XX. *Particulars respecting the anatomy of the Dugong, intended as a Supplement to Sir* T. S. RAFFLES' *Account of that animal.* *By Sir* EVERARD HOME, *Bart. F. R. S.*

Read June 29, 1820.

SOMETIME after Sir THOMAS STAMFORD RAFFLES' paper on the Dugong was laid before the Society, I received from him a young female of that animal, four feet six inches long, and the viscera of a male, eight feet long, preserved in spirit, with the bones dried.

From these materials I have selected the most interesting facts that came under my observation, not adverted to in Sir THOMAS STAMFORD RAFFLES' description, and now lay them before the Society, to render the account of this most extraordinary animal as complete as it is possible for me to do.

The external form of the animal was in sufficient preservation to enable Mr. CLIFT to give a representation of it, which is annexed, (Pl. XXV.)

Although the tusks, as well as the mode of shedding them, have been described in a former paper, the skull of the small dugong furnishes farther materials respecting the teeth of this animal. It has two incisors in the upper jaw immediately before the two milk tusks; these are more advanced in the gum than the tusks; and therefore, would appear before them. The gum covering the alveoli was very thick,

and a ligamentous substance passed down from it into each separate opening, and attached itself to the teeth they contain, to serve as gubernacula, to guide the points of the incisors and tusks in the right direction to pierce the gum.

The first, or temporary set of molares which had been shed in the other skulls, was in the small one twenty in number, there being five on each side of each jaw.

In the anterior scabrous projection of the lower jaw, were four regular sockets on each side, filled with a ligamentous substance passing into them from the gum, forming gubernacula for the incisors not yet completely formed.

The tongue, which is represented in one of the annexed Plates (Pl. XXVII.) of the natural size, has two nipple-like processes at its base, one on each side; it is only loose for half an inch at the point, which is covered with long villi, showing that the sense of taste is very delicate.

The insides of the cheeks are covered with cuticle, in which are strong projecting bristles, as in the hare and rabbit.

The œsophagus is lined with cuticle, which terminates before the entrance into the stomach, where the œsophageal glands are situated.

The stomach differs from all the stomachs I have yet seen; for although it possesses peculiarities met with in the whale tribe, the pecari, the hippopotamus, and beaver, even these very peculiarities are differently arranged, as will be seen by referring to the annexed drawings.

The cardiac portion is small, for an animal living on vegetable food, and extends farther to the left side beyond the entrance of the œsophagus than is usual; its form is more

globular than the human. On the upper or small curvature to the left of the entrance of the œsophagus, quite at the extremity, are situated the gastric glands, forming a rounded mass, as in the beaver. The orifices of these glands are small, and covered over with a membranous bag, which has only one large aperture. The glandular mass is divided into two portions. Their appearance is seen in Plate XXVII. and resembles more that of the same glands in the ardea argala, described in a former paper, than of any quadruped. The internal surface of this portion of the stomach is smooth, but not cuticular; the coats are thick near the cardia, but thin towards the pyloric portion. The communication between this and the pyloric portion, is by a round aperture three fourths of an inch in diameter, similar to what is met with between the different cavities of the stomach in the whale tribe. Immediately beyond this orifice there are two openings from the pyloric portion, one from the posterior side into a cul-de-sac six inches long, and one from the anterior only three inches in length. This portion is rather shorter than the cardiac, is thinner in its coats, has a smooth internal surface, and bends a little upon itself before it terminates in the pylorus, which is marked by a welt, or valve. The two appendages to the pyloric portion, differ from those in the hippopotamus and the pecari, in being smaller, and projecting farther, as well as in not belonging to the cardiac portion, as in these animals. All these cavities, including the appendages, were distended with fuci in a macerated state, undergoing trituration.

This complex stomach, belonging to an animal whose food is nearly the same as that of the hippopotamus, makes it

very desirable that the internal cavities of the stomach of that animal should be examined and described. This, I believe, has never yet been done; and, whenever an opportunity offers of sending the stomach home preserved in spirit, the opportunity, we trust, will not be lost, as it will prove a most acceptable service to Comparative Anatomy. Such an examination would probably put us in possession of all the peculiarities in the structure of the organs of digestion, that are met with in nature, for digesting vegetable substances, as well those that grow upon land, as those that grow at the bottom of the sea, or of rivers of fresh water.

The duodenum receives the ducts of the liver and pancreas about four inches from its origin at the pylorus The coats are strong, the internal surface is honeycombed, having longitudinal ridges, and smaller ones in a transverse direction. The jejunum has, on that side attached to the mesentery, a row of orifices of glands, not in one line, but in a regular zig-zag. These were very distinct in the small dugong, but could not be seen in the large one. Similar orifices are met with in the colon of the ornithorhyncus paradoxus, ranged in ten separate dotted lines. These orifices extend to the cæcum. The mesenteric glands are large, flat, oval, and thinly scattered.

The cæcum is shown in Plate XXVII.; it is four times the size of the ilium, conical in its shape, and thick in its coats.

The colon has small lacunæ over its whole surface.

