the nares, and by some tendinous slips into the inferior and anterior cervical transverse processes.

On removing this muscular mass a very large plexus of blood-vessels, principally venous, was seen extending from the first cervical to the fourth dorsal vertebra, lying on the heads of the ribs, and passing also upwards into the large spaces formed by the transverse processes of the cervical vertebræ; a portion of this plexus likewise passed in the interval between the two heads of the trachelomastoid muscle, and in the cup-like cavities or interspaces between the necks of the ribs. In the interval between the transverse processes of the second and third dorsal vertebræ it received a large vein which passed out of the spinal canal; this vessel and its fellow of the opposite side were traceable upwards to the interior of the cranial cavity, one lying on each side of the medulla spinalis external to the dura mater, and its origin appeared to be from a venous sinus formed within the cranial dura mater. Arteries derived from the internal carotid accompanied these veins, and were arranged in a somewhat similar, though more numerous, finer, and more intricate retiform manner.

At the posterior or thoracic part of this rete mirabile the veins gradually coalesced, and thus formed several large trunks on each side of the spine; these again uniting ultimately formed two large veins, which were distinctly traceable into the superior vena cava immediately prior to its entrance into the right auricle. Two large spinal arteries, after traversing this rete, were traceable downwards along the spinal canal, one on each side of the medulla spinalis on the external surface of the arachnoid, but within the dura mater, gradually converging and becoming smaller in calibre until they reached a point opposite to the articulation of the first or most anterior chevron bone, where they united and formed a single vessel, which was from thence traceable to near the termination of the spinal canal in the vertebræ of the tail. These arteries were accompanied anteriorly by a somewhat similar arrangement of veins, branches passing into the internal jugular, which were perhaps less complex in their anastomosis than were the arteries, although the latter constituted a larger part of the plexuses.

The Depressor maxillæ inferioris, situated behind the angle of the jaw, which it clothed and almost completely concealed, was a powerful deltoid-shaped muscle, and arose from the posterior surface of the mastoid process of the squamous bone, and the sulcus behind and internal to it; the fibres converging, ran downwards and forwards to be inserted into the posterior and inferior surface of the angle of the maxilla, and also into a portion of its ramus for the extent of about 4 inches anterior to that point. This muscle appeared to be homologous with the digastric of other mammals, from its position as well as action, which latter was twofold, first to depress, and second to retract the inferior maxilla.

On removing a strong temporal aponeurosis and a quantity of dense cellular tissue the Temporal was exposed; this muscle arose fleshy from the entire of the temporal fossa, which latter was formed by the union of the squamous, frontal, parietal, basi-sphenoid and pterygoid bones, extending as far forwards as the posterior angle of the orbit, and backwards to the anterior edge of the glenoid cavity and interarticular fibro-cartilage; the greater part of the fibres ran downwards and forwards, converging to be inserted by a very strong tendon into the prominent coronoid process of the inferior maxilla, which its tendinous insertion embraced; this muscle was of great thickness, and composed of fine and firm muscular fibres. Posterior to the tendon of this muscle, and in front of the interarticular cartilage, was placed a large oval, probably glandular body, about $1\frac{1}{2}$ inch thick and 2 inches long. A large plexus of arteries and veins surrounded its outer and posterior part, but no duct was detected in connexion with this otherwise seemingly glandular body. Probably it was a rudimentary salivary gland, although the existence of an organ of this nature has been generally denied to cetaceans.

The Pterygoid muscle was small and flat; it arose fleshy from the external surface of the pterygoid plate, which formed the outer wall of the posterior nares; the muscle ran downwards and backwards, and was inserted into the internal border of the lower jaw near its angle, sending some of its posterior fibres to be inserted into the interarticular fibrocartilage. This muscle was evidently the representative of the external pterygoid; no muscle corresponding to the internal pterygoid was found.

Superior and external to this muscle was placed a very remarkable plexus of arteries and veins which lay in a distinct cavity, bounded internally by the pterygoid muscle, and externally by the angle of the inferior maxilla and fibrocartilage; the cavity was lined by an extremely delicate glistening membranous structure, similar in texture and appearance to the seroid lining membrane of the veins. The vascular plexus itself extended from the coronoid process of the lower jaw to a point midway between the angle of the latter bone and the upper border of the sternum. The venous ramifications that partly formed the plexus gradually united as they passed backwards, and ultimately formed one trunk, the jugular vein. The arterial portion of it was derived from the trunk of the internal carotid. The common carotid artery ascended on the anterior surface of the longus colli muscle, lying under the omohyoid and external to the great cornua of the os hyoides, and midway between the top of the sternum and the angle of the jaw; it divided into four branches.

First, the external maxillary or facial, which passed upwards to the angle of the lower jaw, lying external to the vascular plexus just described, and ramified on the surface of the pterygoid muscle and maxilla. Secondly, the occipital, which ran parallel with the longus colli muscle, crossing superficial to the pneumogastric nerves, and terminated on the posterior portion of the occipital bone among the deep muscles in this situation. The third branch or internal maxillary was the largest; it passed forwards and outwards, and was lost among the deep structures at the base of the skull; and fourthly, the internal carotid, which formed part of the before-mentioned plexus, continuing its course into the cranial cavity to supply the brain through the medium of its rete mirabile, where its inosculating branches interlaced with those of the venous plexus at the base of the skull.

The Masseter was a quadrilateral muscle consisting, as usual, of two planes of fibres, superficial and deep. The former arose by a flat tendon from the central portion of the inferior border of the orbit, from whence it ran downwards and backwards to be inserted into the posterior part of the angle of the lower jaw in front of the depressor maxillæ inferioris; a few of its fibres were inserted into the interarticular fibrocartilage. The latter or deeper set of fibres arose tendinous from the margin of the glenoid cavity, extending as far forwards as the posterior edge of the orbit; the fibres of this plane ran downwards and a little forwards, and were inserted into the base of the lower jaw about 3 inches in front of its angle, and occupied by its insertion about 3 inches of the outer surface of this bone.

In a triangular space, bounded by the masto-humeral externally, the sternomastoid internally, and the pectoralis major below, corresponding to the posterior inferior triangle of the neck in the human subject, lay a considerable number of lymphatic glands, and also a very remarkable oval glanduloid body which, under the microscope, was found to consist of numerous cells or cavities imbedded in a matrix of loose fibro-areolar tissue, and into which very few blood-vessels were traceable; these are probably the representatives of the glandulæ concatenatæ.

On removing the integument and fascia from the abdominal wall, the following muscles were disclosed.

External oblique.—This muscle arose by fleshy slips from the eight inferior ribs, and its origin was connected to the before-described muscular mass situated on the anterior part of the thorax; its fibres ran downwards and inwards, forming a large tendinous expansion which covered the anterior part of the abdomen, and was inserted into the linea alba as far backwards as the anterior commissure of the cloacal sulcus; a thin fascia was interposed between this and the following muscle.

Internal oblique, which was situated beneath the foregoing, arose tendinous from the lumbar fascia as far backwards as the vulva; its fibres ran forwards and inwards, and were inserted into the sternal cartilaginous extremities of the eight or nine inferior ribs, and into the linea alba as far forwards as the lower border of the sternum, and backwards to the anterior commissure of the vulval fissure.

Transversalis abdominis.—This muscle lay deeper than the last described, and arose fleshy from the lumbar fascia, extending as far back as the posterior limit of the origin of the internal oblique, and continuing as far forwards as the tenth rib; the fibres ran inwards, and were inserted tendinous into the linea alba, the entire insertion being situated on the deep-seated surface of the rectus abdominis.

Rectus abdominis arose by a central tendon from the three or four anterior chevron bones, from whence its fibres passed forwards and outwards, expanding, arranged in a penniform manner, and were inserted into the second, third, fourth, fifth, and sixth ribs, external to their cartilaginous or inner extremities, by a flat tendinous expansion. This muscle covered, and was connected to, the rudimentary pelvic bones; over it were expanded the tendons of the external oblique and internal oblique, and behind it lay the transversalis muscle.

On removing the integument and fascia from the back of the animal, the following muscles were disclosed.

Latissimus dorsi.—A flat thin muscle, which arose by a broad aponeurotic expansion from the spines of all the dorsal and a few of the anterior lumbar vertebræ, behind the attachment of the rhomboid muscle; the fibres passed downwards and outwards, and were inserted into the internal edge of the inferior surface of the humerus.

Rhomboideus.—This muscle was thin and weak; it took its origin from the spinous processes of all the dorsal and one or two of the anterior lumbar vertebræ by a thin aponeurosis, which was partly united to the origin of the latissimus dorsi; the fibres passed forwards and outwards to be inserted into the inferior angle of the scapula anterior to the following muscle; there was no sign of segmentation into major or minor portions.

Serratus magnus vel depressor anguli scapulæ.—This muscle arose from the aponeurosis investing the abdomen and the eight inferior ribs; the fibres ran upwards and forwards almost parallel to the ribs, and were inserted into the inferior edge of the scapula 4 inches above its inferior angle, where it united with the posterior edge of the origin of the teres: another flat slip of the serratus muscle arose from the second rib and lay above the inferior and posterior part of the muscle. The long respiratory nerve of BELL supplied its inferior portion.

Levator anguli scapulæ.—A small pyramidal muscle; arose from the transverse process of the last cervical vertebra, from whence it passed directly outwards, and was inserted into the posterior superior or cervical angle of the scapula.

Trachelomastoid was a short thick fleshy muscle; it arose by two heads, one from the transverse process of the first dorsal vertebra, and the second from the sides of the bodies of the three or four posterior cervical; the fibres passed upwards and outwards to be inserted into the posterior surface of the mastoid process of the squamous bone behind the articulation of the lower jaw. The two heads of this muscle were separated by an offshoot of the great vascular plexus, as before described.

Longissimus dorsi.—A large and somewhat pyramidal-shaped muscle; arose by a broad flat tendon from the neural arches of the caudal vertebræ as far back as the extremity of the tail; the fibres passed forwards, being connected to its fellow of the opposite side by means of a strong tendon which passed up to within 3 feet of the posterior part of the skull, at which point they diverged and were inserted into the osseous crest on the external edge of the occipital bone as far forwards and outwards as the level of the temporomaxillary articulation.

External to but connected with this muscle, a distinct slip of muscular fibres passed from the same origin to the posterior portion of the mastoid process, the lower fibres of which seemed to represent the sacrolumbalis muscle, while the anterior portion was probably the slightly displaced homologue and representative of the splenius capitis.

Levator caudæ, a very powerful muscle, was overlapped by the last described, with which some of its fibres were continuous; it arose by strong fleshy fibres from the dorsal aspect of the transverse processes of the lumbosacral and caudal vertebræ about 5 feet anterior to the root of the tail; it was inserted by eight strong flattened tendons, each of which measured from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in thickness, into the sides of the neural spines of the lower caudal vertebræ, expanding posteriorly into the fibrocartilaginous tissue which formed the substance of the lateral flukes of the tail.

Depressor caudæ major, an enormous muscular mass which formed the entire bulk of the posterior and inferior part of the body from the pudendal fissure to the base of the tail, and arose from the anterior surfaces of the bodies and transverse processes of all the lumbosacral and all the caudal vertebræ, and also from the ventral and lateral surfaces of the chevron bones. This muscle was divided into about nine subordinate bundles, each of which terminated in a round powerful tendon, which, at its origin from the muscle, measured about 1 inch in diameter; all these tendons passed backwards, and expanding were inserted into the sides and anterior surfaces of the bodies of the caudal vertebræ, the last tendons expanding into the under surface of the substance of the tail.

Depressor caudæ minor.—This muscle was similar to but smaller than the last described; it arose below and external to it, from the anterior surfaces of the caudal vertebræ, extending as far forwards as midway between the last rib and the posterior extremity of the spinal column, and was inserted by roundish tendons into the substance of the tail, sending a few of the most anterior fibres to the most posterior of the caudal vertebræ immediately connected with that organ.

The anterior or pectoral extremity, although it externally appeared but a solid single lancet-shaped organ, yet on examination was found to contain the rudiments of the various segments of the typical vertebrate upper extremity as found in the other orders of Mammalia, viz. scapula, humerus, radius and ulna, carpus, metacarpus, and phalanges.

The muscles, as might be expected, were small, rudimentary, and undeveloped; nevertheless it was not difficult to determine the position and homologies of those that were present.

Among those of the shoulder.—The Deltoid was small, fleshy, and triangular in shape; it arose from the upper half of the external flat surface of the scapula above the infraspinatus; the fibres passed outwards and backwards, converging towards the head of the humerus, into the anterior and internal surface of which they were inserted by a strong flat tendon; its action was probably to advance the paddle upon the scapula.

Teres major.—A flattish muscle, arose tendinous and fleshy from the inferior border of the scapula; the fibres passed downwards, forwards, and outwards, and were inserted into the anterior and internal surface of the neck of the humerus; some of the fibres were inseparably connected at their origin with the insertion of the serratus magnus.

Supraspinatus.—This muscle lay immediately beneath the deltoid; it arose from the upper border of the dorsum of the scapula and acromion process. The fibres ran downwards and backwards, converging to form a large triangular muscle, about half the size of the deltoid, and soon ended in a tendon, which was inserted into a ridge on the anterior inferior and external surface of the head of the humerus.

Infraspinatus.—A large flat triangular muscle, arose fleshy from the lower half of the dorsum of the scapula; its fibres passed upwards and outwards, and were inserted into the superior and external part of the head of the humerus.

Subscapularis, also large and triangular, with its base towards the vertebral border of the scapula; it arose from the entire subscapular fossa, and its fibres passed downwards, converging to form a flat tendon, which was inserted into the front of the head of the humerus superior to the humeromastoid muscle, which latter at this point formed a round tendon that lay in a groove in the head of the humerus. This muscle exhibited very few and indistinct tendinous intersections, thereby contrasting in a striking manner with the corresponding muscle in *Globiocephalus Svineval*, in which there were eight radiating tendinous plates running nearly parallel and partitioning the muscle into nine fleshy slips, which ended in a tendon that did not pierce the capsule of the scapulo-humeral articulation.

The axillary vessels and nerves passed in front of the subscapularis tendon; and the artery, which in this situation was of about the size of the human popliteal, had two venæ comites accompanying it, and bifurcated at the lower border of the tendon, where it sent one branch, about the calibre of the human radial, down along the humerus, and the other (the subscapular) ran along the inferior border of the scapula. The brachial plexus of nerves was composed of very small branches, which broke up into muscular and cutaneous filaments. The plexus itself, prior to its division, lay on a plane superior and external to the vessels.

At the upper part of the axillary space two remarkable series of veins were situated, one set being placed anterior and horizontal, the second set posterior and vertical; the former was contained in a flat and membranous expansion, and was somewhat quadrilateral in outline; the vessels composing it, with the exception of a few intercommunicating branches, ran parallel to each other, and were held together by a strong cellular investing membrane. This plexus was situated above the subscapularis and posterior to the origin of the omohyoid muscle.

The second, or vertical plexus, lay about 2 inches posterior to that just described; it was flat and triangular in outline, with its apex, which was thin and membranous, directed towards the vertebral column; its base or inferior border, enclosing the second series of vessels, was formed of dense cellular tissue, and presented a well-defined border, which extended from the first rib, internally, to the apex of the shoulder on the external or pectoral side of the omohyoid muscle. The free border of this structure may be considered as homologous to the ligamentum bicorne or costocoracoid membrane of other mammals*.

