PHILOSOPHICAL TRANSACTIONS.

XI. *Some curious facts respecting the Walrus and Seal, discovered by the examination of specimens brought to England by the different ships lately returned from the Polar Circle. By Sir* EVERARD HOME, *Bart. V. P. R. S. In a Letter addressed to Sir* HUMPHRY DAVY, *Bart. Pres. R. S.*

Read March 4, 1824.

DEAR SIR,

As the late expeditions sent out by Government to make discoveries in the Polar regions, were originally planned and recommended by the President and Council of the Royal Society, I am desirous to communicate to the Society, through you, some discoveries that have been made in the line of Comparative Anatomy, from an examination of the specimens that were brought home. This I wish to do before the different expeditions which are to sail in the ensuing spring shall leave our coasts, that the officers employed, knowing that, independent of the great objects of their voyage, many branches of science have been already much enlightened by their means, they will be induced, when-

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ever the opportunity occurs, to collect materials by which science may be still farther advanced.

To those who include Comparative Anatomy among their pursuits, it will be gratifying to know that the pickle, or brine, in which the salt provisions are preserved, is well fitted for preserving the internal parts of animals, keeping them in a state better adapted for examination, dissection, and injection, than they are found to be after having long remained in spirit.

The first discovery I shall mention, is a peculiarity in the structure of the hind flipper or foot of the walrus, that has not been adverted to; nor could it have been done now, by any one not well acquainted with the mechanism of the foot of the fly, enabling it to support its weight, and carry on progressive motion against gravity.

Such is the general resemblance between this flipper and the foot of the fly, that having upon a former occasion seen it in a very mutilated state, macerating in water, I discovered this analogy, and requested my friend Captain SABINE, in the Artillery, at the time he sailed with Captain CLAVERING to make experiments on the Figure of the Earth, to bring me the feet and other parts of the walrus. With the assistance and exertions of Mr. ROWLAND, Assistant Surgeon to the ship, he has complied with my request, and enabled me to bring forward the following observations on this subject.

It is a curious circumstance that two animals, so different in size, should have feet so similar in their use. In the fly, the parts require being magnified one hundred times to render this structure distinctly visible; and in the walrus, the parts are so large as to require being reduced four diameters to bring them within the size of a quarto page.

As a knowledge of the structure of the fly's foot, led to the detection of the use of the hind flipper of the walrus; so, on the other hand, an examination of the toes of the walrus has enabled me to make out the use of a part of the foot of the fly which I did not sufficiently understand — I mean the two points; Mr. ADAMS called them pickers, from supposing that they entered certain small holes in the surface, on which progressive motion was carried on. This opinion I did not deem worthy of consideration, but was unable to make out their real use; on comparing them, however, with the outer toes of the walrus, they are evidently intended to surround the exhausted cavity, so that a vacuum may be more suddenly and perfectly formed.

The flipper, whose external appearance is seen, Plate IV. was in a very corrugated state; but in Plate V. in which its muscles and bones are shown, they closely resemble those of the human hand.

The second discovery I have to notice, is the mode in which the bile in the walrus is collected in a reservoir, and thence impelled by a considerable force into the duodenum. The internal surface of the stomach of the walrus consists of rugæ; these in some respects resemble those of the cod fish; the orifice from the œsophagus is very large, so as evidently to admit large masses, and also of regurgitation; in this respect it is so like the seal, as to be distinguished from it only by the difference of size: in both these animals the orifice at the pylorus is extremely small and valvular, preventing the contents of the duodenum from again returning into the stomach. In the seal the gall bladder is small, detached from the liver, and opens, by a very small orifice, two inches and a half from the pylorus. In the walrus, a large cylindrical hard body

lies behind the duodenum, loosely connected to it by cellular membrane; at its lower end it projects like an os tincæ into the gut. This proves not to be the common opening of a ductus communis choledochus, but a canal leading directly from a large oval cavity with thick strong coats, by no means unlike those of the urinary bladder in a thickened state. These parts are shown in Plate VII. half the natural size. This cavity is supplied with bile laterally by a single duct from the liver.

This mode of supplying the duodenum with bile, differs from what is met with in all the animals I have had an opportunity of examining; and what is highly satisfactory, some of the substances on which this animal feeds, are, I believe, almost wholly peculiar to itself. I am informed by my friend Mr. FISHER, who was Astronomer in the two last voyages, that he was present when the contents of a walruses stomach was examined: they consisted entirely of the long branches of sea weed, Fucus digitatus, which is very abundant in the Arctic seas, especially in those parts of them where the walrus is met with in the greatest numbers. One of the seamen said it made him sick to look at the half digested sea weed contained in one of the stomachs. This sea weed, when the sea is open, is thrown up in great quantities on the beach, and when the sea is frozen, is found in masses under the ice.