The whole intestinal canal is fourteen times the length of the animal, of which the small make five, the large nine. There are no valvulæ conniventes in any part of the intestines.

The spleen is made up of a fine beautiful reticulated network.

The external opening of the nose is that of the whale tribe in miniature; and the os hyoides has the same form as in that tribe. The epiglottis is long, and has a ligamentous edge; it stands up in the posterior nostrils, but does not form a tube with the glottis, as in the whale tribe. The glottis is very similar to the human, as well as the thyroide, cricoide, and arytænoide cartilages. There are no sacculi laryngæi; but two ligaments pass forwards from the base of the arytænoide cartilages to have an attachment to the concave surface of the thyroide, forming a rimula glottidis, which can be made wider and narrower, and the ligamentous bands tighter or looser, by the action of the arytænoide muscles. I have dwelt more upon the cartilages of the larynx, which are so different from those of the whale tribe, as this animal is said to be capable of making a noise not unlike the cry of a young child. The trachea is only two inches long before it divides into two; the rings are circular, although not regularly separate from each other.

The lungs in the larger dugong are two feet in length, that is one-fourth the length of the animal; they are exceedingly elastic, and the cells are very small, about the same size as in the whale: those nearest the surface are twice as large as the others, so that they cannot readily empty themselves entirely. The rings of the bronchiæ are very strong; they are oval in their form, and run into one another. This circumstance is shown in Plate XXIX.

The greatest peculiarity in the structure of this animal, is that of the ventricles of the heart being completely detached

from one another. This is not met with in any other animal, and it is at first difficult to account for it, as the circulation of the blood does not differ from that of the whale tribe and quadrupeds in general.

It was natural to look to the heart of the whale for something at least analogous to it. In the whale, the right ventricle has its apex on the same line with that of the left, and the muscular fibres appear to be more nearly of the same length, than in the hearts of quadrupeds in general. This circumstance, of the muscular coats of the two ventricles of the whale's heart being more equal in power than is usual, renders it probable, that in the dugong, where the lungs have such uncommon length, it was necessary that the approach to equality between the two ventricles should be still greater; and this equality could in no way be so well effected as by giving the muscles of the right all the superior mechanical advantages which, in other animals, belong to the left, as was explained to the Society in the year 1790.

The ventricles, although similar in structure, are not of the same size or thickness; the left in the larger dugong, is five inches long, and thicker than the right, which is only four and a half.

The auricles have transverse elastic bands, passing from one side to the other, as in the whale. The orifice of the foramen ovale was completely closed, although the part where it had been, was distinctly marked. The valvulæ mitrales and tricuspides had nothing particular in their appearance; nor had the semilunar valves of the aorta and pulmonary artery.

The relative size of these two great trunks is the same as in the elephant.

The kidneys are long narrow conglobate, and have eleven mammæ on each side.

The form of the penis is represented in Plate XXX.; it has no bone in it, as in the hippopotamus and sea otter. This representation is taken from that of the dugong eight feet long.

The vagina is four inches long. The os tincæ takes on the form of a rose. The uterus is about three inches long. The horns go off at right angles, as in the engraving, (Pl. XXX.) which was taken from a drawing of the dugong four feet six inches long.

The cribriform plate of the ethmoide bone in the small skull, had three distinct foramina on each side, for the branches of the olfactory nerve.

The eye had a membrana nictitans. The cornea was prominent; the lens double convex, the coats thin, the nigrum pigmentum very black.

The sternum in the small dugong was ligamentous in the middle, where the cartilages of the ribs joined it. This peculiar structure, which appeared to be for the purpose of allowing the body to bend forward, was not met with in the large one, the whole being formed into one bone. The appearance is so remarkable, that it is shown in Plate XXXI.

The two bones in the flesh, substitutes for a pelvis, are shown in Plate XXXI.; they were situated opposite the fourth vertebra of the loins.

There is a bony canal in the anterior part of the spine, from the anus to the tail, for the great blood vessels, the spinous processes of which are only attached to the vertebræ by ligament.

There is only one bone corresponding to the phalanges of the thumb, and it is the same with respect to the little finger;

that belonging to the little finger is the broadest, so that the thumb (if the term may be used) is in the situation commonly occupied by the little finger.

EXPLANATION OF THE PLATES.

PLATE XXV.

The external appearance of a young dugong, upon a scale of two inches to a foot.

PLATE XXVI.

The stomach distended, to show the prominent part of the cardiac portion containing the gastric glands, the contraction between the cardiac and pyloric portion, and the two cæca that communicate with the pyloric portion; the thickening at the pylorus, and the termination of the ducts of the liver in the duodenum; on a scale of half an inch to one inch.

PLATE XXVII.

Consists of three figures.