Coracobrachialis, a short round muscle placed anterior to the above-described venous plexus; it arose from the apex and anterior surface of the coracoid process, from whence it passed downwards and outwards to be inserted, by a flat tendon, into the anterior and internal part of the head of the humerus on the scapular side of the groove for the humeromastoid muscle. This muscle had no connexion with the capsular fibro-cartilage, but in *Globiocephalus Svineval*, in which a synovial capsule existed, it was inserted into the ligament, thus forming a coracocapsular muscle similar to that which exists in several other animals, and which has been lately described by Mr. WOOD as an abnormal condition in Man†.

No flexors of the fore arm were developed, but external to the coracobrachialis there were a few tendinous bands which appeared to be the sole representatives of this group of muscles, being probably the rudiments of the biceps flexor cubiti.

The triceps was a flat irregular mass, and consisted, first, of a long head which arose from the inferior surface of the neck of the scapula, from whence it passed backwards to be inserted into the extremity of the cartilaginous condylo-olecranal apophysis; this division of the muscle crossed over the teres major, forming, with it, the humerus and scapula, a quadrilateral space through which the circumflex artery and nerve passed, winding round the neck of the humerus. The second, or external head, arose tendinous from the middle part of the upper and posterior edge of the humerus, and passing towards the long head, was inserted into the upper surface of the cartilaginous process anterior to, but separate from, the long head; this division of the muscle ran posterior to the elbow-joint. The third, internal or shortest head, arose tendinous from the posterior edge of the humerus, about $1\frac{1}{2}$ inch below its head; the fibres ran backwards and inwards, and were inserted into the highest or most posterior point of the cartilaginous olecranon, about 3 inches above the insertion of the long head; this division of the muscle was about 2 inches long.

This muscle could have had but a very restricted action. In *Globiocephalus Svineval* it was represented merely by interlacing fibrous bands without a trace of muscularity.

The rudimentary muscles of the fore arm were the following‡: on the dorsal surface

* Vascular *retia* or reservoirs, similar to those recorded as existing in other Cetacea, were, in the present specimen, situated in three localities; of these reservoirs the first and largest was placed in the thorax, and corresponded to that described by HUNTER and others, but did not, in the present instance, extend so far outwards on the ribs as in the Porpoise and Dolphin. The second occupied the pterygomaxillary region, and has not been mentioned by previous authors; and the third, as above described, lay in the axilla. There was no plexiform arrangement of vessels on the abdominal surface of the depressores caudæ (psoæ) muscles as noticed in other Cetacea by TYSON, von BAER, and BRESCHET.

† Royal Society's Proceedings, June 1867.

‡ No muscles passing from the fore arm to the manus have been observed in any of the Toothed Whales. Their presence in the large Fin-whale (*Physalus antiquorum*, Gray) was noticed by Mr. FLOWER (Proc. Zool. Soc. Dec. 1865), but without detailed description.

there was but one, the extensor digitorum communis, which was a mere slender fasciculus of muscular fibres having its origin from the interosseous space and from the fibrocartilaginous capsule surrounding the heads of the radius and ulna, a few fibres being traceable downwards from the interosseous space between the bones of the fore arm; it soon formed a flat tendon which, opposite to the first row of carpal bones, divided into four tendinous slips that were inserted into the terminal phalanges of each digit, sending a slight expansion into the sides of each of the proximal phalanges.

On the anterior aspect of the fore arm the following flexor muscles were found, which though small were much better developed than the extensors.

Flexor carpi radialis.—This muscle arose fleshy from the anterior surface of the humeral extremity of the radius; it soon formed a round tendon, which running downwards, was inserted into the base of the metacarpal bone of the first digit. To its inner side lay

The Flexor digitorum communis, which arose by short tendinous fibres from the internal surface of the cartilaginous olecranon process, and by a few fibres from the inner edge of the humerus; its fibres, after a short course, terminated in a round tendon, which passed downwards to the level of the first row of the carpal cssicles, where it divided into four tendons, one of which was inserted into the distal phalanx of each digit, and in its course sent a slip to each of the intermediate phalanges.

Palmaris longus, an extremely delicate muscle, arose from the cartilaginous olecranon, from whence, soon becoming tendinous, it passed downwards and was inserted into the metacarpal bone of the fourth digit and into a rudimental palmar fascia, which was expanded over the carpal bones and cartilages, and covered the tendons of the flexor muscles.

Flexor carpi ulnaris was the most internal and the strongest of these muscles; it arose from the internal surface of the olecranon, and soon became tendinous; it ran downwards to be inserted into the inner side of the metacarpal bone of the fourth digit, posterior to the last-described muscle.

The scapulo-humeral articulation was surrounded by a distinct capsular ligament, lined by a thin distinct synovial membrane, and was perforated internally by the tendon of the subscapularis muscle, which lay in contact with the synovial capsule; in this it differed from the shoulder-joint of *Globiocephalus Svineval*, in which latter animal the tendon of the subscapularis did not pierce this capsule. In general the capsular ligament was thin, except inferiorly, where it was strengthened by several fibrous bands, forming the inferior scapulo-humeral accessory ligament. These fibrous bands are not present on the capsule of this joint in *Globiocephalus Svineval.*

The glenoid cavity of the scapula was deepened by a well-marked cotyloid ligament, and a distinct synovial membrane lined the interior of this articulation.

The ligament of the notch of the scapula was a strong fibrous band flattened at its attachments and rounded in the centre; it passed from the coracoid process to the superior border of the scapula, and the suprascapular nerve and artery passed under it.

The articulations existing between the radius, ulna, and humerus, as well as those between the former bones and the carpus, were amphiarthrodial in character, the several osseous surfaces being united by a very soft, fatty fibrocartilaginous substance. This character of articulation also obtained between the carpals, metacarpals, and phalanges, without the slightest trace of synovial investments.

Viscera.

The mucous membrane on each side of the cavity of the mouth, which lined the space intervening between the lateral border of the tongue and the internal or gingival surface of the ramus of the lower jaw, was disposed in longitudinal folds corresponding to those already described as existing on the geniothoracic region of the animal. These folds were arranged in two sets, a superficial or primary, and a deeper or secondary.

The former series were strongly marked, with deep furrows between them, and ran parallel to the ramus of the lower jaw. The latter, which were much shallower and finer, were situated in the furrows or interspaces between the former, and their course, instead of being parallel to the primary folds, ran in an oblique direction forwards and outwards across their interstices.

This peculiar arrangement of the mucous membrane and integuments greatly facilitated the expansibility of the submaxillary pouch.

The primary folds in the immediate vicinity of the tongue were coarse and irregularly disposed, but as they approached the internal surface of the inferior maxilla they became smooth, fine, and more unequally scattered over the surface.

The roof of the mouth represented in outline an elongated isosceles triangle, and was divided longitudinally into two smaller and more acute triangles by a prominent keel, formed by the inner border of the palate-plate of the superior maxillary as it overlapped the vomer; this keel extended along the central line of the palate, from the meeting of the superior maxillaries anteriorly to the isthmus faucium posteriorly. In front the keel was rather obscurely marked, but as it extended backwards it became much more prominent, and by its downward projection divided the palatine surface into two lateral elongated triangular spout-like concavities, each of which was deeper posteriorly than anteriorly, and more excavated along its inner or vomerine border, from the depth of the median crest in this situation, than near to its outer or labial edge, which latter was formed by the margin of the superior maxillary bone, where it met and was concealed by the formative nidus or wreath of the baleen plates. The mucous membrane lining the roof of the mouth was dark in colour, rugose, and highly vascular.

The free edge of the upper lips was thick and rounded, but, although they nearly covered the wreath, did not project downwards as far as the level of the median palatine keel. The lower lips were thicker and larger. The capacity of the mouth was much diminished by the encroachment of the baleen plates, as well as by the median crest; however, this seemed to be compensated for in a considerable measure by the great expansibility of the submaxillary pouch.

ESCHRICHT and REINHARDT, in comparing this species with the Greenland Whale, *Balæna mysticetus*, allude to and explain the great difference in the capacity of the bony framework of the mouth of these two animals, the enormous size of that of the latter being due to the immense vertical antero-posterior arch of the palatine surface, while in the *B. rostrata* the roof of the mouth has scarcely any appreciable curvature in this direction; there is, however, no provision in the soft parts of the Mysticete for buccal or submaxillary expansion so characteristically developed in the Rorqual; and although in the transverse direction the great outward lateral concavity of the anterior part of the lower jaw in *Balæna rostrata* is not sufficient to enlarge greatly the mouth from side to side, as it is counteracted by the posterior inward convexity of the bone, yet it seems to us that the great expansibility of the submaxillary pouch in *B. rostrata* compensates for the greater proportionate capacity of the bony framework in *B. mysticetus*.

There was no appearance of any of those pits and fissures on the mucous surface of the palate described in *B. mysticetus* by ESCHRICHT and REINHARDT, and supposed by them to be the rudiments of the Stenonian ducts, although in consequence of the presence of the peculiar glandular mass, already noticed as existing between the muscles of the lower jaw, a very careful search was made, but in vain, for even the slightest trace of a duct.

The mucous membrane of the roof of the mouth was extremely vascular, especially towards the wreath of the baleen plates; eighteen or nineteen large blood-vessels, varying from the size of a goosequill to that of a crowquill, traversed the superior maxillary bone obliquely forwards and outwards, and were distributed to the formative nidus of the whalebone; of these vessels the anterior ran obliquely forwards, the middle outwards, and the posterior backwards.

The tongue was oblong and flattened, somewhat elliptical in outline; it measured 1 foot 9 inches from base to tip, and 10 inches in breadth at its widest part, which was about the centre of the organ. It was completely fixed to the floor of the mouth*; the frænum wide and short, extending to its tip, which was rounded and obtuse. On each side the mucous membrane was reflected from its edges to become continuous with that lining the general buccal cavity. The borders of the tongue were more distinctly defined anteriorly than towards its pharyngeal end, but in no situation could the organ be called free. Its dorsal surface was covered with a thick yellowish scaly epithelium, transversely rugose, and easily detached; this coat invested the small fungiform and filiform papillæ, which were irregularly distributed all over the surface of the organ. The basement layer of mucous membrane displayed also considerable rugosity, the folds being small and placed transversely towards the centre of the tongue, but larger and more obliquely situated near its edges. No calyciform papillæ were observed, and of the other two series the fungiform were the most numerous, and were better marked laterally than in the mesial line.

* In a specimen of *Globiocephalus intermedius*? recently (April 1867) captured off Newhaven the tongue was free and moveable both at its tip and edges.—A. M.

Proceeding from within outwards the muscles of the tongue were arranged in the following order, on either side of the well-developed, central, cellular raphe.

First. The Genioglossus, which was irregularly quadrilateral in outline and arose from the internal border of the inferior maxilla near its anterior or symphysial extremity; the fibres ran upwards and inwards, forming a thin flat belly to be inserted into the deep surface of the mucous membrane in the centre of the tongue.

Second. The Lingualis, or intrinsic muscle of the tongue, consisted of several series of interlacing muscular fibres running both in a transverse and longitudinal direction, which together contributed to form a considerable portion of the bulk of the organ; the longitudinal part lay between the genioglossus and the hyoglossus muscles; the transverse fibres decussated with the fibres of the other muscles of the tongue.

A vertical series of lingualis fibres were found interposed between the lingual artery and the hyoglossus muscle, separating the latter from the other sets of intrinsic fibres.

Third. The Hyoglossus arose by a round fleshy mass from the great cornu of the hyoid bone, from whence it ran forwards expanding in its course, and was inserted into the entire length of the side of the tongue from base to tip.

Fourth. The Palatoglossus formed the orbicular sphincter surrounding the isthmus faucium, and was exposed by removing the mucous membrane from the buccal surface of the lateral boundaries of this opening; it was a strong crescentic muscle $\frac{5}{8}$ of an inch in thickness, 2 inches in breadth, and about $3\frac{1}{2}$ inches in length, measured from the tongue to the middle line of the velum palati; it arose from the median line of the soft palate, and its fibres passed downwards and outwards in an arched direction to be inserted into the dorsum of the tongue, on a plane external to the insertion of the last-described muscle.

The Palatoglossus, from its position, was evidently of great importance in the economy of the animal, as by its contraction it completely closed the isthmus faucium and so prevented the entrance of water into the œsophagus during the prehension of food; it likewise cut off the passage of air through the mouth during the act of respiration.

Fifth. A thin expanded muscular plane external to the hyoglossus existed as a representative of the Styloglossus; it arose from the outer side of the fibrocartilage, which united the styloid bone or cornu of the os hyoides to the base of the skull, lying external to all the other muscles of the organ; its insertion extended forwards into the posterior half of the lateral margin of the tongue.

From the arrangement of the preceding muscles, the following conclusions may, we think, be deduced with respect to the motions of the tongue. Although fixed to the floor of the mouth, its sides could most probably be elevated by the contraction of stylo-glossus and palatoglossus muscles, and centrally depressed by the genioglossus and hyoglossus, thus rendering it transversely concave on the upper surface, especially towards the base; its apex might likewise be depressed, as in prehension, by the genio-glossus, and its base, during the act of deglutition, might be lowered by the hyoglossus and depressor muscles of the hyoid bone. Its body might be shortened by the lingualis either in its vertical or transverse direction; but from the fixity of the apex this portion would scarcely admit of any retraction, consequently any shortening in the antero-posterior direction could only be accomplished by the drawing forwards of the hyoid bone by the action of the stylohyoid, basiokeratic, and the other advancers of this bone.

The nerves supplying the tongue were:—First, the lingual or motor nerve, which was distributed to the muscles, and lay internal to the lingual artery upon the lingualis muscle and beneath the hyoglossus.

Second, the gustatory or sentient nerve, a branch of the fifth pair, lay on the outside of the genioglossus muscle, and sent branches upwards to be distributed to the papillæ on its mucous membrane.

Third, a small twig of the glossopharyngeal nerve from the eighth pair was distributed to the mucous membrane of the back of the organ.

The lingual artery, a considerable branch of the external carotid at the base of the tongue, gave off numerous branches which ramified among the muscles; its continued or ranine trunk ran along the outer border of the hyoglossus muscle as far forwards as the tip of the tongue.

The veins of the tongue lay nearer to the median line than the arteries, and formed a plexus in the raphe near its base which terminated in the great jugular vein.

At the inferior portion of the middle third of the tongue there existed a large closed cellular pouch, lined by a dense smooth layer of areolar tissue; this cavity was interposed between the genioglossi muscles, and was about 8 inches long by 3 inches wide; it extended forwards beneath the organ to within 4 inches of its tip, and was of sufficient capacity to contain the extended hand. Whether this cavity were a normal arrangement of parts, or merely a want of lateral coalescence depending upon the immaturity of the individual, it is difficult to decide; the latter theory seems to be the more probable, as there was no apparent function which such a cavity could fulfil.

Pharynx.

The pharynx was separated from the cavity of the mouth by the palatoglossus muscle already described.