The mucus secreted by the coats of the gall bladder, which in general is so small as to be of no consideration, in this animal is so abundant, as to induce me to consider it a necessary ingredient to the bile with which it is mixed.

The third new fact, with an account of which I shall con-

clude this letter, is the peculiar structure of the funis and placenta of the seal: for this specimen I am indebted to Lieutenant GRIFFITH, who, during the last voyage, met with it in a seal that was caught. He took out the fœtus and part of the uterus, and brought them home preserved in brine. The preservation of the parts was so complete, that the vessels admitted of being minutely injected.

The placenta in this animal has the following peculiarities: the trunks forming the funis are not twisted together; their whole length is nine inches; three inches from the placenta they begin to give off branches, which freely anastomose with one another; these branches are connected to the placenta itself by three membranous folds, like so many mesenteries; between these folds the blood-vessels are conveyed to the substance of the placenta, on the surface of which they ramify to a great degree of minuteness. This structure will give a greater facility than common to the circulation through the placenta, which makes it an object of enquiry, whether the same peculiarities exist in other marine animals. The drawings of the biliary ducts, and of the placenta, were made by Mr. ROSE, a student in surgery under me at St. George's Hospital.

I am, dear Sir, yours truly,

EVERARD HOME.

Sackville Street,
Feb. 11, 1824.

EXPLANATION OF THE PLATES.

Plate IV. contains four figures, representing different views of the left hind flipper of the walrus, diminished to one-fourth the natural size.

As the skin of the animal is very thick and unyielding, and had been for so long a time in strong brine, the parts were much shrunk and corrugated; but even in this state they showed that the palm of the flipper formed a concavity, which had the appearance of a cup, when the great and little toe were made to encircle the others.

In this state of the parts this concavity was thrown into longitudinal rugæ, so that the real size could not be ascertained, the span from the point of the great toe to the end of the little toe not exceeding twelve inches.

Figs. 1 and 2 represent the flipper, with the palm upon the ground, in the expanded and contracted state.

Figs. 3 and 4 represent the palm in these two states, with the rugæ formed by the skin.

Plate V. shows the internal structure of this flipper, after the thick skin thrown into rugæ upon the palm was dissected off. The flipper now lost all appearance of a foot, and took on that of the hand of a giant, so far as respected the bones and muscles, differing indeed in having a web covering all the other parts, and extending beyond the point of the thumb and fingers. The span now, instead of being twelve inches, became twenty-eight; and although this figure is upon the same scale as those in Plate IV., the span is seven inches.

Fig. 1.

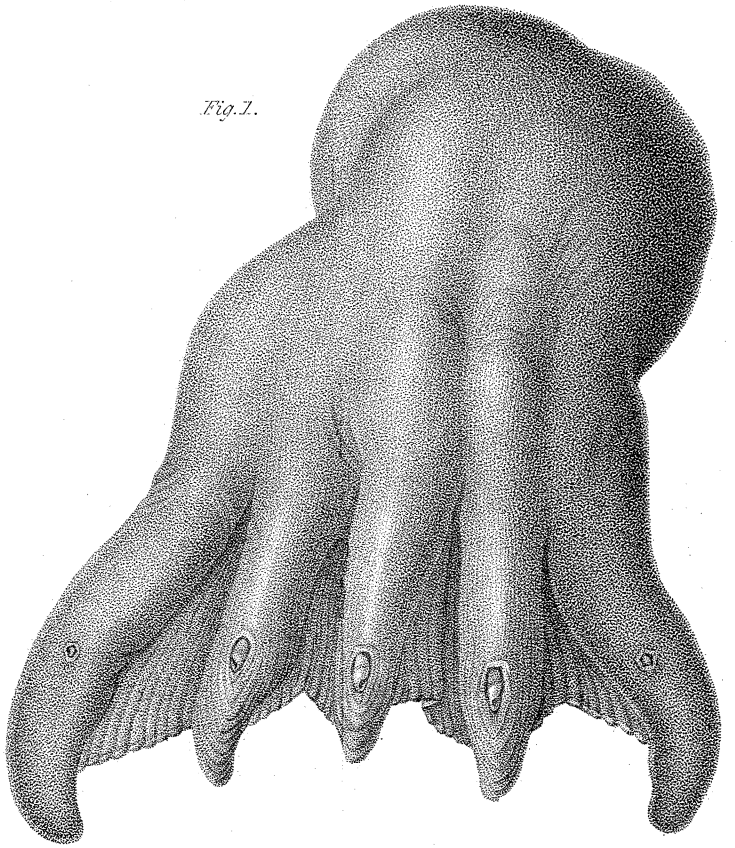


Fig. 2.