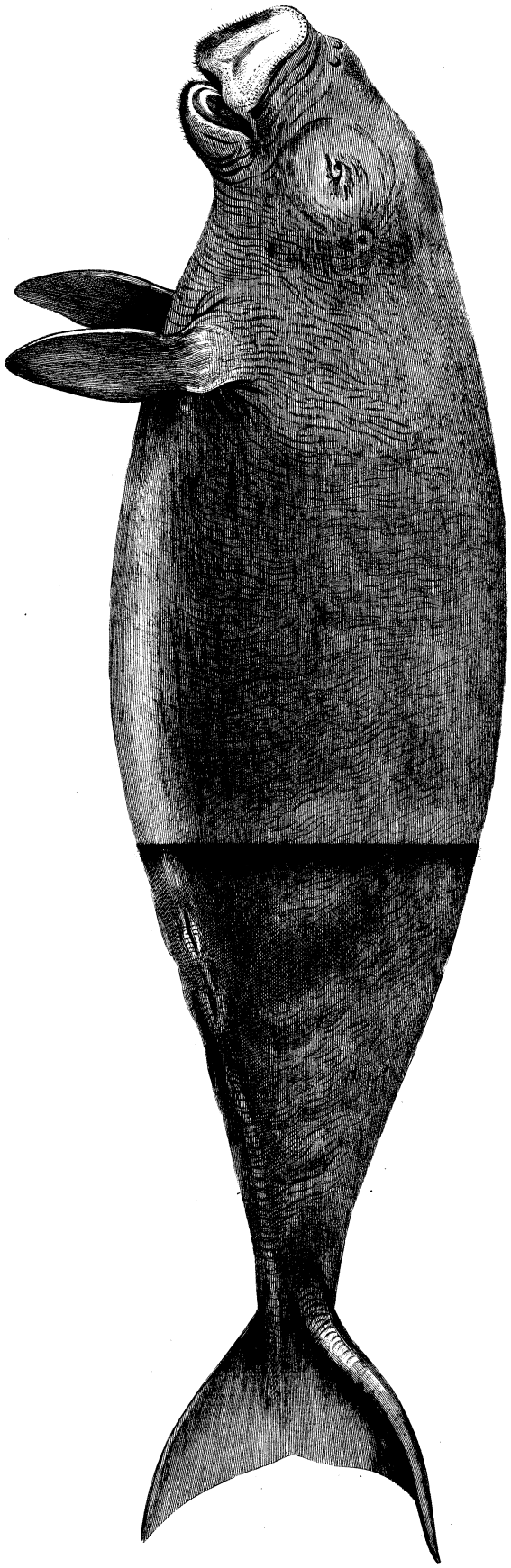
Fig. 1. The gastric glands in one mass, and the œsophageal glands, with the orifices exposed; of the natural size.

Fig. 2. The tongue in situ, only loose for half an inch at the point; two nipple like processes at the root; the papillæ at the tip for the sense of taste; natural size.

Fig. 3. The cæcum; on a scale of half an inch to one inch.

PLATE XXVIII.

The heart, with the aorta and pulmonary artery; of the natural size; from the dugong, eight feet long. The great peculiarity of the ventricles being separate, is distinctly shown.