From the anterior edge of this sphincter, the mucous folds which formed the great submaxillary pouch commenced and passed forwards on each side of the tongue, as before mentioned; the mucous membrane lining this sphincter was completely devoid of rugæ, but was thickly studded with numerous secreting crypts opening by pores on its surface, from which, by pressure, was expelled a quantity of viscid mucus. The velum had a firm feel and was destitute of a uvula; this probably is a normal arrangement in Cetacea, as there was no trace in *Globiocephalus Svineval.*

On the anterior portion of the pharyngeal cavity, behind the palatoglossus muscle, the surface of the mucous membrane was marked with slight crescentic folds, concave backwards; these folds bounded anteriorly and laterally a semicircular space that extended backwards as far as a curved fold of the mucous membrane, hereafter to be described. This space was deeply alveolated, and its mucous surface presented a reticulated appearance, somewhat resembling the carneæ columnæ of the heart; its central portion, however, for about the width of $1\frac{1}{2}$ inch was smooth, being perfectly free from all such alveolations. Posteriorly and laterally the alveoli were arranged in five or six transverse series, gradually diminishing in size until they entirely disappeared towards the middle of the pharynx, where the mucous membrane became perfectly smooth, and so continued until it reached the commencement of the œsophagus.

Two inches in front of the root of the epiglottis, and surrounded by the alveolated surface just described, there was a strong crescentic hood-like fold of mucous membrane, the concavity of which was directed backwards; this fold measured along its free posterior border 9 inches, and the lateral cornua of this edge were prolonged on each side of the opening of the glottis in the form of fræna, which were gradually lost in the mucous membrane of the upper part of the œsophagus; its convex margin anteriorly was continuous with the before-mentioned alveolated space; the depth of the fold at its central part, which corresponded to the opening of the larynx, was about $2\frac{1}{2}$ inches; its inferior surface was smoother than its superior, and was studded with the orifices of numerous minute mucous pores. This hood-like fold formed the covering of a cavity capable of containing half a large orange. Beneath the mucous membrane of this fold were curved muscular fibres passing from side to side, whose use appeared to be for the contraction of the subjacent pouch.

This remarkable hood-like fold was capable of being drawn over the orifice of the glottis when the margins of that opening were approximated, and its use appeared to be to cover and protect the superior opening of the larynx during the act of deglutition, a purpose which could be completely accomplished by the contraction of the muscular fibres between its laminæ, which, when the arytenoid bodies and epiglottis were closely approximated, would suffice to cover and keep together the sides of the opening. Immediately posterior to the crescentic or hood-like fold was placed the upper opening of the larynx or glottis, on each side of which was situated a deep channel, which was directed backwards and downwards towards the œsophagus, being separated only from the glottis by that portion of the mucous membrane which was prominently elevated on each side to form the aryteno-epiglottidean folds. Numerous rugæ and mucous pores were situated on the outer wall of this channel and continued down to the œsophagus.

The orifice of the glottis was triangular in outline, the base being placed at the epiglottis, and the apex between the arytenoid bodies, the lateral boundaries being formed by the aryteno-epiglottidean folds.

The epiglottis was tongue-shaped and extremely flexible; its base was attached posteriorly to the central part of the upper surface of the thyroid cartilage, and its edges laterally became continuous with the aryteno-epiglottidean folds which embraced the bases of the arytenoid bodies. It was attached anteriorly in the median line by a well-developed frænum, which extended into the floor of the pouch or sac before noticed; and beneath this fold of mucous membrane there was a strong muscular band, the hyo-epiglottideus muscle, which ran to the anterior surface of the epiglottis from the centre of the posterior aspect of the body of the os hyoides. A prominent ridge extended along the middle of the epiglottis on its posterior superior surface, descending into the larynx, becoming more prominent as it passed downwards, and ceasing at the insertion of its base into the thyroid cartilage.

The anterior extremities of the arytenoid bodies were thick, fleshy, and somewhat tongue-shaped; they were united to each other in the mesial line from the top of the cricoid cartilage to within 2 inches of their apices, where they separated and formed two free linguate extremities, whose inner surfaces were directed towards each other, and could be readily approximated by the contraction of the arytenoideus proprius muscle; their outer borders were thick and fleshy, and were continued down as prominent ridges into the larynx.

There is an important difference existing between the glottis of *Balænoptera* and that of *Delphinus* and *Globiocephalus*; that the constituent parts of the free upward tubular prolongation of the larynx are closely united to a much greater extent in the latter animals, whereas in the former the lateral boundaries of this opening are quite separate, and only capable of being formed into a tubular elongation by the approximative action of their appropriate muscles.

The cartilaginous portion of the epiglottis formed but a small part of the centre of the entire organ, and beneath its mucous investment its lateral parts were constituted of a layer of interlacing muscular fibres, which were continued into the loose fold of mucous membrane that enveloped the base of the arytenoid bodies.

The larynx was firmly connected by muscles and ligaments to the os hyoides, which, as before described, consisted of a body and four cornua; the former occupied the median space about 4 inches anterior to the thyroid cartilage; its shape was that of a flattened triangle, whose rounded and emarginate apex was directed forwards, and whose lateral angles or posterior cornua were continuous with it, being prolonged backwards on each side. Its inferior surface was convex, and presented externally an oblique line that commenced about 2 inches from the apex and ran backwards and outwards to the tip of the external angle, to which was attached the mylohyoid muscle; anteriorly there was a rough surface, about $2\frac{1}{2}$ inches in extent, into which the basiokeratic muscle was inserted. The superior surface was concave, and was occupied in the middle line by the attachment of strong hyo-epiglottic ligaments and muscles; external to these the deep-seated basiokeratic muscle had its origin, and extended outwards to the end of the external angle. The anterior border terminated in front in the apex, which latter was bounded on each side by a concave space, to the anterior portion of which the base of the anterior cornu or styloid bone was closely united by strong fibrous tissue, the remainder of the border being merely occupied by cellular membrane. The posterior margin was rounded and concave; to it the sternohyoid and thyrohyoid muscles were attached, the former occupying a space extending outwards about 3 inches from the median line, the latter lying on a plane superior was inserted into a line leading from the centre of the margin for about 1 inch in extent.

The cornua or ossa styloidea were distinct, curved, cylindrical bones, and were articulated internally by short and firm fibrous and fibrocartilaginous bands to the sides of the anterior portion of the body, as before described. In *Globiocephalus Svineval* the union is accomplished by a prolonged fibrous rounded band. ESCHRICHT and REINHARDT picture a similar elongated intervening ligament in the Mysticete.

At their external extremities these bones were somewhat club-shaped, and were closely united to the base of the skull by the interposition of a strong fibrocartilage; from their anterior or concave edge they gave attachment to the muscles of the tongue, viz. the hyoglossus and genioglossus; posteriorly three muscles arose from each of them; first, the superficial hyokeratic, which occupied the inner third; second, the deep hyokeratic, which had its origin from the middle and part of the inner third of the bone; this muscle was prolonged posteriorly and superiorly to the last described; and third, the keratopharyngeus, which took its origin from the remaining outer third of the cornu. No muscles covered their fibrocartilaginous cranial articulation; but in *Globiocephalus Svineval* the craniostyloid articulation was covered by a short flat muscle, the squamo-styloid, which, arising from the squamous bone above the articulation, and crossing over the fibrocartilage, went to be inserted into the styloid bone at its cranial third. Another muscle in this animal, the stylohyoid, of a pyriform shape, arose from the squamous bone behind the styloid articulation, and was inserted into the extremity of the posterior cornua or lateral angle of the body of the hyoid bone, in its course crossing the external carotid artery and the lingual nerves.

Larynx.

The framework of the larynx was composed of four true cartilages, viz. thyroid, cricoid, and two arytenoid.

The thyroid formed the lateral and inferior boundary of the laryngeal cavity, and was composed of two symmetrical halves or alæ united by a central isthmus; each ala exhibited four edges bounding two surfaces. The anterior edge was concave forwards and smooth, it measured 4 inches in length; the posterior edge was $8\frac{1}{2}$ inches in length, and was deeply excavated; it terminated internally in a triangular prolongation 2 inches in length, with its apex directed backwards.

The external or lateral border was convex and slightly prolonged forwards to form the anterior cornu, from whence the thyrohyoid muscle had its origin; posteriorly this border was prolonged into a round digital process which formed the posterior cornu, whose extremity was connected by fibrous tissue to a well-marked tubercle situated on the posterior and lateral aspect of the cricoid cartilage. The entire extent of this external margin, measured from its anterior to its posterior cornu, was 7 inches, and to it the inferior constrictor of the pharynx was attached. The inner border was formed of two distinct parts, an anterior and posterior; the former, about an inch in extent, was united to its fellow of the opposite side, forming the median isthmus before mentioned, while the latter, which measured about 2 inches in length, was free, smooth, and separated from the corresponding portion of the opposite side by a deep triangular notch, which at its posterior extremity measured $1\frac{1}{2}$ inch in breadth. The inferior or superficial surface was flat, and exhibited the attachments of three muscles along its outer margin; of these the thyrohyoid was most anterior, the cricothyroid most posterior, and the sternothyroid intermediate.

The upper or deep-seated surface corresponded to and covered the upper third of the inferior surface of the great laryngeal pouch, to be hereafter noticed, and posteriorly it came into contact with the outer surface of the arytenoid cartilage; its central portion in front gave origin to the thyro-arytenoid muscle, and posteriorly to a few of the anterior fibres of the constrictor of the laryngeal pouch.

The cricoid cartilage, in outline, was irregularly rhomboidal, representing about two-fifths of a circle, and formed the inferior boundary of the posterior three-fourths of the larynx. It presented two surfaces, which were bounded by four irregularly shaped edges and angles. The superior surface presented on each side a slight concavity, from which the crico-arytenoideus posticus took its origin, and in the central line it was transversely concave to accommodate the passage of the œsophagus; the inferior surface was the reverse shape of the superior, *i. e.* concave on each side and convex on the central line; to this latter part the mucous membrane of the posterior three-fourths of the larynx was closely adherent. The centre of the anterior edge presented a slight concavity, to which the posterior edge of the arytenoideus proprius was attached. The posterior margin was extremely irregular in outline, presenting in the median line a tongue-shaped process, which was directed backwards towards the first ring of the trachea. The outer edge was slightly convex, where it gave origin to the cricothyroid muscle. The anterior and external angle formed a facet for articulating with the arytenoid cartilage; the posterior angle extended backwards, terminating in a flat process; and about 1 inch internal to this a small tubercle was situated, to which the inferior cornu of the thyroid cartilage was articulated by the interposition of strong fibrous tissue.

The arytenoid cartilages were extremely irregular in shape; each of them consisted of a body or central part and two processes; the body had three surfaces, an external, internal, and posterior; the first was enlarged by the projection of a prominent shelf-like process along its lower and outer border, from this the upper fibres of the constrictor of the laryngeal pouch arose.

The internal surface of the cartilage was convex, presenting on the middle of its posterior border an oval concave articular facet, which measured $1\frac{1}{4}$ inch in length by $\frac{1}{2}$ an inch in width; this was articulated with a convex surface placed on the outer edge of the posterior and lateral aspect of the cricoid cartilage, and was lined by synovial membrane and surrounded by a capsular ligament. The superior surface was somewhat triangular, and of much less extent than either of the other two; it lay in front and above the articular surface just described, and was covered by the crico-arytenoideus posticus muscle. The posterior process was pyramidal, and prolonged downwards and inwards towards the median line, where it was united to its fellow of the opposite side by a strong round fibrous cord, about two lines thick and 1 inch in length, the transverse ligament of the arytenoid cartilage. The anterior process was flattened; it curved upwards and inwards, and terminated in a fibrous band, which was placed as a kind of support in the centre of the free tongue-shaped arytenoid body, this latter forming the posterior boundary to the rima glottidis. The entire length of this cartilage was 8 inches, its greatest width in the centre being $3\frac{1}{2}$ inches.

The muscles of the larynx were seventeen in number, viz. on the anterior aspect there were, first, the thyrohyoid, a flat muscle, 4 inches long by 1 inch broad; it arose fleshy from a ridge on the anterior and outer portion of the thyroid cartilage behind the base of the anterior cornu; from this the fibres ran forwards and inwards to be inserted tendinous into the posterior part of the body of the os hyoides, extending outwards 1 inch from the median line. Second, the crico-thyroid, a strong and flattish muscle, measuring 4 inches long by $1\frac{3}{4}$ inch wide; it arose fleshy from the outer surface of the anterior extremity of the cricoid cartilage, passed forwards and upwards to be inserted into the lower and external edge of the inferior cornu of the thyroid cartilage; it lay behind, and on a plane deeper than the sterno-thyroid. The muscles situated on the posterior aspect were, first, the crico-arytenoideus posticus, a large fleshy mass, which took its origin from the outer third of the posterior surface of the cricoid cartilage; its fibres ran forwards and outwards, and embraced the posterior and external angle of the arytenoid cartilage into which they were inserted. Second, the arytenoideus proprius, a flat, azygos muscle, which consisted of slightly decussating fibres running obliquely from the inner edge of one arytenoid cartilage to the corresponding border of its fellow; its lower fibres ran transversely, while the middle and upper were slightly curved. This muscle extended $1\frac{1}{2}$ inch above the superior border of the cricoid cartilage, and terminated $2\frac{3}{4}$ inches behind the commissure of the arytenoid bodies.

Between the layers of mucous membrane that formed the arytenoepiglottidean folds, on each side the superior aryteno-epiglottideus muscle was enclosed; it passed from the outer and anterior part of the arytenoid cartilage to be inserted into the external margin of the epiglottis. On the same plane, but posterior to it, the inferior aryteno-epiglottideus muscle was situated, whose attachments corresponded to those of the last described, the posterior border of the superior being in contact with the anterior edge of the inferior muscle.

The hyoepiglottideus muscle was triangular in shape, the base being directed towards the os hyoides and the apex attached superiorly and posteriorly to the epiglottis. It arose from a vertical median ridge on the upper surface of the body of the os hyoides, ran backwards and upwards to be inserted into the anterior surface of the epiglottis; this muscle was separated from its fellow of the opposite side by a narrow cellular interval, and lay beneath the frænum epiglottidis. The superior laryngeal nerve, which entered above and in front of the thyroid cartilage, ran enclosed in the aryteno-epiglottidean folds of mucous membrane, and was distributed to the mucous membrane lining the larynx, apparently giving off no muscular branches.

On raising and reflecting the ala of the thyroid cartilage an accessory aryteno-epiglottideus muscle was exposed; it was somewhat triangular in shape, and arose from the anterior and external angle of the arytenoid cartilage; from this the fibres passed inwards, diverging, and were inserted into the side of the fibrocartilaginous pedicle of the epiglottis, posterior to which its fibres coalesced with those of its fellow of the opposite side.

The thyroarytenoid muscle was united to the posterior border of that last described, in fact both appeared to be but parts of one large muscular expansion; it arose from the vertical median ridge on the superior surface of the thyroid cartilage, where its fibres were distinctly separate from the foregoing muscle; it passed forwards and inwards, and was inserted into the anterior and external margins of the arytenoid cartilage, and into the contiguous margin of the cricoid.

There were no vestiges of chordæ vocales or of a ventricle, or a lateral laryngeal sacculus; but situated in front of the cavity of the larynx, and opening by a wide orifice immediately at the root of the epiglottis, there was a remarkable large musculo-membranous mesial sac or laryngeal pouch, which extended downwards and backwards in front of the trachea; its walls, which were thick, were almost entirely composed of circular muscular fibres, which anteriorly or nearer the glottis took their origin from the upper surface of the thyroid cartilage, and posteriorly formed a series of circles with no definite origin or insertion. The interior of this cul-de-sac communicated directly with the central portion of the laryngeal cavity by a wide orifice, and was lined by a continuation of the mucous membrane of the former.