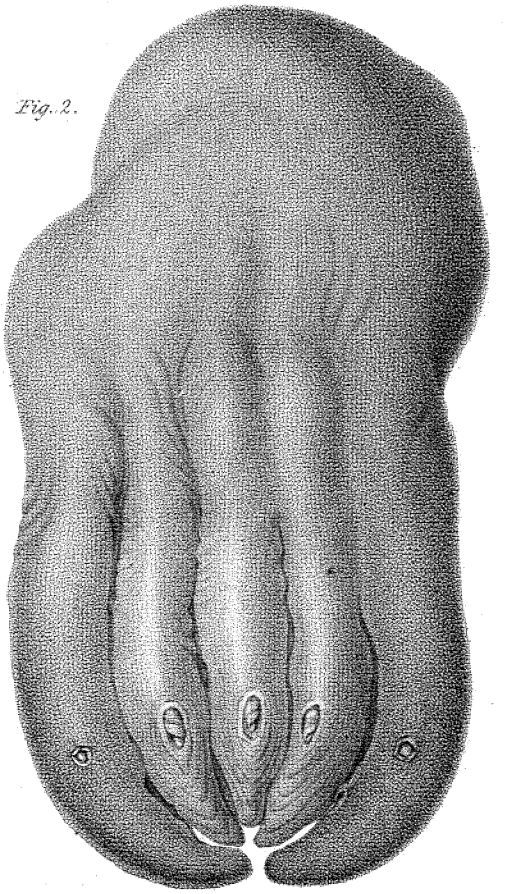


Fig. 3.

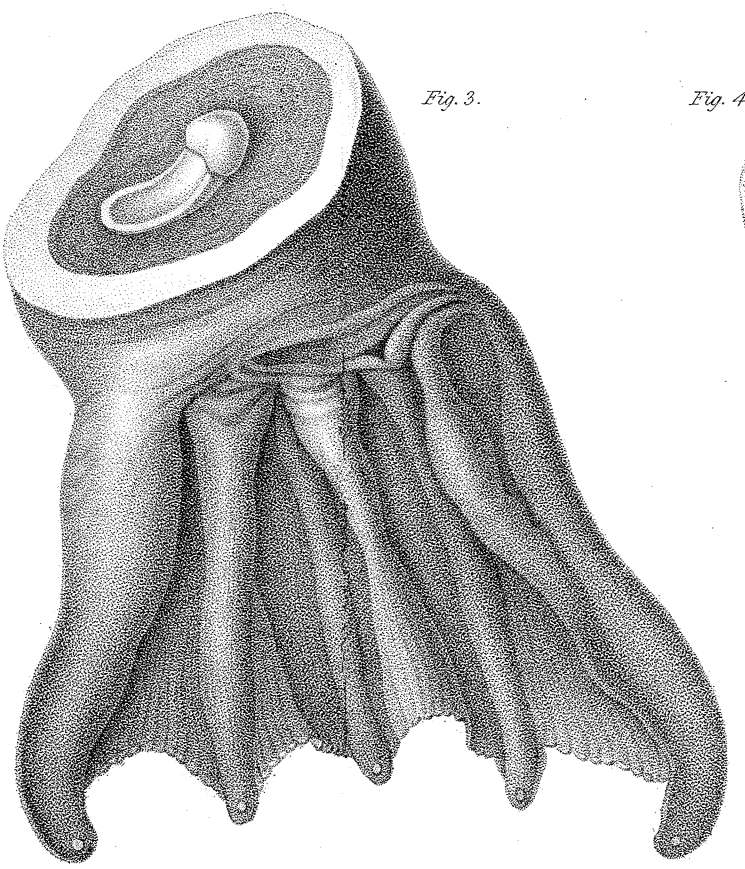
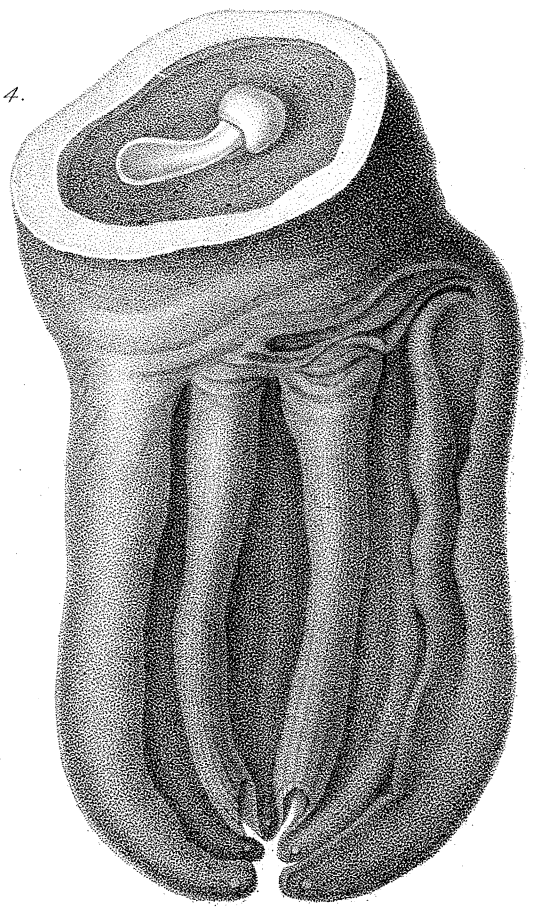