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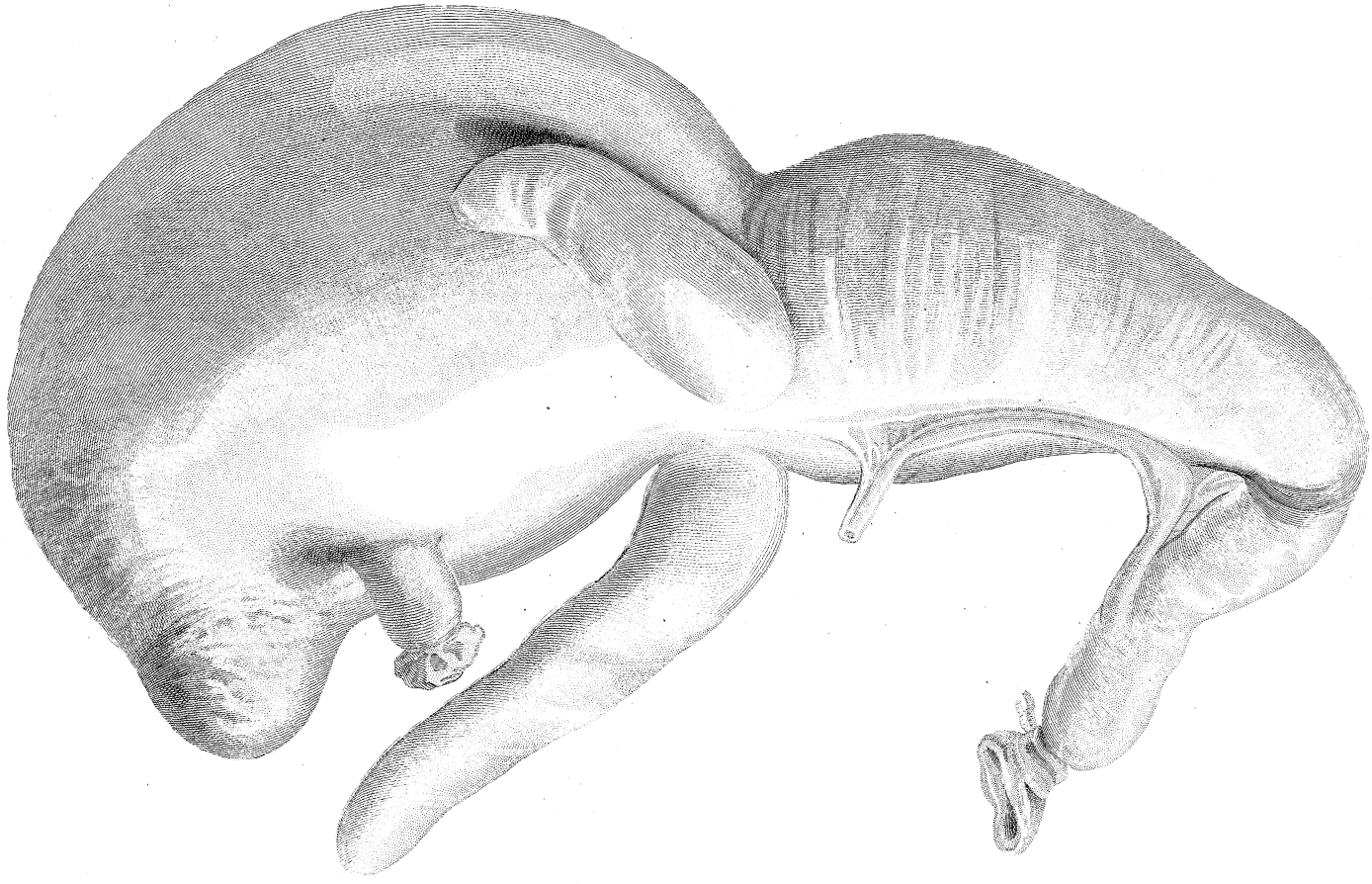
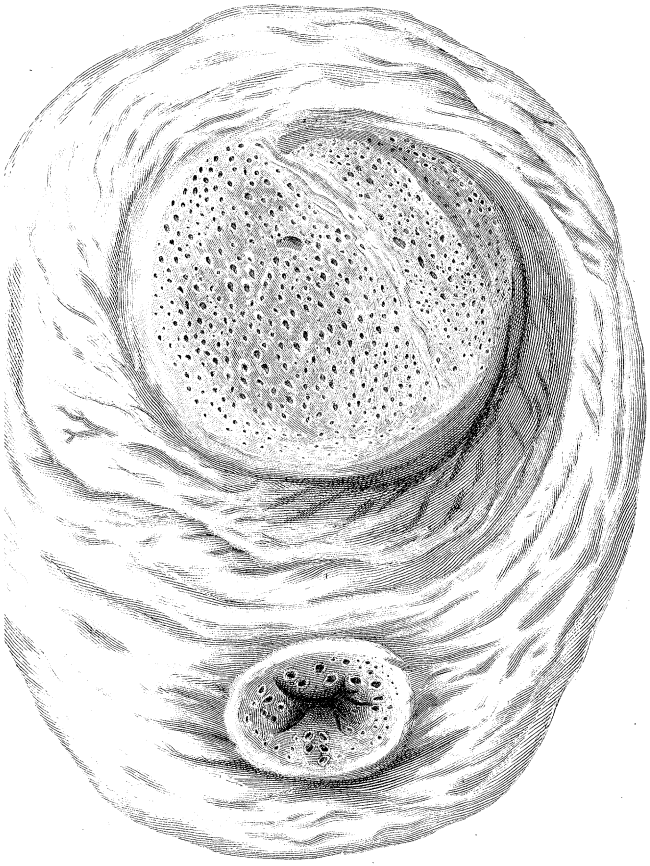
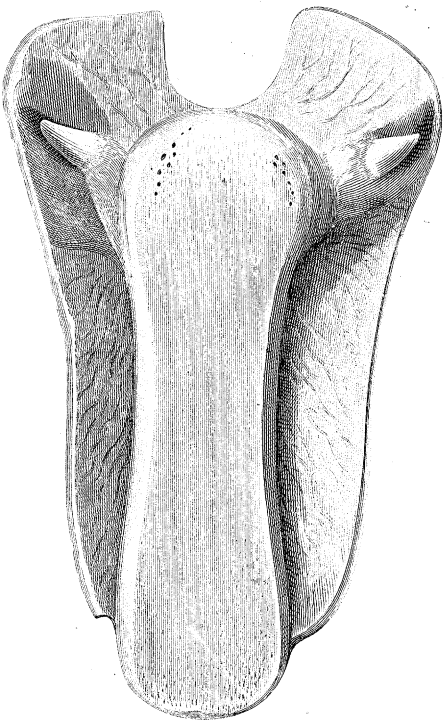


Fig. 2.