From the situation and structure of this pouch its probable use was to assist, by the contraction of its walls, in the act of expiration, increasing the expulsive force of the respiratory apparatus, by the sudden contraction of its circular fibres expelling the contained air, and so not only considerably augmenting this power, but also sustaining the expiratory current, more especially towards the termination of this act.

It might also be suggested as an organ for the production or modulation of sound, if these animals possessed such a faculty, which must be considered as very doubtful. The great size of its laryngeal aperture, and the absence of all constricting bands or apparatus, militates considerably against the latter use of this organ.

A dissection of the soft part of the upper surface of the head exhibited the relative anatomy of the

External nares.

These were two semilunar slit-like orifices situated on the superior surface of the cranium acted on by three separate planes of muscular fibres. The lips of these apertures, which have already been described, would permit a complete approximation, as also of considerable divarication.

The first or most superficial plane of muscular fibres consisted of the dilator naris, which was exposed by raising off the dark-coloured integument and subjacent fascia; it consisted of a fan-shaped series of converging fibres, which arose from the outer border of the superior maxillary bone as far forwards as the anterior extremity of the intermaxillary and the tip of the cartilaginous septum or primordial vomer, extending backwards to the anterior extremity of the malar bone, and to that portion of the superior maxilla which formed the front wall of the temporal fossa. It was also connected with the dense fascia investing its superficial surface; the fibres of the muscle passed inwards, converging, and were inserted, the most anterior, into the cartilaginous median raphe that extended from the extreme point of the snout to the anterior extremity of the median sulcus or groove interposed between the lips of the external nares. The middle and posterior fibres ran to be inserted into the outer lip of the nares by a flat expanded tendon. From the direction of the fibres of this muscle its use appeared to be to divaricate the alæ or lips of the nares, and by so doing to give free access to the air either during inspiration or expiration.

The second or middle plane of muscular fibres consisted of two parts; first, a frontal portion, retractor alæ nasi, which was probably a representative of the pyramidalis nasi; it arose fleshy from the depression on the anterior and external portion of the frontal bone immediately in front of the anterior occipital crest; the fibres of this portion ran directly forwards, forming a fleshy belly about $3\frac{1}{2}$ inches in length, which was inserted into the cartilaginous part that formed the posterior and lateral part of the lip or boundary of the nares. The use of this portion of the muscle appeared to be to retract and fix the posterior and external lips of the nares, and in conjunction with the following muscle to close these orifices. The second portion of this muscle, or constrictor naris, arose from the anterior edge of the temporal fossa, and from the upper edge of the superior maxillary bone; its fibres passed, in a curved direction, forwards and inwards to be inserted into the anterior superior surface of the median cartilaginous raphe, some of the fibres passing into the outer lip of the nares, and others into the upper edge of the superior maxilla. The fibres of this muscle in passing forwards took an arched course, the concavity of which was directed inwards and upwards, and with the corresponding muscle on the opposite side embraced the nasal outlets like a sphincter; consequently, when these muscles contracted simultaneously, their action would be to compress the external alæ of these outlets and so close the nasal apertures. These muscles are probably the homologues of the compressores nasi.

The third, or deepest plane, was formed of a single muscle on each side, which arose from the whole of the upper and inner surfaces of the intermaxillary bone, and from the inferior and external aspect of the cartilaginous mass or primordial vomer, which occupied the fossa between these bones; the fibres curved outwards and backwards, and were inserted into the side of the cartilaginous body forming the outer boundary of the naris. This muscle, probably the representative of the depressor alæ nasi, seemed available to open the nostril, its action being to rotate the alar cartilage, and thus to withdraw these moveable nasal pads.

On dissecting off the muscles, a large solid central cartilaginous crest or primordial vomer was disclosed which extended anteriorly from the point of the snout, where it passed 7 inches in advance of the bony vomer and completed the median portion of the roof of the mouth, to the divergence of the intermaxillary bones posteriorly, where it divided into three; the two lateral parts passed forwards and gave support to the constrictor naris; the central division anteriorly, where it joined the primordial vomer, was cartilaginous, but posteriorly and superiorly it became fibrous.

The external or alar fibrocartilages were oval in shape, and so arranged as to be capable of completely stopping the nasal apertures; they were composed of a soft fibrocartilage permeated, especially on the external side, with fat-cells, which rendered them highly elastic; their inner or nasal surface was lined with a thick mucous membrane, arranged in longitudinal folds and of a deep bluish-black colour; on raising this a strong muscle was exposed, which arose from the outer side of the median cartilaginous crest, from whence it ran backwards and was inserted into the outer side of the nasal fibrocartilage; this muscle by its contraction would draw forwards and inwards the anterior extremity of the fibrocartilage, and so remove it from the nasal aperture, leaving this orifice perfectly free. The closing of these orifices appeared to depend, in a great measure, on the relaxation of this muscle.

On raising the posterior border of the second plane of muscles, a large nerve, the infraorbital branch of the fifth pair, was seen emerging from the foramen in the superior maxilla; it divided into three branches, which were traceable into the muscles and integuments of the nares.

As the blowholes are the only orifices through which the atmospheric air is allowed to pass during the act of respiration, we find accordingly that these outlets are amply provided with the means of carrying on this important function. Their alæ can be divaricated by the simultaneous action of the superficial and deep muscular planes, and, on the other hand, they could be brought together by the middle plane of fibres, which from their fasiculi running in an elliptical direction on each side of the blowholes, formed a regular sphincter and approximate the external lips of the orifices; at the same time the central portion of the muscle, from its deep-seated position, would press the external or alar cartilages against the septum, and so completely close these passages; the pressure of water from the outside may account for the fact that the muscles for opening are much more powerful than those for closing these canals.

There are some points worthy of notice respecting the mechanism by which the functions of respiration and deglutition are performed, in this and other Cetaceans, which we think have not hitherto been clearly explained.

As regards the first or *respiratory* function, it is obvious that when the animal approaches the surface of the ocean its first act will necessarily be that of expiration, in order to expel from its lungs the deoxidized air contained therein after the preceding inspiratory act; expiration is accomplished in a great measure, as in other mammals, by the contraction of the abdominal muscles drawing in the ribs, and propelling upwards the musculo-tendinous diaphragm, and thus forcibly diminishing in every direction the capacity of the thorax; this action, from the great mobility of the ribs, their non-attachment anteriorly, and the obliquity of their position, can in these animals be carried to an extent proportionally greater than in any other mammals. Whilst this is being accomplished the entire larynx is drawn forwards and elevated, and the posterior and internal lips of the arytenoid bodies being at the same time brought into contact, form by being overlapped and covered by the flexible margins of the epiglottis a protrusible tube; in this state the upper opening of the glottis is extended into the pharyngeal orifice of the nares. The elevation of these parts appears to be accomplished in the following way:—First, the styloid bones or great cornua of the os hyoides are drawn upwards and fixed by the action of the stylohyoid muscles; next, the body of the hyoid bone is raised and carried forwards by the hyokeratic and kerato-pharyngeal muscles, whose combined action is to approximate the body to the cornua; and finally, the stylopharyngeus, constrictor and hyoepiglottic muscles draw forwards the glottis, whose tubular shape is preserved by the arytenoepiglottideus muscles approximating the lateral and free margins of the arytenoid bodies on each side to the epiglottis in front of them, the edges of the latter overlapping those of the former. This being accomplished, the palatine muscular fibres situated round the nasopharyngeal orifices contract and grasp the intruded glottis, and so by this beautiful and simple contrivance a free and direct channel of communication is formed between the lungs and the external orifices of the blowholes. While these actions are in progress the palatoglossus by its contraction closes the isthmus faucium, and shuts off all communication with the mouth. The lateral prolongations of the peculiar hood-like fold, before described as existing between the root of the tongue and epiglottis, would seem by their contraction to engirdle the anterior and lateral parts of the base of the tubular prolongation of the glottis, and so fix and bind together the organs forming this aperture. The anterior nares or blowholes being now opened by the action of the muscles before described for this purpose, and the fibrocartilaginous pads being at the same time withdrawn from the nasal passages by the appropriate muscles, the contained air is expelled, and this by its expiratory momentum may likewise assist in freeing the channel.

This act of blowing or spouting has been represented by G. Cuvier and others as having the appearance as if the animal forcibly ejected from its nostrils a *large mass* of water, and it has therefore been conjectured that the creature for this purpose must necessarily be furnished with some peculiar anatomical contrivance to retain such fluid. But this phenomenon may be accounted for in a different way, and without the gratuitous assumption of the animal having any such reservoir, which, so far as the anatomical structure of the present specimen bears on the point, is an assumption absolutely groundless.

Expiration is most probably commenced when the animal's head is near, but as yet beneath the surface of the water, and when but a slight stratum of fluid is lying above the outer orifices of the blowholes, which as the creature expires, combined with the condensed halitus from the lungs being suddenly and forcibly driven upwards, may simulate a column of water; but that a large quantity of ingested fluid is got rid of by the act of expiration through the blowholes is, at least in the present instance, not only improbable, but in fact impossible, as from the mechanism of the organs engaged there was no contrivance by which the entrance of the fluid from the larynx, if present, into the lungs or digestive canal could be prevented; the only appearance of a receptive cavity in connexion with the respiratory tract was the large laryngeal pouch before described, but from the position of the opening of this sac into the cavity of the larynx, any fluid admitted into it must necessarily enter the lungs and so suffocate the animal.

Expiration having been accomplished, the animal now protrudes its blowholes above the surface of the water; the abdominal muscles are relaxed, and the diaphragm descends; the nares at the same time being opened, a stream of air enters the lungs through the larynx, the apex of which is still retained in the orifice of the posterior nares; the thorax is likewise expanded by the action of the serrati, intercostales, and pectoral muscles, and when the act of inspiration is accomplished the larynx descends, the middle plane of muscles closes the nares, and aëration of the blood, by means of the inhaled air, is carried on. In other cetaceans the process of respiration is effected in a manner somewhat similar, though the anatomical arrangements admit of individual varieties. In *Globiocephalus Svineval* there was developed a special muscle, the basio-thyrohyoid, which arose tendinous from a longitudinal antero-posterior line on the basilar process of the occipital bone, and was inserted into the posterior border of the thyroid cartilage, and into the posterior cornu on the basihyoid bone; this muscle seems to be developed for the purpose of drawing the larynx upwards, and so compressing the pharynx against the spine, and preventing the possibility of the entrance of air into the digestive canal. In this animal likewise the superior constrictor of the pharynx arose from the anterior edge of the internal pterygoid plate, about 3 inches within the openings of the posterior nares, from whence the fibres ran inwards and backwards to the median line of the pharynx, which it forcibly draws forwards. These additional arrangements facilitated the drawing upwards of the larynx.

The act of *deglutition* appears to be more simply performed; the animal, according to LILLJEBORG and others, subsists chiefly on fish, together with mollusca and medusæ; in the stomach of our specimen nothing was found but the crystalline lens of the eye of some small fish.

The mode of taking food appears to be as follows:—the mouth is opened under water, and with the relaxed submaxillary pouch encloses a quantity of animals and fluid together, while at the same time the palatoglossus being contracted, shuts off all communication with the pharynx; the mouth is now closed, and the pouch contracted by the action of the mylohyoid or constrictor muscle aided by the elasticity of the pouch itself; these together exert a force sufficient to expel all the superfluous water, while the baleen plates prevent the escape of all solid matters, which being strained are left in a condition fit to be swallowed: the palatoglossus now relaxes, and the tongue being pressed upwards the contents of the mouth are passed into the pharynx; the glottis is simultaneously closed by the approximation of the arytenoid bodies, which are brought together by the arytenoideus proprius and drawn upwards and forwards by the aryteno-epiglottidis muscle, when they meet and are overlapped by the tip of the epiglottis, the whole being covered by the hood-like fold of mucous membrane, which seems to be especially adapted for this purpose. It will be seen that by this admirable contrivance all extraneous matter is strictly excluded from the larynx while the food is passing through thc œsophagus to the stomach.

The Trachea and Lungs.

The trachea was continued backwards from the posterior and inferior extremity of the larynx for about $5\frac{3}{4}$ inches, and terminated opposite the superior aspect of the arch of the aorta by bifurcating into the right and left bronchi; it measured in diameter $3\frac{3}{8}$ inches, and its cartilaginous rings, which were irregular, often bifurcating and coalescing, formed almost complete circles; the last was peculiar in shape, and consisted of two arches united in the centre so as to form the commencement of the two bronchial tubes; this union was much more extensive in front than behind, and the pair of rings immediately above were joined to it on the anterior aspect by means of a cartilaginous plate continued up from the vertex of the angle of union of the lateral halves of the last ring.

The tracheal mucous membrane had a peculiar folded arrangement, being traversed by a number of longitudinal sulci, apparently to permit of its being distended. The right bronchus bifurcated immediately after its origin, which gave to the termination of the trachea the appearance of its being trifurcate: both these bronchi on the right side entered the root of the lung at a considerable distance from each other. The upper, or what may be termed the accessory division, was much smaller than the inferior, measuring only 1 inch in diameter, whereas the lower division was nearly $2\frac{1}{4}$ inches in the same direction. On the left side there was but a single bronchus, whose diameter was 3 inches.

The right lung measured $15\frac{1}{4}$ inches in length and 7 inches in width; the left was 17 inches long and $6\frac{1}{2}$ inches broad, and passed further forwards than the right. The bases of both lungs were much hollowed where they lay in contact with the diaphragm, and measured 13 inches in breadth from their anterior to their posterior borders.

In the root of the right lung the pulmonary artery lay above the bronchus, and the two principal pulmonary veins lay below and on a plane anterior to it; at the top of the root a small accessory pulmonary vein passed outwards, lying 3 inches below the truncated apex of the lung, and $3\frac{1}{2}$ inches above the pulmonary artery.

On the left side the pulmonary artery lay also above and behind the bronchus, and the veins, two in number, were situated one on a level with the bronchus, the other about 3 inches more posteriorly. The lining membrane of the pulmonary veins displayed a series of longitudinal plicæ similar to those seen in the trachea. The roots of the lungs were bounded anteriorly and posteriorly by the pulmonary plexuses formed by the pneumogastric and phrenic nerves. The divisions of the bronchi were traceable into the substance of the lung for a very considerable distance, retaining their cartilages to their seventh division, when the tubes measured about one line in diameter. Nothing remarkable was found in the minute anatomy of the lung; its parenchyma was highly elastic, and contained a quantity of yellow fibrous tissue.

Pericardium and Heart.

The pericardium was conical in shape, with its expanded base attached posteriorly to the central portion of the muscular and tendinous diaphragm; it exhibited no peculiarities in its arrangement or in the sheaths accompanying the vessels that arose from the heart, which were similar to those of mammals in general.

The crescentic fold described by MARSHALL, which corresponded to the obliterated left superior vena cava, was not perceptible; this fold, we may observe, does not seem to bear in its development any relative proportion to the size of the animal in which it is found, as, for example, we have not seen it nearly so well developed in the horse as in the human subject.

The heart in its external configuration displayed little worthy of special remark; it was rather flatter than the hearts of most mammals, and had no white spot of BAILLIE; its apex was rounded, and its auricular appendices were short and blunt; the coronary arteries were large, forming a vascular collar round the circumference of the organ, and sent off branches which, as usual, marked the divisions between its cavities.