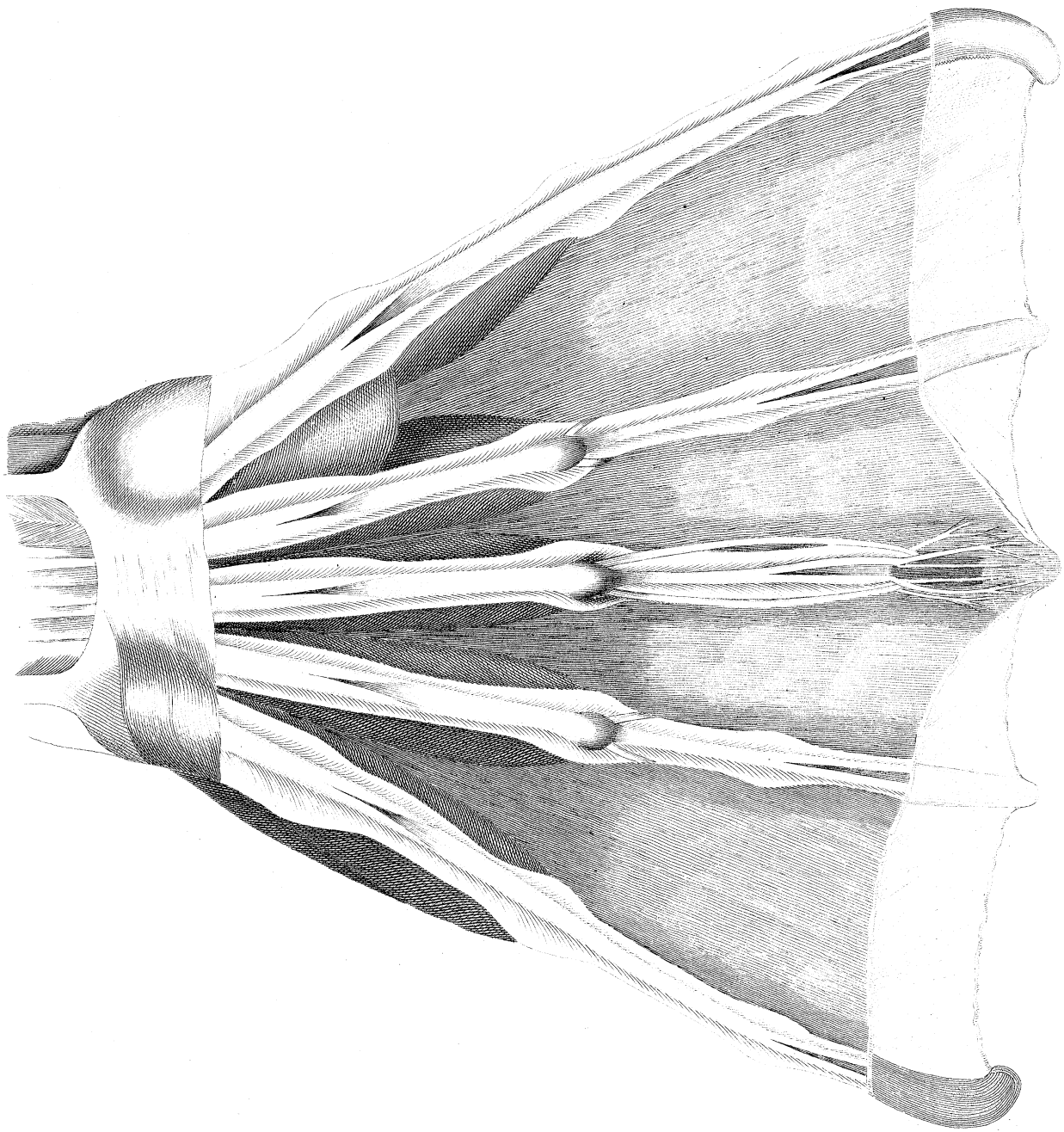
Fig. 4.