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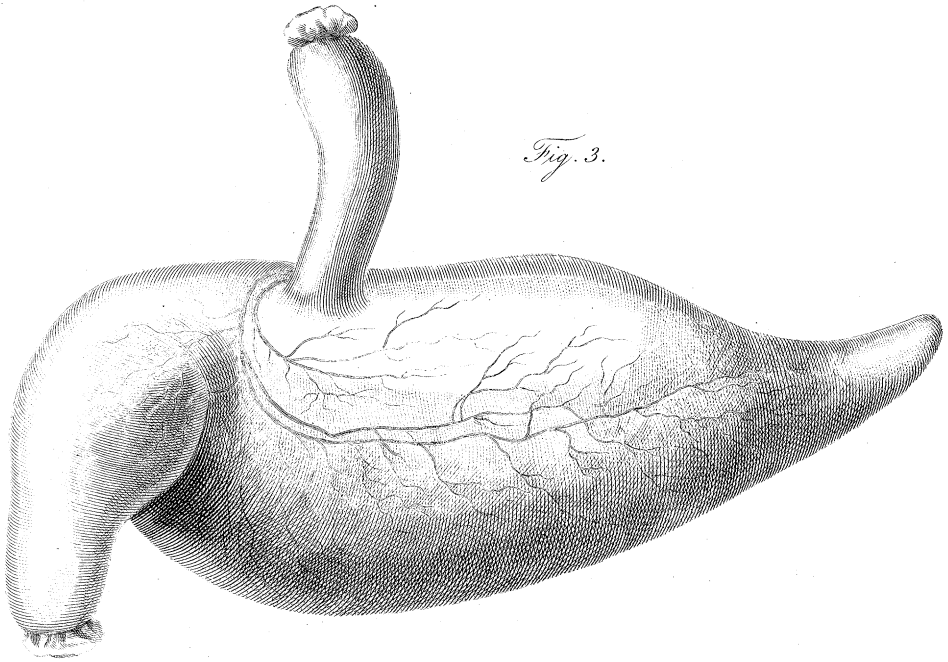