The wall of the right auricle was about the fifth of an inch thick, and its endocardiac aspect exhibited very strong musculi pectinati; the greater eustachian valve was but slightly marked, but the lesser fold was more distinct, and the superior cava had no protecting valve.

The foramen ovale was obliterated, but the annulus Vieussensii surrounding it was well defined, prominent, and muscular. The right auriculoventricular opening was guarded by the usual tricuspid valve, which was extremely strong and well marked.

The wall of the right ventricle was about $\frac{3}{8}$ of an inch thick, and its cavity was crossed by a strong trabecula, the moderator band of KING, which was attached to its anterior and septal walls. The conus arteriosus was short and dilated, and, as usual, gave off the pulmonary artery.

The left auricle was rather smaller than the right; its wall was also smoother and thinner, measuring only $\frac{1}{10}$ of an inch in thickness; five pulmonary veins opened into it, two on the left and three on the right side.

The wall of the left ventricle, at the base of the heart, measured $1\frac{3}{4}$ inch in thickness and $\frac{3}{4}$ of an inch at its apex; its muscular bundles were extremely powerful, and its mitral valve large and strong.

The aortic and pulmonary valves displayed no novel anatomical points worthy of remark.

The aorta, after its origin from the left ventricle, was directed upwards and forwards, and at the sinus of MORGAGNI, which was well marked, it measured 3 inches in diameter; its coats were a line and a half in thickness and highly elastic. The entire length of the arch was 8 inches; it curved to the left side, immediately beneath the thymus gland and in front of the trachea. The arteria innominata arose from its first curve, corresponding to the upper border of the sinus of MORGAGNI; it then ran forwards, outwards, and towards the right side, being crossed in front by the left vena innominata just as it was about to terminate by dividing into the right carotid and right subclavian arteries; its entire length was 4 inches, and its diameter nearly $1\frac{1}{2}$ inch; its point of division was situated about 4 inches above the first rib. The left carotid arose about 5 inches to the left of the arteria innominata; it then ran upwards by the side of the thyroid body, where it measured about 1 inch in diameter, and continuing its course forwards for about 5 inches, terminated in the usual manner by dividing into the external and deep-seated branches. $1\frac{1}{2}$ inch still further to the left of the carotid the subclavian arose, and after a course of $\frac{3}{4}$ of an inch it gave off three branches, viz. first, the vertebral, which ran directly forwards and outwards to the transverse process of the seventh cervical vertebra; second, the transversalis colli, which passed forwards and outwards; and third, the axillary, a small branch that passed outwards to supply the rudimentary anterior extremity.

The descending aorta passed backwards into the posterior mediastinum, where it measured only 1 inch in diameter and gave off intercostal branches, twenty-two in number; it then passed through the diaphragm into the abdomen, in which cavity it was continued backwards, finally terminating as caudal by being distributed to the muscles in this region. In this part of its course its branches presented no variation from the ordinary arrangement, with the exception that the superior mesenteric arose from the cæliac axis, a variety occasionally met with in the human subject.

The main trunk of the pulmonary artery was $2\frac{3}{4}$ inches in diameter, its coats being about $\frac{1}{4}$ of an inch thick; it passed to the left of the aorta, and after getting behind that vessel divided into the right and left branches. The large cord-like ligamentous remains of the ductus arteriosus was crossed by a cardiac branch of the pneumogastric nerve, which passed downwards in front of the aorta, between it and the pulmonary artery, to join the cardiac plexus.

Digestive Apparatus.

No distinct superior pharyngeal constrictor was visible; but a few scattered muscular fibres seemed to be substituted for it, having no very determinate course or attachment. In other Cetaceans, however, this muscle is present, as, for example, we found it in *Globiocephalus Svineval.*

The middle constrictor was a flat fan-shaped expanded muscle; it arose fleshy from the entire length of the posterior border of the great cornu of the os hyoides; the fibres ran in a radiating manner, the anterior forwards and inwards, the middle directly inwards and the posterior backwards, all being inserted into the median raphe on the superior aspect of the pharynx, along which it stretched for about 9 inches, passing forwards as far as the base of the skull.

The stylopharyngeus was a strong round fleshy band; it arose external to the basilar process of the occipital bone, crossed over the middle of the anterior fibres of the last muscle, and was inserted into the median raphe.

The inferior constrictor took its origin from the whole length of the posterior border of the thyroid cartilage; its fibres passed inwards, and were inserted into the posterior portion of the median raphe for an extent of about 11 inches.

These two constrictors were separated by the glossopharyngeal nerve and the kerato-pharyngeal muscle.

From the lower border of the pharynx, and on a level with the posterior margin of the cricoid cartilage, the œsophagus was continued through the posterior mediastinum for the length of about 18 inches, where it terminated at the cardiac orifice of the stomach.

The œsophagus measured 5 inches in circumference, and presented the usual number of coats, viz. cellular, longitudinal, circular muscular, and mucous; the last, or mucous, was covered with a thick, softish, easily detached epithelium, which was only connected closely to the subjacent basement layer by the processes which it sent in through the numerous mucous crypts; these latter were arranged in longitudinal rows extending the entire length of the tube. Intervening between these series of apertures were rugæ whose direction was principally longitudinal, their use being to facilitate distension; the rugæ became smaller and more irregularly placed as they approached the cardiac orifice, where their direction and appearance became more assimilated to those on the mucous surface of the first stomach. The entire thickness of the wall of the œsophagus measured $\frac{1}{4}$ of an inch.

The gastric cavities were five in number, well covered with peritoneum; of these the second was the largest, and the third much the smallest.

The first stomach was somewhat oblong in shape; it measured $12\frac{3}{4}$ inches in length and 20 inches in circumference at its central part; the spleen was closely connected to its fundus by a short gastrosplenic omentum. The wall of this cavity was $\frac{3}{4}$ of an inch thick, was strong and firm, and divisible into the following layers, viz. first, peritoneal; second, longitudinal muscular, very well developed; third, circular muscular; fourth, fibrous, firm, in colour white, and about half a line thick; fifth, a thin pulpy layer of fatty material of a light yellowish colour; sixth, a white soft areolar lamina containing nerves; seventh, a second bright yellow fatty layer similar to the fifth; eighth, basement vascular layer of mucous membrane; and ninth, epithelial or cuticular coat. The only thing found in this cavity was the crystalline lens of a small fish, which corroborates the statement of LILLJEBORG that this animal feeds occasionally on fish.

On opening the stomach its lining membrane presented a very remarkable rugose appearance, the long axis of the rugæ running transversely from right to left, each fold being about a line in depth; from these primary transverse ridges secondary spurs were continued at unequal intervals, thus giving the whole surface a minutely convoluted cerebriform appearance.

A number of wide and rather shallow furrows ran from the cardiac orifice in a radiating manner over the wall of the cavity, passing towards its fundus, crossing but not interrupting the epithelial rugæ just described.

The orifice of the œsophagus measured in its transverse diameter about $1\frac{3}{4}$ inch; it was thrown into plicæ in the direction of the long axis of the tube, and presented a small valvular fold on the anterior border of the opening, which measured about $\frac{1}{2}$ an inch in depth and rather more than $\frac{3}{4}$ of an inch in length; numerous pore-like orifices studded the entire epithelial surface, both on and between the above-described furrows.

The aperture of communication between the first and second stomachs was defined by the sudden cessation of the cuticular lining of the former in a fringe-like border; at this point the diameter of the viscus measured $3\frac{1}{4}$ inches.

The second stomach was much larger than the first; it measured 27 inches in length and 22 inches in circumference, cylindrical in shape with rounded extremities, and in contour slightly sigmoid. The coats were much thinner and softer than those of the last-described cavity, their entire thickness being only $\frac{3}{8}$ of an inch, and consisted of a peritoneal, circular, a fibrous, a submucous, which was very vascular, and an epithelial layer. The rugæ on the mucous surface were much thinner, sharper, and more prominent than those in the first stomach, and towards the superior and posterior or concave margin they became very small, and interlacing with each other, produced quite a reticulated appearance in this situation. The inferior border was thrown into transverse folds, about twenty in number, which ran in an antero-posterior direction parallel to each other; each fold at its origin was small and flat above, but towards the convex edge it became large, thick, and prominent. These folds extended over the surface for about the length of 10 inches, with an average depth between them of 1 inch; in the centre, at the distal extremity of the second stomach, these folds attained their greatest development, becoming smaller as they approached the orifice leading from the second to the first cavity. They were crossed by many smaller longitudinal rugæ, which varied both in size and direction.

The mucous membrane lining the orifice leading from the second to the third stomach was perfectly smooth; the opening measured 5 inches in circumference, and was surrounded by a well-defined muscular annulus or sphincter, whose free margin was mainly directed towards the cavity of the second stomach, and measured in depth about 1 inch.

The communication between the third and fourth stomachs was through a remarkably constricted oblique and valvular aperture which measured in circumference 5 inches; it was guarded on the distal side, or that towards the fourth cavity, by a crescentic fold of mucous membrane which was very thin, and gradually shaded away on the wall of the cavity on both sides; its extremities were about 1 inch apart, and its depth in the centre measured about $1\frac{1}{2}$ inch.

Within this orifice there was a pouch about $3\frac{1}{4}$ inches long, 3 inches broad, and $3\frac{1}{2}$ inches deep; it opened backwards into the third stomach by a large orifice, which was surrounded by a muscular annulus whose fibres were better marked below than above;

this pouch, with the exception of one transverse fold of mucous membrane that traversed its fundus, was perfectly smooth.

The fourth stomach in shape was broadly pyriform; its length was about $14\frac{1}{2}$ inches, its circumference varying from 24 inches at its widest or proximal to 19 inches at its narrow or distal extremity; its mucous surface was smooth, being destitute of rugæ; its coats were extremely thin, especially at its inferior margin, where they measured only one line in thickness; superiorly the thickness increased to $1\frac{1}{2}$ or 2 lines. Immediately below the opening from the third stomach, the fourth dilated and afterwards narrowed gradually towards its distal extremity; in this situation a few longitudinal rugæ were irregularly distributed, and some glands were detected, more particularly round the orifice leading into the fifth stomach; this orifice presented a crescentic-shaped appearance on its proximal, but was oval in shape on its distal side, the difference in shape being caused by a semilunar fold or valve-like process which partially surrounded the aperture on the side corresponding to the fourth cavity; this fold measured along the chord of its arc $1\frac{1}{4}$ inch; the distal side, or that corresponding to the orifice of the fifth stomach, was even narrower, measuring only 1 inch in diameter, and was surrounded with a few longitudinal rugæ and the orifices of some mucous glands.

The fifth or last stomach was small in comparison to the others; in length it measured only $9\frac{1}{2}$ inches, and in circumference about 20 inches; its coats were slightly thicker than those of the fourth cavity; its walls were studded with numerous glandular follicles, and it communicated with the duodenum through the medium of a small pylorus, which was guarded by a muscular sphincter and marked with numerous rugosities, both longitudinal and transverse; the circumference of the pyloric orifice measured $4\frac{1}{2}$ inches. This cavity seemed to be more especially the seat of gastric secretion, and so probably of digestion. In other Cetaceans the second or third stomachs are often supposed to be the true digestive cavities.

On the outer or peritoneal surface and inferior border of these cavities the omentum was attached, not quite $\frac{1}{2}$ an inch in thickness, as in the case described by HUNTER, but thicker at its left than at its right extremity; however, nowhere did it exceed $\frac{1}{4}$ of an inch in thickness. The pneumogastric nerves ramified over the surface of all the stomachs, as also did the gastric arteries, but more especially on the coats of the second stomach; the long descending branch of the gastric artery ran in a groove which separated the first from the second stomach. Immediately below the pyloric extremity of the fifth stomach the duodenum commenced and passed on to join the jejunum; its entire course was superficial in the abdomen, only overlapped by the colon and omentum, and its length, measured to where it passed through the root of the mesentery, was about 1 foot. The hepatic and pancreatic ducts lay on its posterior aspect; these ducts joined each other about $\frac{1}{2}$ an inch before they entered the outer or peritoneal covering of the intestine. The conjoined duct ran very obliquely for 2 inches between the coats of the intestine, opening in a valvular manner under a very peculiar hood-like fold of mucous membrane into the interior of the duodenum, at the distance of about $6\frac{5}{8}$ inches below the pyloric orifice.

The remaining portion of the small intestine extended from the duodenum to the cæcum; it measured in length 80 feet, and in circumference from 4 to $5\frac{1}{2}$ inches; in its course four remarkable dilatations were observable placed at variable distances from each other; some of these measured 10 inches in circumference and about 4 inches in length. Of the three divisions of the small intestines the duodenum was the largest in calibre, the jejunum the smallest, and the ilium intermediate in size.

The mesenteric vessels were very large and numerous, and many lacteals and glands clustered about the root of the mesentery, more particularly at the point of junction between the ilium and cæcum; a chain of glands lay in the concavity of the terminal coil of the former, enclosed in the layers of the mesocæcal fold of peritoneum, each of which was about the shape of a kidney bean; similar glands were traceable upwards, but less distinctly, and at greater intervals along the entire length of the ilium.

The intestinal wall consisted of four coats. First, a peritoneal; second, a longitudinal series of muscular fibres; third, a series of circular fibres, which in the regions of the dilatations or pouches before mentioned were thinner and more expanded than elsewhere; and fourth and lastly, the mucous lining, which was thrown into five or six folds or plications, which in the upper portion of the intestine were arranged principally in a longitudinal direction at irregular intervals round its wall; these longitudinal folds were here and there connected by transverse ones, which were best marked along the concave or attached margin of the gut, and projected from its mucous surface for the depth of about 3 lines.

The depth of the primary or longitudinal plicæ varied from 6 to 9 lines; sometimes, but rarely, they joined each other at an acute angle, and wherever this occurred they enclosed a long irregular lozenge-shaped space; in the intervals of these folds the mucous membrane was perfectly smooth, particularly on the convex wall of the intestine; in the other portions, especially on the sides of the jejunum, numerous patches of mucous follicles were distributed. In the ilium transverse folds (valvulæ conniventes) took the place of the longitudinal ones and were increased in size. The glands of PEYER occurred, both solitary and in scattered patches, all through the ilium.

On laying open one of the before-mentioned dilatations, the mucous membrane lining it was seen to be arranged in the form of crescentic folds at each of its extremities, the concavities of the folds being placed in opposite directions, and the portion of the wall of the gut intervening between them was sacculated and extremely thin, being but scantily covered by the muscular coat; this was most observable at the fundus of each pouch, where the wall of the intestine seemed only to consist of the serous and mucous coats.

In the parietes of the jejunum, at its gastric extremity, a number of hard tubercular bodies were situated, which to the touch conveyed the sensation of their being lymphatic glands; these, on opening into the intestine, presented on its mucous surface the appearance of somewhat bluntish conical papillæ, which were perforated at their apices by small orifices, one on each eminence, capable of admitting the head of a small pin. These apertures led into tortuous canals enclosed in the coats of the intestine, and were for the most part occupied by the bodies of entozoa, one in each nidus, their heads being firmly attached by hooks imbedded in the fundus of each canal.

On examination these animals proved to be the *Echinorhynchus porrigens* of RUDOLPHI, by whom they were discovered in the same species of whale, and described in his 'Synopsis Entozoorum.' They are also mentioned by HUNTER in the second volume of his 'Essays and Observations'*.