One foot.

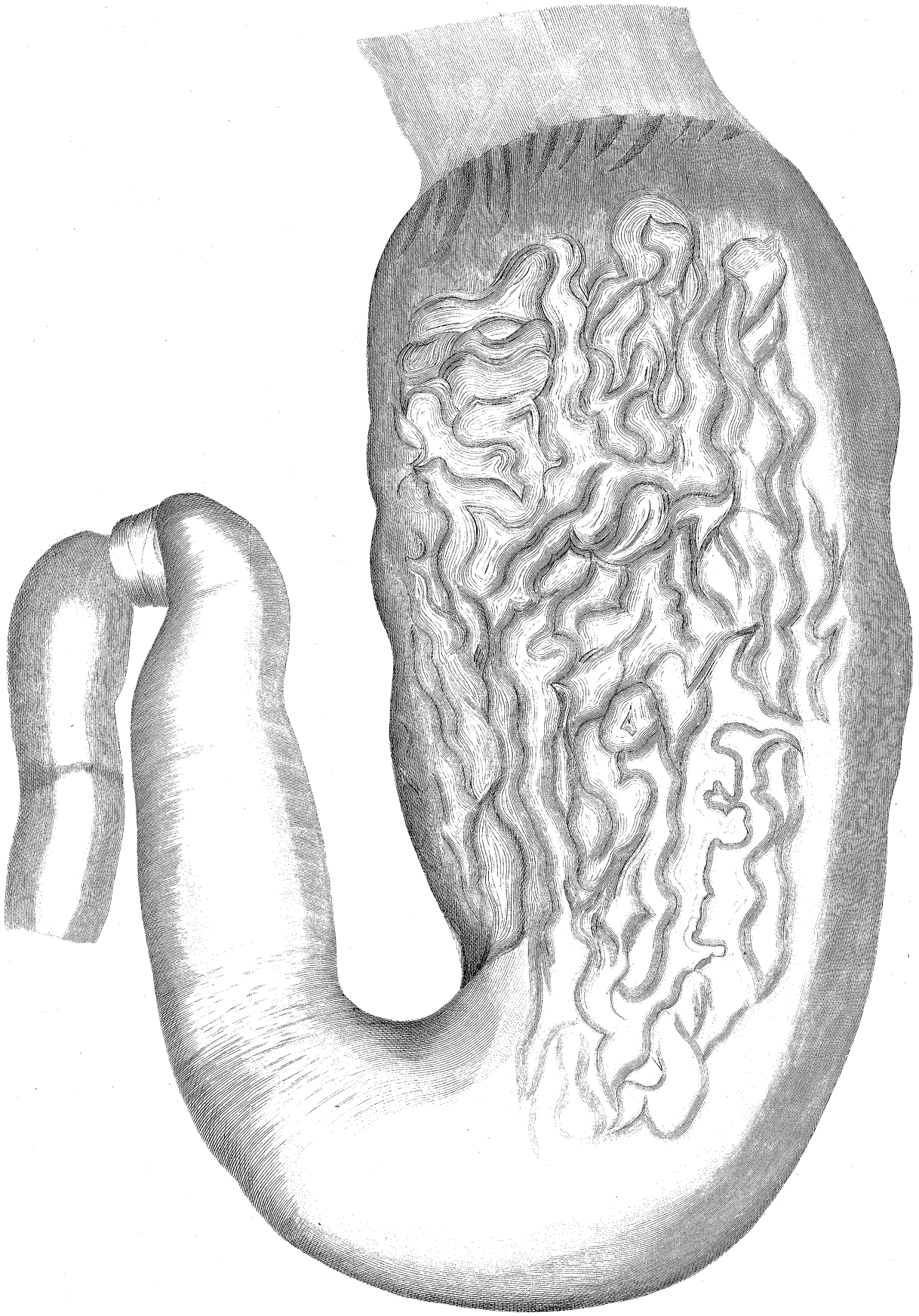
Franz. Bauer del.t

J.s Basire sculp.t



L. Rose del.[t]

J.s Basire sculp.[t]