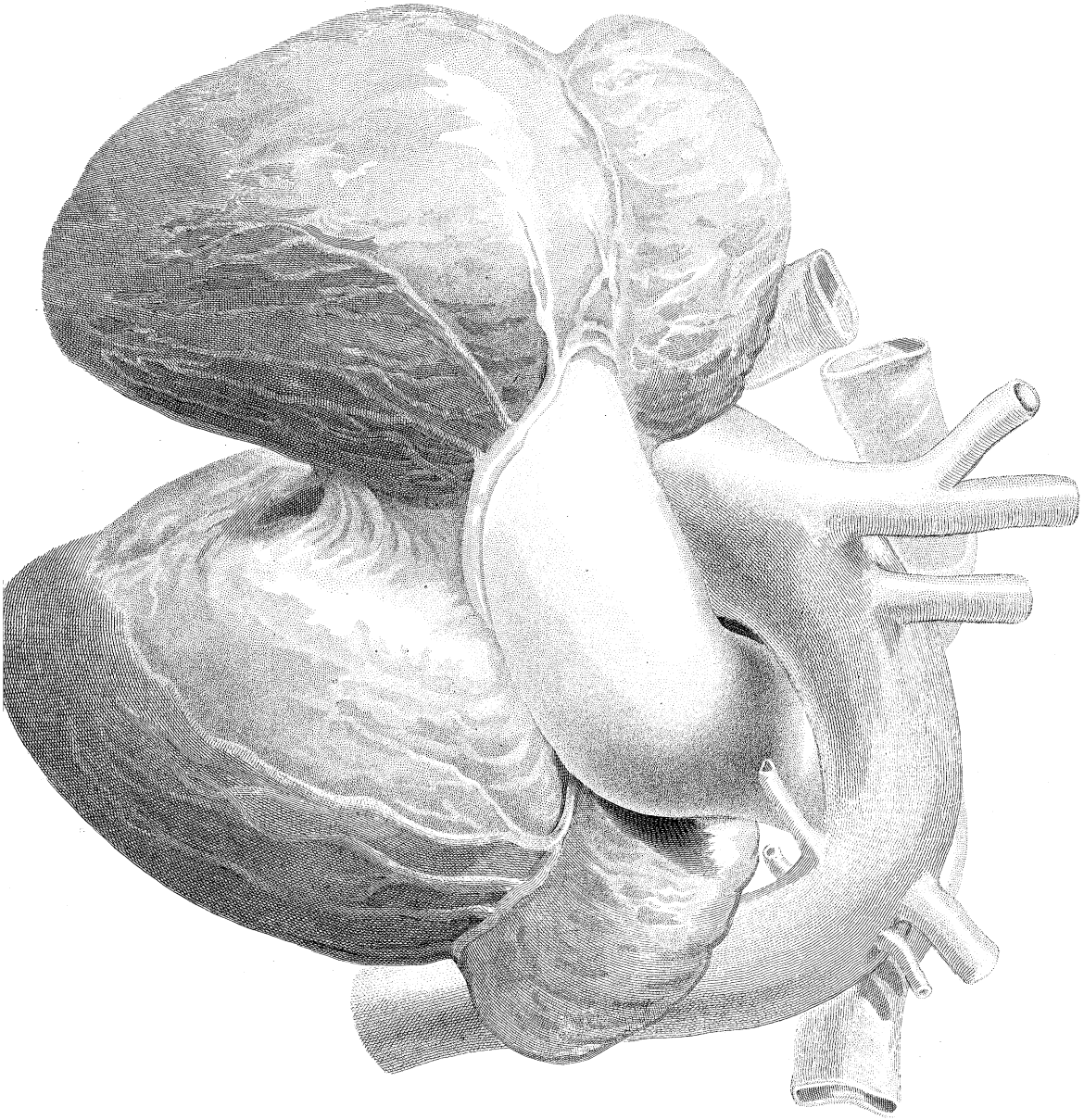

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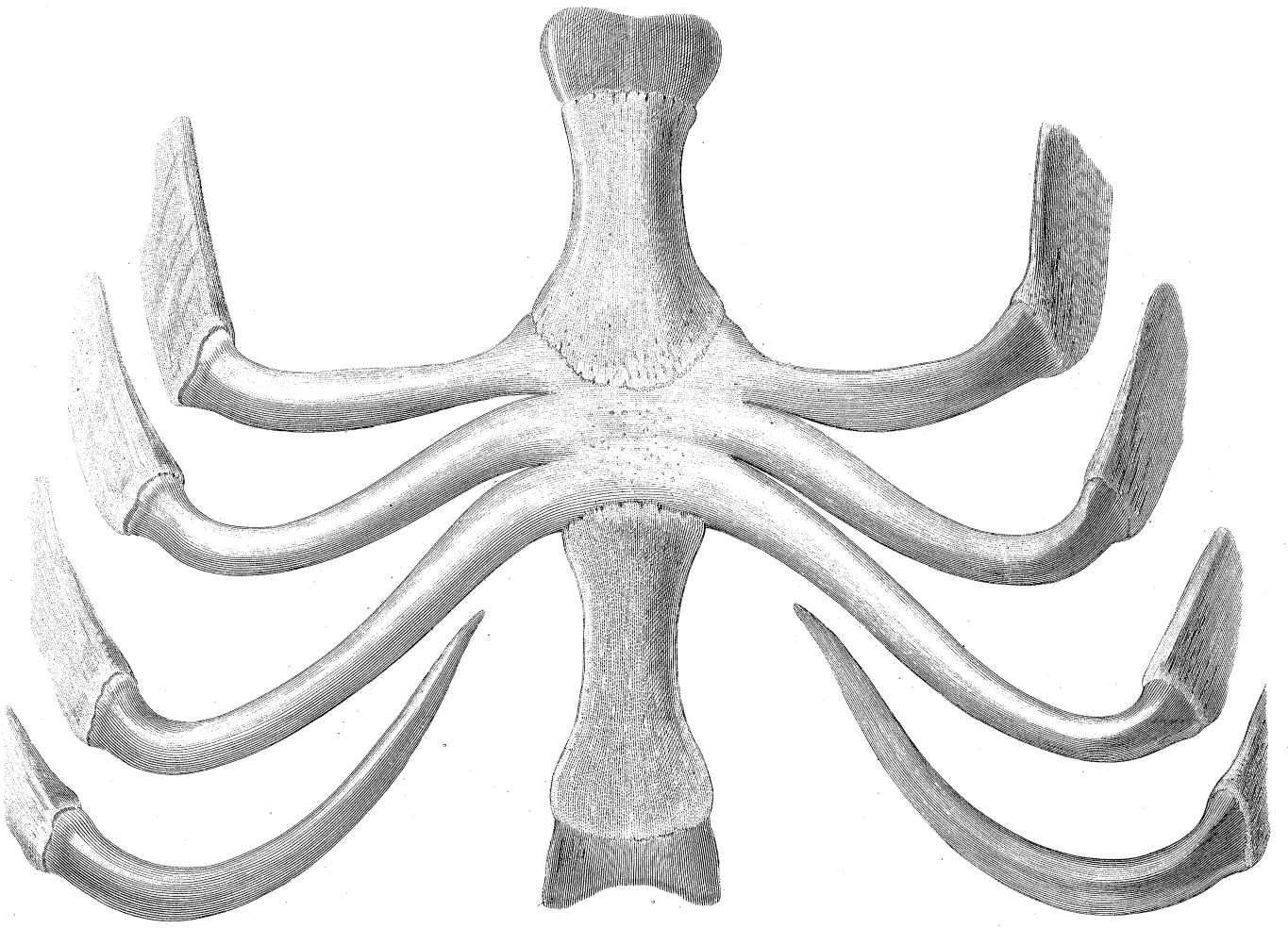