The large intestine extended for the length of 5 feet 8 inches, and communicated with a cæcum about 8 inches long, which latter exhibited no vermiform appendix; the blind or cæcal extremity of this intestine was situated on the right side, and pointed downwards and backwards, with the small intestine lying along its inner margin enclosed in the layers of the mesocæcum for the distance of about 7½ inches. This portion of the large intestine was cylindrical, and measured 7 inches in circumference; from it the colon was continued forwards and to the left side, forming a few slight curves for about 1 foot of its extent and terminated in the rectum, which was 4 feet long, and passed directly backwards to the cloaca. The circumference of this intestine varied from 5 at its centre to about 2 inches at its cloacal or anal termination; this latter was surrounded by circular muscular fibres that formed a well-defined and strong sphincter. The colon was imperfectly sacculated, and its coats were nearly the same as those of the small intestines. The whole intestinal tract was thus about six times the length of the body of the animal.

The liver was a large brownish-coloured gland, irregular in outline, and presenting two surfaces and two edges. The upper surface measured 22 inches across from side to side, and was divided into two lobes right and left; of these the former was the smaller in area; it was convex, and measured 16 inches in depth from its vertebral or thick to its ventral or thin edge. The left lobe was thinner, flatter, and more pointed in front; it measured 16½ inches in breadth.

The anterior edge was thin and excavated in the middle into an angular notch, 6 inches in depth, for the reception of the umbilical vein. The posterior edge was thick and nearly straight, corresponding to a very short coronary ligament, whose layers were several inches apart. The falciform ligament separated these lobes, and was readily separable into two layers; it ran the usual course from the umbilical vein in front to the vena cava behind.

The under surface was divided into three lobes by two intervening fissures. The right lobe below was smaller than the corresponding portion on its anterior surface, and in shape was somewhat crescentic, being, however, much wider anteriorly than along its vertebral margin; to the left it was separated from the Spigelian lobe by the vena cava, whilst its right edge corresponded to the right lateral ligament. The lower surface of the left lobe was concave, to accommodate the anterior aspect of the stomach; and its left margin presented two small notches and terminated anteriorly in a rather acute point.

* Specimens from this Whale have been described by Drs. JOHN BARKER and A. MACALISTER in the 'Proceedings of the Dublin Natural-History Society' for 1865.

The Spigelian or central lobe was elongated, and extended from the vertebral edge behind to the transverse fissure in front, which its free anterior tongue-shaped extremity bounded to the left; its right edge was thin and overlapped the vena cava partially behind, while it completely covered it in front, and became continuous with the right lobe by a thin bridge of hepatic substance; to the left a superficial branch of the vena portæ formed its boundary.

On the lower surface there were only two fissures, a transverse situated between the right and Spigelian lobes for the transmission of the vena portæ, hepatic artery and duct, and a second for the reception of the vena cava. The portal vein, which measured 4 inches in circumference, entered at the posterior and right side of the fissure, where it formed a dilatation or sinus, and then divided into two branches, of which the left was the larger. The hepatic artery, which was an inch in circumference, entered the fissure midway between the duct and the vena portæ, but on a plane inferior to both, and after dipping into the hepatic substance it divided into its right and left branches; the duct which lay to the left side of the fissure was formed by the union of the right and left branches, of which the latter was much the larger; its coats were highly elastic, and it measured about three-quarters of an inch in circumference. The umbilical vein entered the free border of the falciform ligament, and for about the distance of 5 inches from the left end of the transverse fissure was pervious. At 3 inches from its point of entrance it measured in circumference $2\frac{1}{2}$ inches, but beyond this point it suddenly narrowed and soon after became obliterated; one of its branches united with a radicle of the left branch of the vena portæ, but no distinct ductus venosus could be seen, as is the case in the horse. The vena cava grooved the posterior surface of the gland for about 10 inches of its course, and formed a curve whose convexity was directed to the left, where it entered this channel; its circumference measured 5 inches, and at its point of emergence it had increased to 6 inches; its coats were comparatively thin, but were strengthened by a thin layer of the capsule of Glisson, and also by the liver substance that crossed and partly surrounded it: no gall-bladder existed. A transverse section through the gland displayed nothing but the orifices of extremely large vessels and coarse parenchymatous tissue connecting the granules.

The kidneys were elongated, prismatically shaped organs, presenting three surfaces bounded by three blunt edges; they lay one on each side of the spine in the anterior part of the lumbar region, and measured 15 inches in length by 5 inches in breadth, and $2\frac{1}{2}$ inches in thickness in the centre, but diminishing towards their extremities by tapering into bluntish points. They were made up of numerous small lobules, some being round, others polygonal in shape, averaging about half an inch in diameter. The renal arteries entered their inner edge about 4 inches from the anterior extremity. The veins made their exit immediately above the arteries; the ureters commenced in the centre of the gland by the direct union of the tubes from the several lobules, there being no regular pelvis to the organ, and passed out from the inferior angle. Numerous large filaments of the sympathetic nerve formed a plexus in front of the renal artery and vein on each side.

The spleen was single, extremely small, oval in shape, of a brownish-blue colour and attached to the left, or bulging of the first stomach, by a very short gastrosplenic omentum.

Ear.

The external auditory meatus opened on the surface by a very minute oval slit, whose longest diameter was about one line; it was concealed at the bottom of a furrow in the integuments, which was situated about $7\frac{1}{2}$ inches posterior to the external canthus of the eyelid, and on a line continued backwards horizontally from the commissure of the lips. From this aperture the auditory canal was continued backwards and inwards, winding round the posterior border of the squamous bone to reach the membrana tympani, where it terminated. The tube was readily separable from the deep-seated layers of the integuments, and was accompanied for a part of its extent by a fibrocartilaginous cord, which latter ceased about 3 inches from the superficial or tegumentary end of the meatus; internally it was united to the posterior and external angle of the periotic bone.

Immediately within the auditory meatus the calibre of the acoustic tube became slightly enlarged, but soon again resumed its original diameter; its whole extent was filled with a dark, greyish, sebaceous substance, the product of a very distinct series of ceruminous glands, the orifices of whose ducts were visible on its lining membrane. The ear-tube itself was composed of three coats. First, an external or fibrocellular one, which, about $1\frac{1}{2}$ inch from the external orifice, exhibited a thin stratum of circular muscular constrictor fibres enclosed in its layers; second, a middle or fibrous coat, which was much the thickest and strongest; and third, an internal or pseudomucous lining membrane, which was formed by an involution of modified cuticle, and arranged in three longitudinal folds that commenced about three-quarters of an inch from the external meatus, and terminated at the dilated portion of the canal.

The petrous or periotic bone was irregular in shape, and was lodged in a deep cavity between the squamous, pterygoid, basioccipital, and exoccipital bones; it was separated from the last-named by the foramen lacerum posterius, which gave exit to the jugular vein. In this cavity it was loosely placed, being merely fitted in, but not united by suture to the surrounding cranial bones, and consequently could be removed from the base of the skull without much difficulty. It presented four parts for description. First, a posterior or opisthotic; second, an anterior or prootic; third, a central or labyrinthic; and fourth, an inferior or tympanic. The opisthotic portion was prolonged backwards and outwards, being somewhat curved, with the concavity directed forwards; it lay in a deep groove in the squamous bone external and anterior to the sulcus for the depressor maxillæ inferioris, and was elongated, laterally compressed, and marked with irregular longitudinal ridges and furrows; where its lower edge was joined to the labyrinthic portion, it presented a prominent bony pedicle for the attachment of the tympanic element.

The prootic portion resembled a three-sided pyramid, having its apex pointing forwards and outwards; it projected into a cavity in the squamous bone, which was traversed by the Eustachian tube and tensor tympani muscle; its surfaces were rough and somewhat tuberculated, pierced by numerous small irregular foramina. On its inferior surface it presented a flattened pedicle, the processus anterior mallei, by which it was united to the anterior extremity of the tympanic bone. The tympanic portion was united to the petrous by the two flattened osseous pedicles just described; it measured $3\frac{1}{2}$ inches in length by 2 inches in breadth, and $1\frac{1}{8}$ inch in depth; in consistence it was extremely dense and brittle, and in shape it resembled a Cypræa or Bulla shell*: its upper and outer edge formed an extremely irregular extended lip and presented three notches, one situated in front of the anterior osseous pedicle of the tympanic bone, which was hollowed into a groove, and transmitted the tensor tympani muscle. The second notch was placed between the anterior pillar of the tympanic bone in front and a large promontory or ridge behind, which was continued upwards into a bony spur, and was continuous with the handle of the malleus. This notch was for the entrance of the eustachian tube. The third, or posterior notch, was situated behind the prominent ridge before mentioned, and in front of the posterior pillar of the tympanic bone; this was the auditory meatus, and towards it the fibro-cartilaginous ear-pedicle ran; in the recent state it was somewhat quadrilateral in shape and looked directly outwards. The inner lip of the tympanic bone was bullate and rugose; it did not come into contact with the petrous bone, but was separated from it by a small interspace, which in the recent condition was filled up by the continuation of the fibromucous membrane that lined the cavity of the tympanum.

The labyrinthic segment, which contained the internal ear, formed the roof of the tympanic cavity; it presented four surfaces, viz. superior, inferior, external, and a posterior. The superior surface was concave, rough, and porous; it exhibited internally a large oval aperture, the internal auditory meatus, whose long axis extended from below and without upwards and inwards, it presented internally on its floor two digital foramina, one small and obliquely placed, the aqueductus Fallopii, which transmitted the portio dura; the other, or larger foramen, was placed posterior and inferior, and terminated in a conical fossa, which was perforated by an irregular series of foramina (*Macula cribrosa*) for the transmission of the portio mollis to the internal ear: these foramina were separated from each other by an osseous ridge.

Posterior and external to the internal meatus there was a deep funnel-shaped depression which terminated in a cul-de-sac, internal to which, and directly posterior to the internal auditory meatus, was a small oval tube, which opened into the cochlea, the aqueductus cochleæ; the lower or tympanic surface of this portion of the bone was convex, hard, and smooth, and its anterior external border was perforated by the aperture of exit of the portio dura nerve. The posterior surface, which was continuous with

* A good representation of this segment is given in the 'Catalogue of Seals and Whales in the British Museum' by Dr. Gray, 1866.

the inferior, was marked below by a large smooth round aperture that led forwards and outwards to the inferior scala of the cochlea, the fenestra rotunda, above which was a sharp ridge that separated it from a large oval foramen, which was partly closed at its upper and anterior part by a thick scale of bone; this aperture was directed into the jugular foramen behind, and into the highest part of the tympanic cavity in front. The external surface was deeply hollowed, and formed part of the superior and internal boundary of the cavity of the tympanum; anteriorly it was marked by an opening for the transmission of the corda tympani nerve which communicated with the aqueduct of Fallopius; posterior and internal to this the fenestra ovalis was situated, which latter was closed accurately by the base of the stapes with its narrow end directed forwards, and its long axis pointing downwards and backwards; it communicated with the vestibular cavity, a small space that presented on its superior, posterior, and internal part extremely diminutive rudimentary semicircular canals. At the upper and outer part of the labyrinthic segment the aqueduct of the vestibule wound obliquely to the lower part of this cavity.

The inferior posterior angle of the labyrinthic segment was prolonged backwards and almost touched the opisthotic portion, where it formed the inferior boundary of the large irregular foramen before noticed; on the lower surface of this portion of the bone, the cochlea was exposed on removal of the superficial osseous substance, which was extremely dense.

The cochlea consisted of two turns, with the apex of the modiolus directed downwards and outwards; the upper and inner part, or scala tympani, was somewhat larger than the lower and outer, the scala vestibuli. The lamina spiralis was deeply grooved for the reception of the filaments of the auditory nerve.

The separate ossicles of the ear were but two in number, as the malleus was, correctly speaking, a process of the tympanic bone from which it projected upwards from the centre of its margin. It consisted of a short, stout handle, which was continued as a ridge of bone into the inner concave side of the tympanic cavity; its upper or free portion presented a rounded process (or capitulum) projecting outwards, surrounded by a slight groove that separated it from the articular surfaces for the incus; these latter surfaces were placed on the posterior aspect, and were twofold; one larger surface, ovoid in shape, looked backwards, the second, directed upwards, was convex, and situated immediately below and at right angles to the former; a minute canal traversed this bone, piercing it in a small triangular interval that separated the rounded extremity from the articular surfaces, and opened into the fossa beneath the rounded process above described.

The incus in shape somewhat resembled one of the phalanges of a diminutive great toe; it presented two concave articular facets on its posterior extremity, which corresponded perfectly with the surfaces on the malleus; the distal end was rounded and bituberculate, but non-articular. On the upper surface a small oval facet was placed, covered with a discoid articular crust to articulate with the narrow extremity of the following ossicle,—

The stapes, which was short, stout, and triangular in shape; it consisted of two rami, a base, and an apex; the latter was covered with an epiphysary lamina, and articulated with a corresponding facet on the upper surface of the incus. The base was ovoid, and exactly fitted into the fenestra ovalis; the two rami were short and thick, cylindrical, and not channelled, and the intervening foramen small and ovoid.

Eye.

The eye was situated about 28½ inches from the point of the upper jaws, 2½ inches above, and directly in a line perpendicular to the commissure of the lips, and about 7½ inches in front of the external auditory meatus.

The eyelids measured 2½ inches along their free margin, and the depth of each of them, taken at its centre, was about thirteen lines from above downwards. The palpebræ were surrounded and defined by two crescentic furrows in the integuments, one of which was placed an inch above the margin of the upper, the other 1⅝ inch below the margin of the lower lid; neither Meibomian follicles, ciliæ, nor tarsal cartilages could be detected at the border of the lids.

The thickness of the palpebræ varied from three lines and a half at the base or orbital attachment to one line at the free margin, the cuticle being three-fourths of a line in depth. The basement layer exhibited a large number of elliptically disposed tendinous fibres intermingled with light-coloured granular fat; on removing this structure a strong orbicularis palpebrarum was exposed, which was half an inch thick at the anterior canthus, but gradually became thin towards its posterior angle, where it measured only one line in thickness. This muscle arose from the inner angle of the orbit; its fibres ran in a semicircular direction, coursing round the upper lid and became slightly attached externally to a strong tendinous band, that ran from the external canthus to the outer wall of the bony orbit; passing this the fibres of the muscles curved downwards, and were attached to the conjunctiva in the centre of the lower lid, where they were gradually lost.

On removing the orbicularis palpebrarum, a large quantity of dark-brown fat was disclosed, in which, at the lower and outer part of the orbit, the lacrymal gland lay imbedded; this latter appeared as a small bilobed granular body, of a yellowish-brown colour, and irregular in outline; it measured 2 inches in its long diameter, which extended from before backwards, and 1 inch transversely; its external or superficial lobe was somewhat square in shape, and was covered by the orbicularis palpebrarum; the internal or deeper-seated lobe was round, and lay within the orbit. Its ducts, about eleven in number, opened on the palpebral conjunctiva by oblique pores. A detached and lighter-coloured glandular body (HARDER's gland?) lay above and external to the gland proper, and its ducts opened by numerous fine pores into the superior palpebral sinus. The lacrymal nerve lay inferior to the gland, and was traceable through it to the conjunctival surface of the eyeball.

Three folds of conjunctiva passed, almost horizontally, from the globe of the eye to the anterior canthus, or commissure of the lids; above and below the central fold two small *culs-de-sac* were thus formed, which seemed as though they were rudimentary puncta; each of these extended to the depth of nearly a line, and was protected superiorly by a similar fold of mucous membrane.