One Inch to a foot

L. Rose del.t *Js. Basire sculp.t*

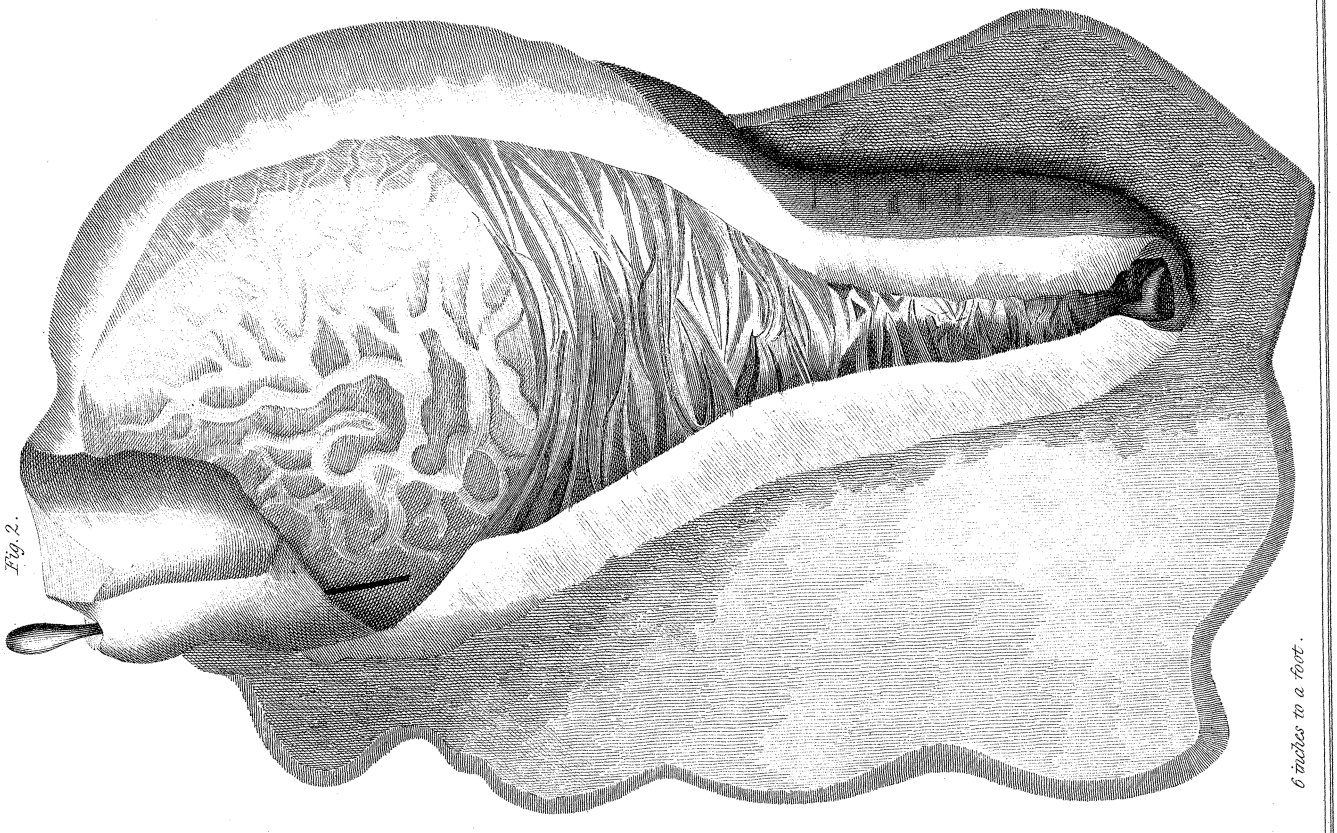


Fig. 2.

6 inches to a foot.