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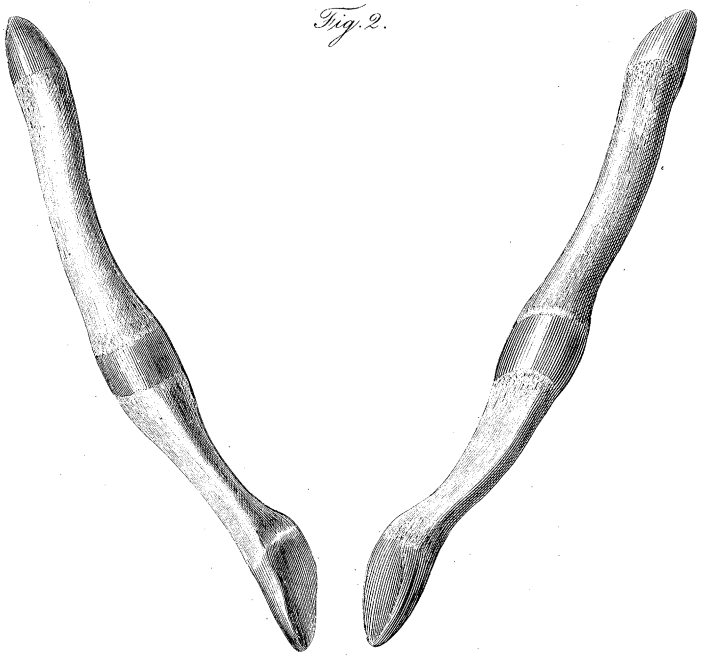

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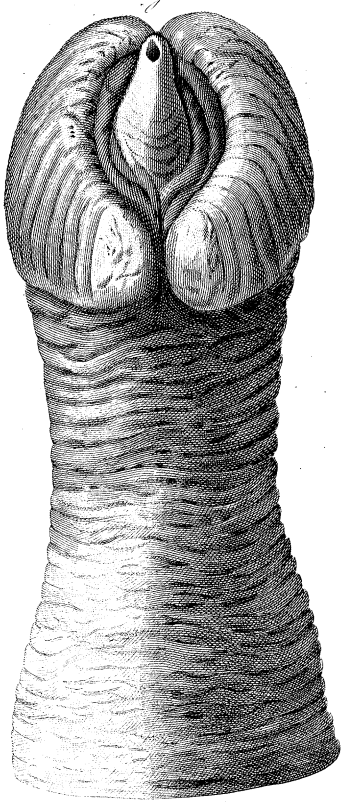

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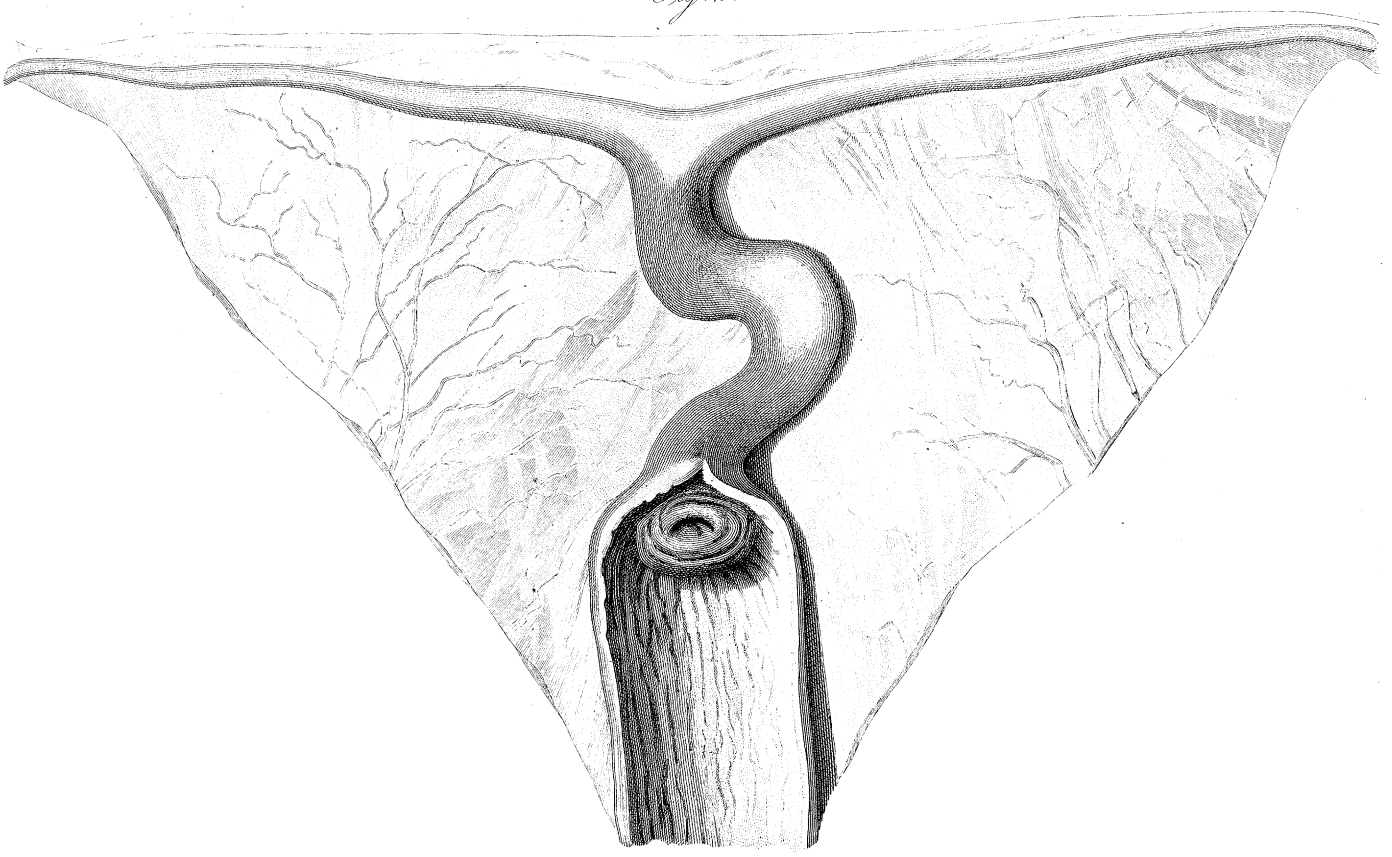