The muscles of the orbit were ten in number*.

The superior rectus arose by two heads, one from the common tendinous sheath of the optic nerve, or ligament of ZINN; the second head had its origin from the superior margin of the optic foramen; these origins soon united and passed forwards to be inserted into the sclerotic coat, about $1\frac{5}{8}$ inch posterior to the edge of the cornea. This muscle was crossed superficially by the frontal branch of the ophthalmic division of the fifth nerve, and its tendon was split by the following muscle.

The superior oblique, which arose from the ligament of ZINN, ran forwards to a point about 3 inches behind the cornea, where the direction of its fibres was changed by passing through an opening formed by the splitting of the tendon of the superior rectus. From this pulley-like contrivance, which was lined by a small synovial bursa, the fibres of the superior oblique took a direction backwards, outwards, and slightly downwards, and were inserted tendinous into the sclerotic immediately in front of the insertion of the choanoid muscle.

The internal rectus arose from the inner side of the optic foramen; its fibres ran forwards on the posterior or external side of the globe of the eye to be inserted into the sclerotic about 1 inch behind the cornea.

The external rectus arose from the outer side of the optic foramen; its fibres ran forwards on the posterior or external side of the eyeball to be inserted into the sclerotic about 1 inch behind the cornea.

The inferior rectus had its origin, like the preceding, from the border of the optic foramen, and in addition from the ligament of ZINN; its fibres passed forwards and outwards, and in a manner precisely similar to the superior rectus. This muscle was perforated by the fibres of the inferior oblique; its tendon formed by the reunion of the separated fasciculi was inserted into the sclerotic at about $1\frac{1}{4}$ inch below and behind the cornea.

The inferior oblique was a short curved muscle; it arose from the inferior and anterior angle of the orbit; its fibres passed backwards and upwards, and having wound through the pulley-like contrivance formed for it in the inferior rectus, before referred to, was inserted into the posterior and inferior portion of the sclerotic.

The choanoid muscle was distinctly quadripartite, having its origin from the sheath of the optic nerve, and being inserted, as in other mammals, into the posterior aspect of the sclerotic coat.

The nerves seen in the dissection of the orbit were the third, which supplied the superior, inferior, and internal recti, the inferior oblique, and the choanoid; the fourth, which was distributed to the superior oblique; the sixth to the external rectus; and the fifth to the soft parts of the orbit.

* The levator palpebræ superioris was absent.

It is unnecessary to enter into any description of the globe of the eye, as it presented no points of departure from the frequently described normal cetacean type, in the great posterior thickness of the sclerotic, the comparatively small depth of the vitreous cavity, and the globular shape of the lens.

Conclusion.

The *Balænoptera rostrata* has already furnished a subject for several descriptions, each of them more or less complete. Of its osteology a most comprehensive and accurate account has been given by Mr. FLOWER in the Proceedings of the Zoological Society of London, 1864, with which, in most points, the osteological relations of the present specimen will be seen to agree, the main points of difference being that in our specimen the foramina between the lateral processes of the axis were not completed by bone, but remained as large oval-shaped notches with an interval of a little more than 1 inch between the free extremities of these processes.

Another difference in the present specimen was the existence of a small osseous tubercle on the left side of the centrum of the seventh cervical vertebra, the rudiment of a parapophysis. Mr. FLOWER notices the existence of a similar tubercle on both sides of the body of the same segment in a specimen in the Louvain Museum, but in the specimens described both by him and other authors this tubercle does not appear to have been present. LILLJEBORG describes it as being developed in one individual more distinctly on the right side than on the left.

There was also a discrepancy in the number of vertebræ, which in our specimen amounted only to forty-six, whereas in most of the other recorded instances from forty-eight to fifty are stated as the number present*. It is, however, possible, as our animal was immature, that two or more cartilaginous terminal bodies might have been present, and from their rudimental state have escaped detection. The last caudal bony centrum measured three-quarters of an inch in its transverse, and five-eighths in its perpendicular diameter; in texture it was spongy and friable.

All the cervical vertebræ, as in the specimen described by HUNTER, were free; whereas in the individual described by Dr. GRAY in the "Zoology" of the 'Erebus' and 'Terror,' and also in one of the specimens in the Louvain Museum, the second and third were united by bone.

The shape of the sternum of the present specimen differed from those heretofore described; it had not the elongated cruciform outline of that described and figured by Mr. FLOWER, but, as before stated in this communication, it was somewhat heart-shaped; this difference, however, might possibly be due to the immaturity of the animal.

* A specimen from Bergen is described in the Scandinavisk Fauna, in which forty-seven vertebræ were stated to be the number present. This, however, Mr. FLOWER explains by the loss of the last one or two segments.

Explanation of Plates.

PLATE IV.

Fig. 1. Drawing of animal, made to the scale of 1 inch to the foot.

Fig. 2. Lateral view of myology of entire animal.

A. Pectoralis major.
B. Deltoid.
C. Infraspinatus.
D. Latissimus dorsi.
E. Dilator naris.
F. Humerus.
G. Masto-humeralis.
H. Sternomastoid.
I. Sternohyoid.
J. Mylohoid, covering maxillary pouch.
K. Depressor maxillæ inferioris.
L. Masseter, superficial fibres.
M. Temporal.
N. Rhomboideus.
O. Longissimus dorsi.
P. Serratus magnus.
Q. External oblique.
RR. Depressor caudæ minor.
S. Depressor caudæ major.
T. Levator caudæ.

PLATE V.

Fig. 1. Rete mirabile shown in the neck and in the axilla.

A. Masto-humeralis, cut across.
B. Upper axillary vascular plexus.
C. Lower axillary vascular plexus.
D. Cervical rete mirabile.

Fig. 2. Muscles of the paddle, front view.

A. Vertebral edge of scapula.
B. Subscapularis.
C. Acromion process.
D. Masto-humeralis, cut across.
E. Costo-coracoid ligament of the notch.
F. Supraspinatus.
G. Origin of teres major.
H. Insertion of teres major, cut and reflected.
I. Brachial artery and venæ comites.
J. Subscapular artery.
K. Long head of triceps.
L. Short or inner head of triceps.
M. Bifurcation of brachial artery.
N. Radial artery.
O. Ulnar artery.
P. Flexor carpi radialis.
Q. Space from which the palmaris longus had been removed.
R. Flexor digitorum communis.
S. Flexor carpi ulnaris.
T. Condylo-olecranon process.
U. Radius.
V. Ulna.
W. Carpus.
X. Metacarpus.
Y. Interposed fibrocartilages.
Z. Phalanges.

Fig. 3. Muscles of paddle, back view.

A. Supraspinatus.
B. Acromion process.
C. Ligament of the notch.
D. Origin of deltoid.
E. Infraspinatus.
F. Cartilaginous inferior angle of scapula.
G. Circumflex artery and vein.
H. Humerus.
I. Long head of triceps.
J. Teres major.
K. Latissimus dorsi, cut across.
L. External head of triceps.
M. Condylo-olecranon process.
N. Ulna.
O. Radius.
P. Extensor communis digitorum.
Q. Carpus.
R. Metacarpus.
S. Phalanges.

Fig. 4. Os hyoides.

A. Body.
B. Posterior cornua.
C. Anterior notch.
D. Articulation with great cornua.
E. Styloid bones, or great cornua.
F. Temporal extremities.

Fig. 5. Thyroid cartilage.

A. Anterior cornua.
B. Posterior cornua.
C. External margin.
D. Central notch.
E. Anterior margin.

Fig. 6. Skeleton of larynx, *in situ*, dorsal aspect.

A. Styloid bones, rotated outwards.
B. Articulation of styloid bones with the body of the os hyoides.
C. Os hyoides.
D. Cricoid cartilage.
E. Posterior border of thyroid cartilage.
F. Crico-arytenoid articulation.
G. Crico-thyroid articulation.
H. Arytenoid cartilage.
I. Transverse arytenoid ligament.
J. Epiglottis.

Fig. 7. Laryngeal pouch laid open, ventral aspect.

A. Os hyoides.
B. Wall of laryngeal pouch.
C. Arytenoid bodies.
D. Cavity of larynx.
E. Alveolations on mucous surface at apex of pouch.
F. Trachea.

PLATE VI.

Fig. 1. Sternum, showing its irregularly cordiform outline.

Fig. 2. Vertical section through the second vertebra or axis, showing the morphological relations of its different parts.

A. Anterior border of centrum.
B. Spinal canal.
C. Neurapophysis cut through.
D. Apical epiphysary crust or summit of odontoid process.
E. Central portion of the upper or second ossific part.
F. Upper epiphysary crust above the primordial fissure, which typically separates the odontoid segment from the centrum.
G. Inferior epiphysary boundary of the primordial fissure.
H. Cancellous tissue of centrum.
I. Inferior epiphysary crust.

There are four epiphysary crusts indicating the presence of two distinct vertebral bodies; the letters D and F indicating the upper and lower surfaces of the first or atlas-vertebra; G, I, the epiphysary laminæ of the second or axis-vertebra.

Fig. 3. Muscles situated on the front of the larynx.

A. Styloid bones.
B. Body of os hyoides.
C. Thyroid cartilage.
D. Laryngeal pouch.
E. A fold of mucous membrane reflected.
F. Kerato-pharyngeus.
G. Deep basio-keratic.
H. Superficial basio-keratic.
I. Sterno-hyoid, cut across.
J. Mylo-hyoid.
K, K. Thyro-hyoid.
L. Crico-thyroid.
M. Inferior constrictor.
O. Aryteno-epiglottideus.

Fig. 4. Laryngeal pouch laid open to show the thickness of its muscular wall.

Fig. 5. Front view of the tongue and pharynx.

A. The tongue.
B. Mucous folds extending along its border.
C. Isthmus faucium, through which is passed a rod.
D. Palato-glossus.
E. Opening of glottis.
F. Epiglottis.
G. Arytenoid bodies.
H. Alveolated surface of mucous membrane.
I. Peculiar pre-epiglottic hood-like fold of mucous membrane.
J. Posterior great cornua of os hyoides.
K. Trachea.
L. Œsophagus.

Fig. 6. Lateral view of tongue and pharynx. References similar to fig. 5.

Fig. 7. Glottis closed, as during the act of deglutition. The letters A, B, C, D, E, F, G, H, I, J, K, L refer to the same parts as in fig. 5.

M. Frena of hood-like fold of mucous membrane.

Fig. 8. Glottis with its lateral walls divaricated. The letters as before.

Fig. 9. Glottis open with the lips retracted. Similar references.

Fig. 10. Tympanic bone with malleus, incus, and stapes attached *in situ*.

Fig. 11. Periotic bone, lower surface.

a. The wall of the labyrinth.
b. Foramen ovale.
c. Pedicles by which the tympanic bone was attached.
d. Opisthotic portion.
e. Prootic portion.

PLATE VII.

Fig. 1. Cranium viewed from above, showing superficial anatomy of the blowholes.

A. Foramen magnum.
B. Occipital bone.
C, C. Temporal fossæ.
D. External nares.
E. Median sulcus.
F. Retractores naris.
G. Dilator naris.
H. Superior maxillary bone.
I. Primordial vomer.
J. Constrictor naris.

Fig. 2. Anatomy of the deep structures of the blowholes as viewed from above. The letters D, E, F, L, J, K refer to same parts as in fig. 1.

Fig. 3. Deep structures of blowholes as viewed from below.

A. Cavity of naris.
B. Black epithelial layer of mucous membrane.
C. Alar fibrocartilages.
D. Deep dilator of the nares.
E. Median crest.
F, I, J refer to same parts as in fig. 1.

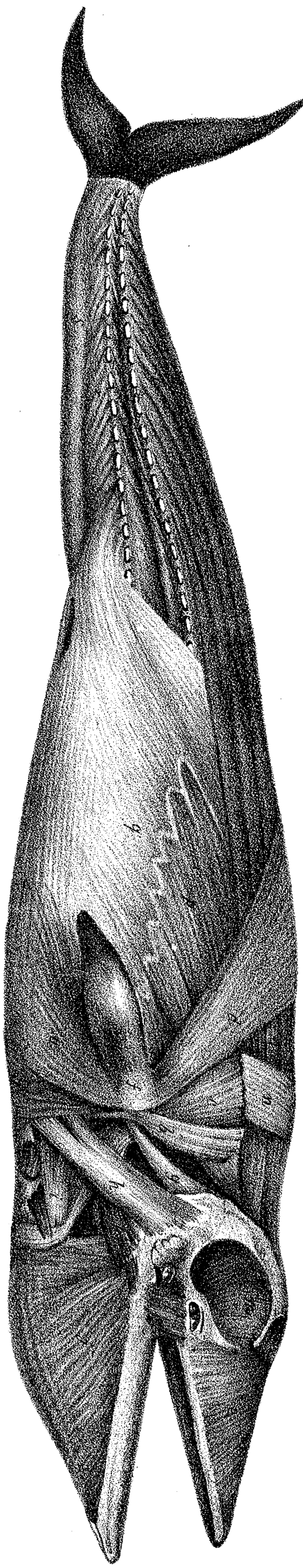
Fig. 4. Stomach and liver. Front view.

A. Œsophagus.
B. First stomach.
C. Second stomach.
D. Third stomach.
E. Fourth stomach.
F. Fifth stomach.
G. Duodenum.
H. Liver.
I. Lesser omentum.
J. Spleen.

Fig. 5. Stomach, and outline of liver, back view.

Letters A to G refer to same parts as in fig. 4.

Fig. 6. Tympanic bone, upper surface with the ossicles attached.



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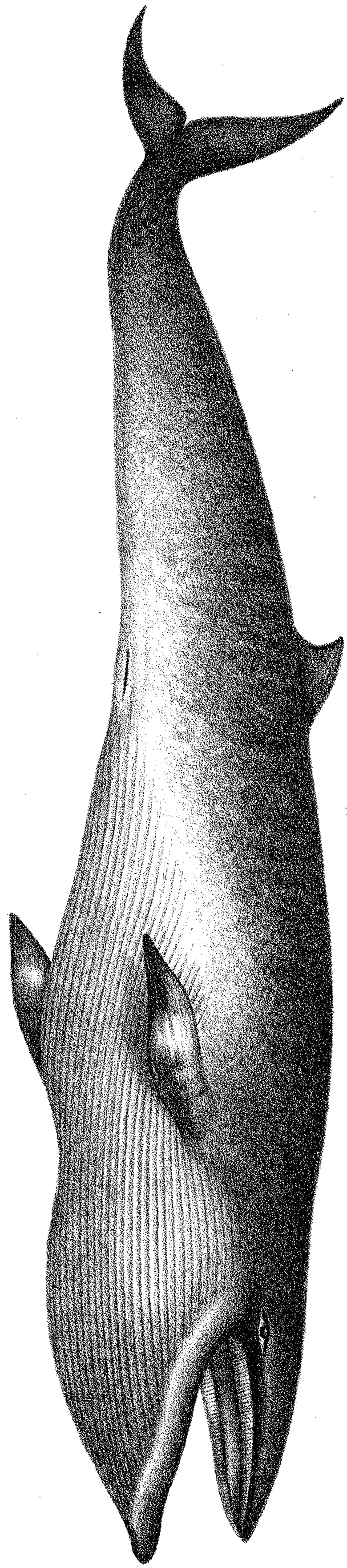

Fig 1

E.M. Williams. F.L.S. F.Z.S. Lith.