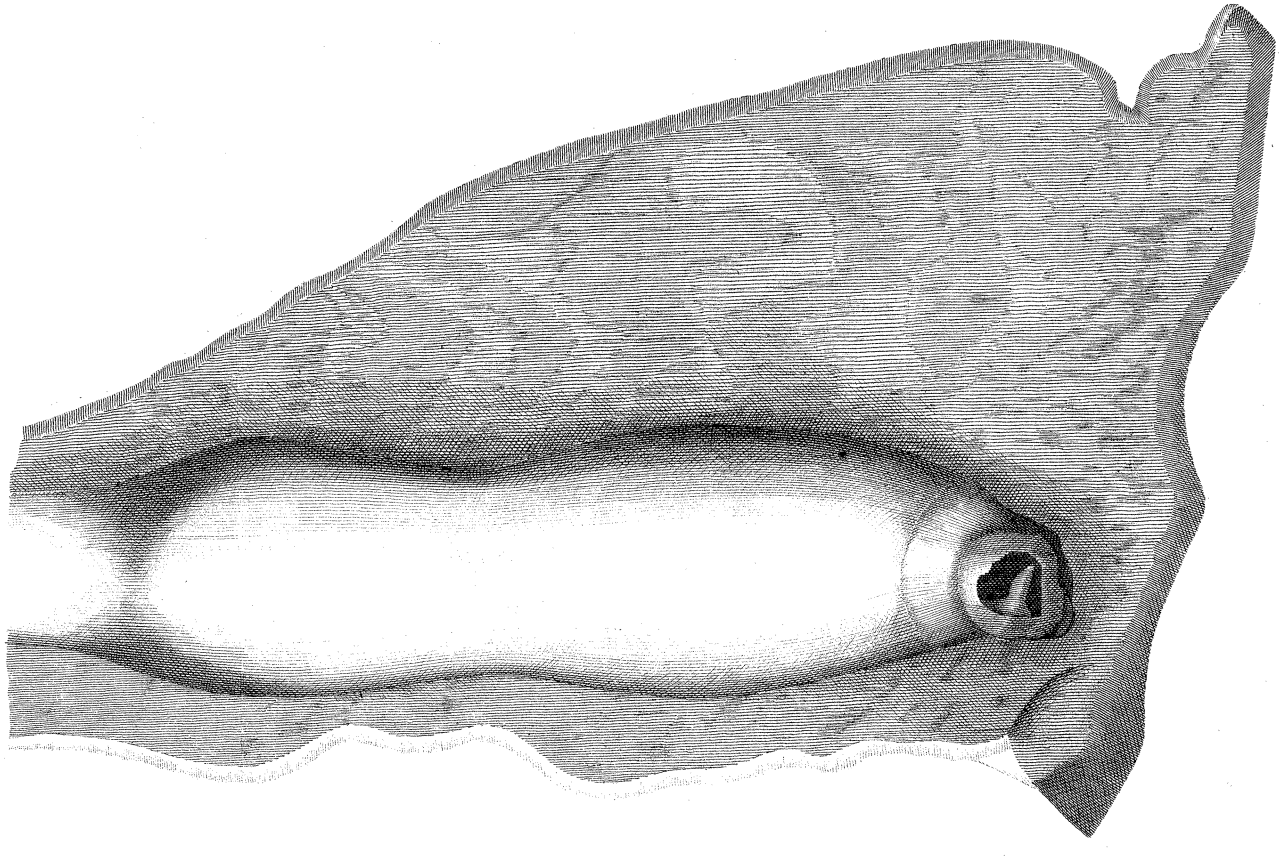
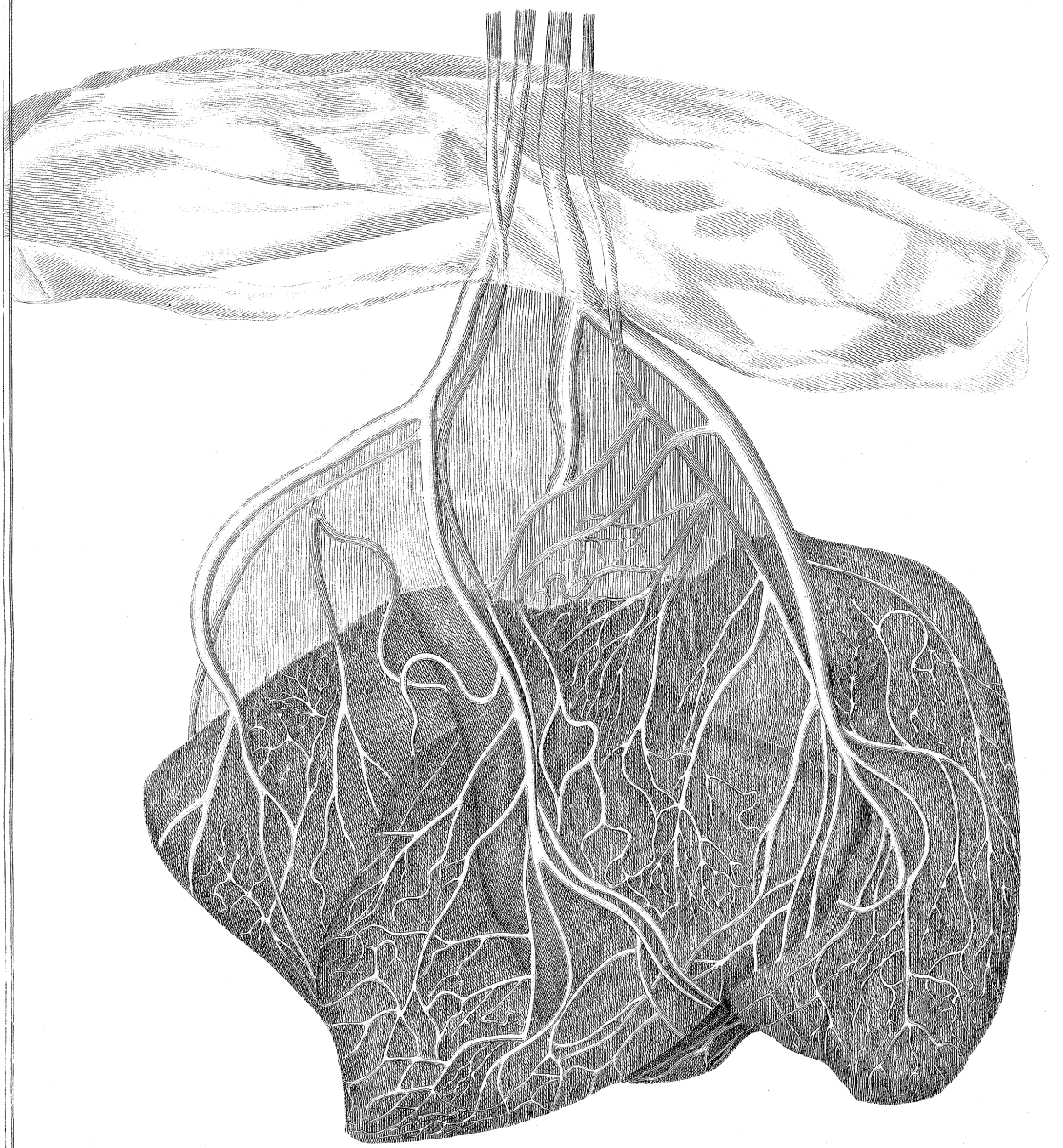