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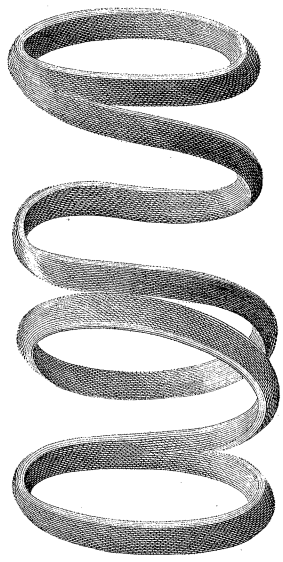

Fig. 2.

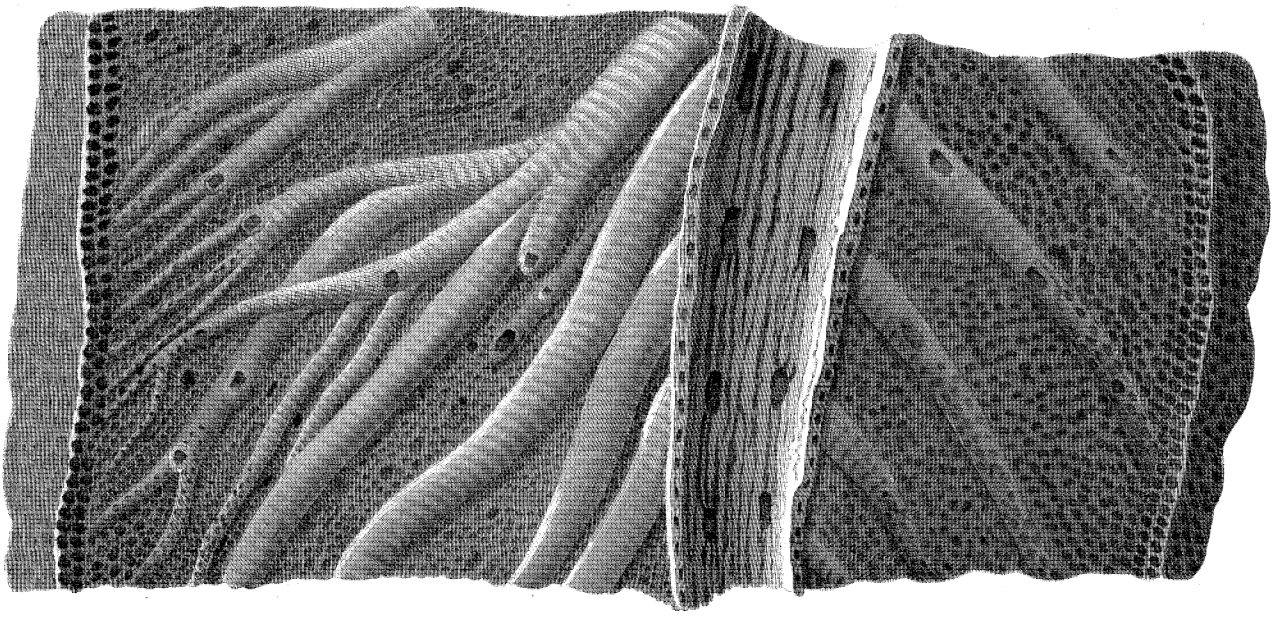

Plate XXIX.

Consists of two figures of the natural size; from the dugong eight feet long.

Fig. 1. A portion of trachea below the bifurcation, to show the connection of the rings.

Fig. 2. A portion of the lungs of the same dugong, to show the appearance of the cells, and the internal surface of the bronchia.

Plate XXX.

Consists of two figures.

Fig. 1. The glans penis of the natural size; from the dugong eight feet long.

Fig. 2. Vagina and uterus of the natural size; from the dugong, four feet six inches long.

Plate XXXI.

Consists of two figures.

Fig. 1. The sternum in the young dugong, to show that the ribs are attached to a ligament between two portions of bone; but in the older, all these parts are ossified. The parts are of the natural size. This peculiarity must render the body more flexible at that age.

Fig. 2. The bones forming a substitute for the pelvis in the female dugong, four feet six inches long; of the natural size.