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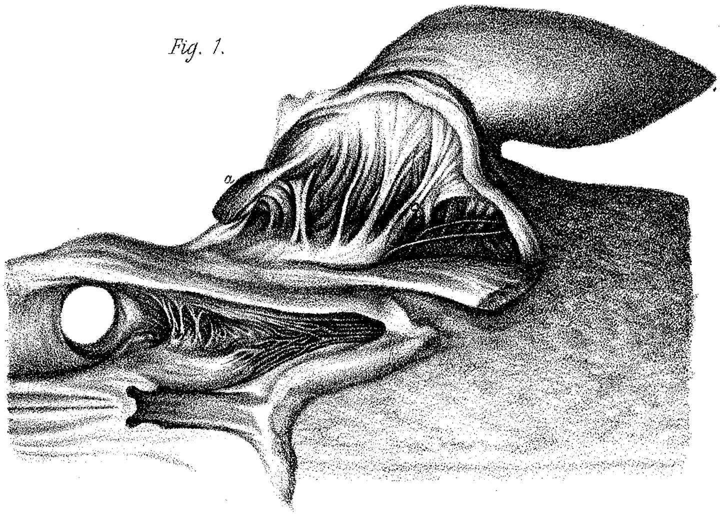

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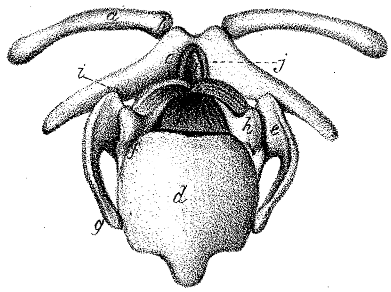

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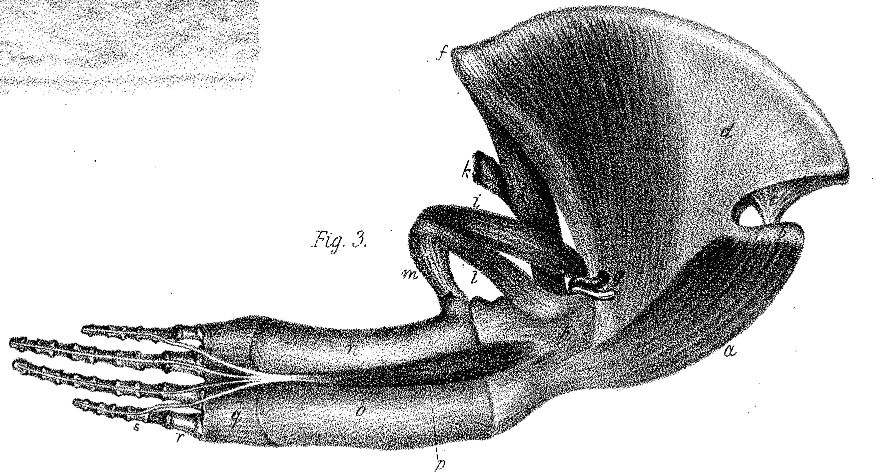

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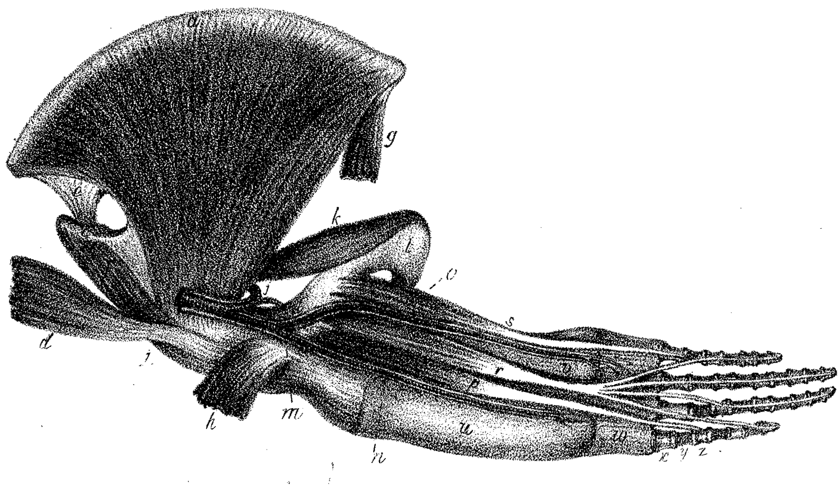

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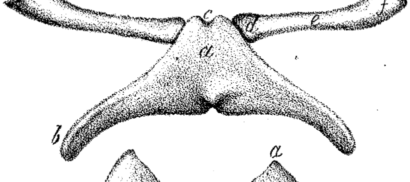

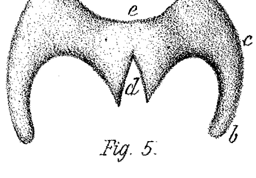

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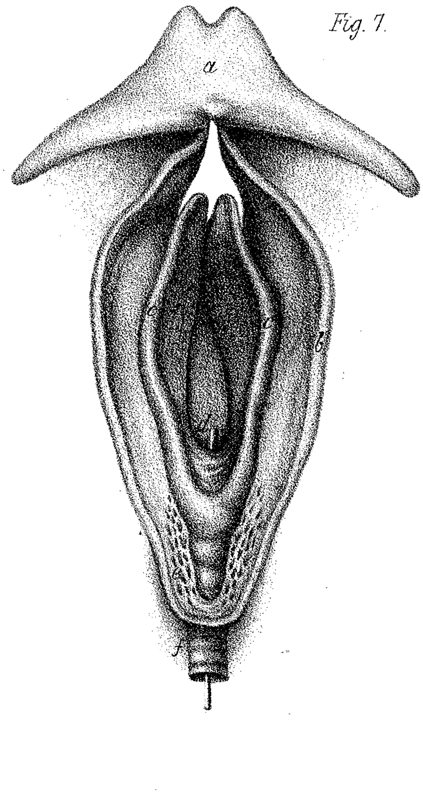

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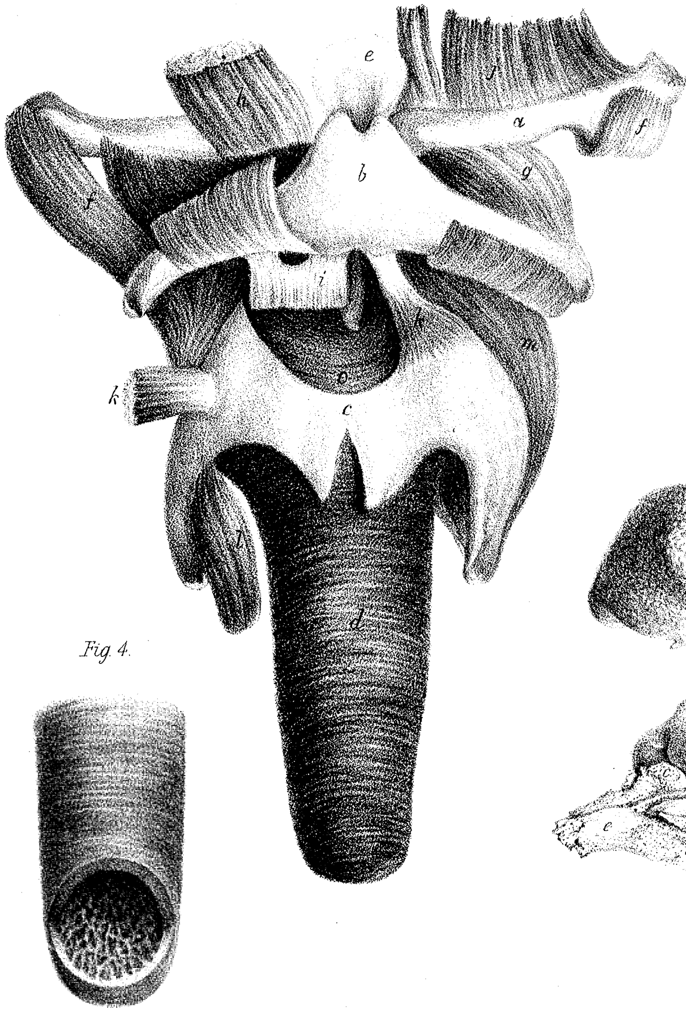

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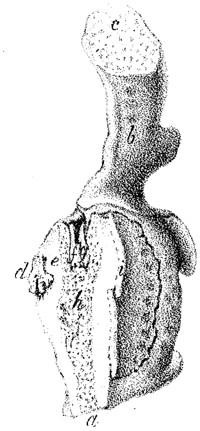

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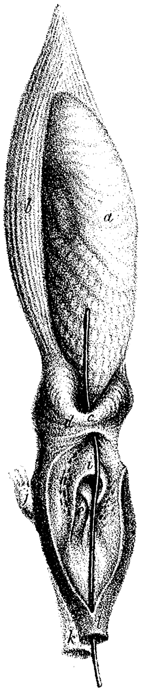

Fig. 10

Fig. 4.

Fig. 11

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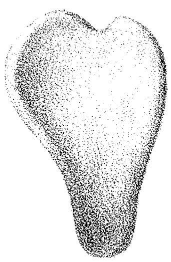

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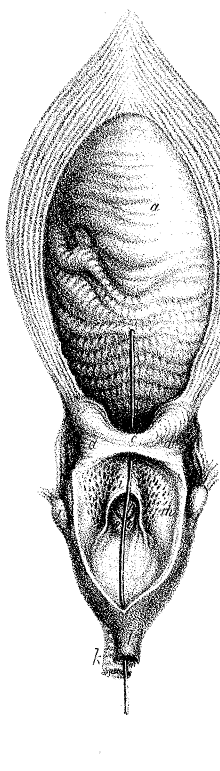

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Fig. 8.

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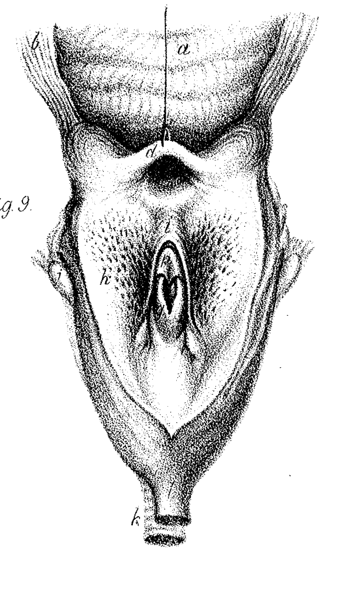

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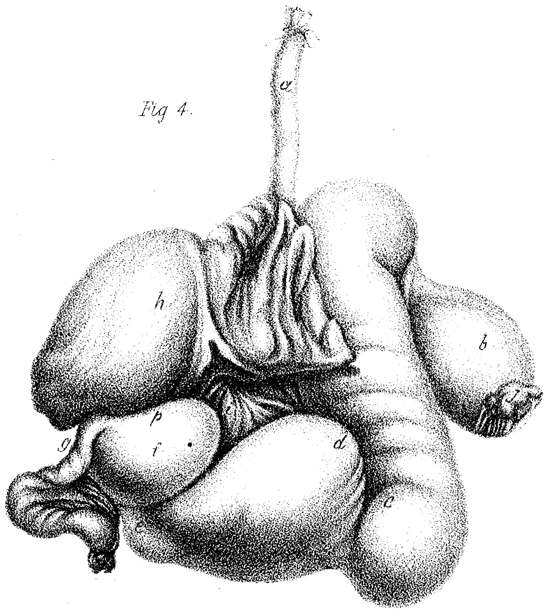

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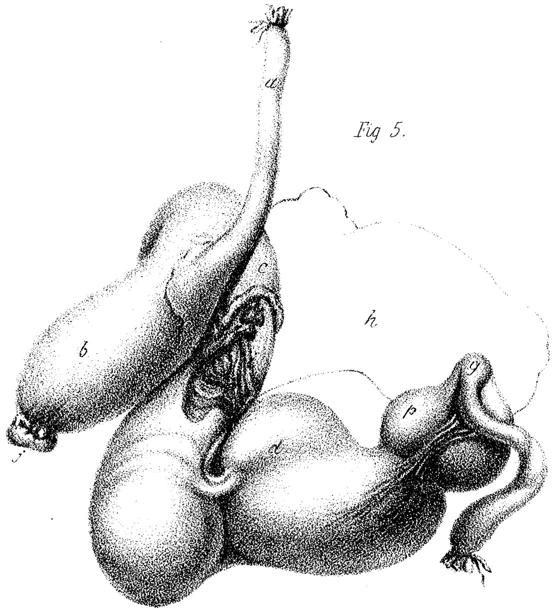

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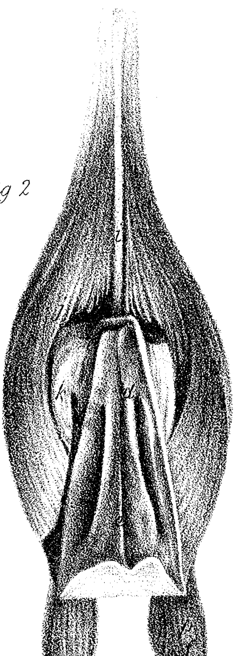

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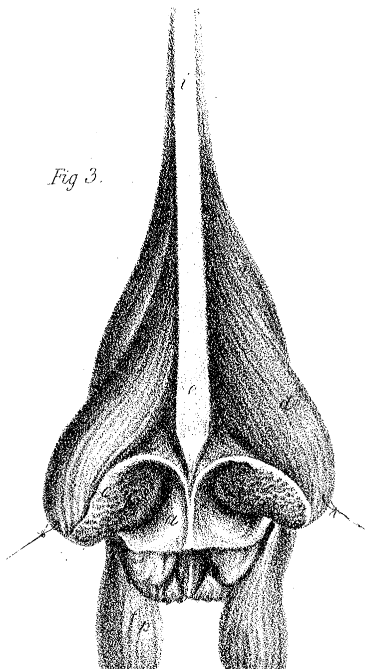

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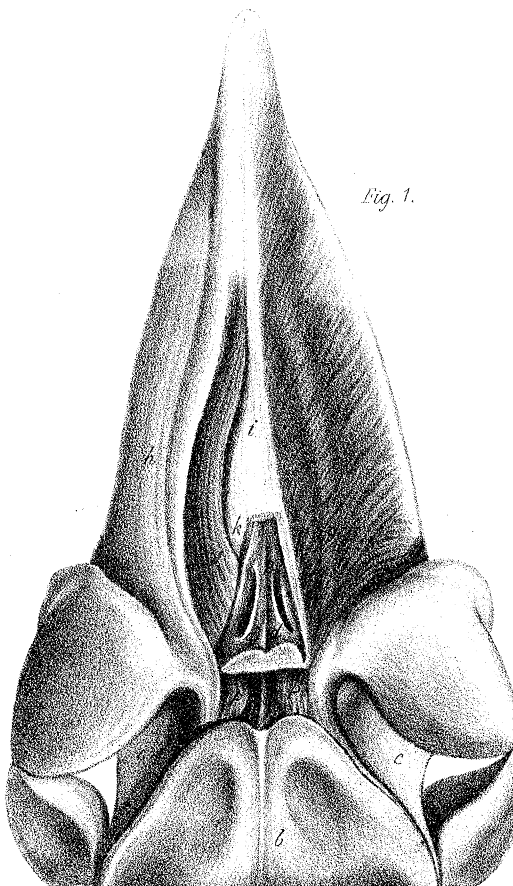

Fig 6.

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