Fig. 1.



One inch to two.

L. Rose del.t *Js. Basire sculp.t*

The resemblance of the bones of the hind flipper of a walrus to those of the human hand, which I believe is like nothing else in nature, is curiously exact; the bones of the wrist are the same in number and shape; so are those of the metacarpus; so also the phalanges of the thumb and fingers. The tendons of the perforantes muscles pass through those of the perforati in the palm upon the metacarpal bones, while in the human hand this takes place upon the first phalanges of the fingers; and there are no lumbricales muscles whatever. On the back of this gigantic hand I was astonished to find the tendon of the indicator muscle.

The muscles and tendons that are peculiar to this flipper, not met with in the human hand, are those of the web which extends beyond the fingers and thumb: this web is a strong ligamentous elastic substance intermixed with muscular fibres; it has a set of muscles, which have their origin from the sides of the last phalanges of the fingers insensibly lost in it, and tendons go off from each side of the perforator muscles, which spread out and are lost in it.

That this gigantic hand is employed as a cupping glass to prevent the animal from falling back in its movements, whether on the ice, or in climbing the rocky cliffs, there can be no doubt; for it is only necessary to take the human hand, and envelope it in an elastic web extending some way beyond the points of the fingers, to prove that it could perform such an office; but when we find the lumbricales muscles wanting, the only use of which is to clench the fist, it adds to the proof; and when the indicator is met with, a mode of opening a valve to let the air in is pointed out.

It may be doubted, whether the extent of the flippers is

equal to the support of the enormous bulk of this animal; but this doubt will be removed when I mention, that Mr. FISHER informs me that a walrus, killed at Spitzbergen, weighed twenty hundred weight, and that an exhausted surface of twenty eight inches by twenty will support a pressure of 15lbs. on every square inch, more than double the animal's weight.

That the principle on which the foot of the fly, the gecko, and the walrus, is formed, is the same, I trust has been established. In the fly there are two cups, in the walrus only one.

In Plate VI. the stomach of the walrus, upon the scale of an inch to a foot, is represented inverted, to show its internal surface.

The œsophagus is lined with cuticle, which terminates in a transverse line at the orifice of the stomach; at the pylorus is a valvular fold, and the aperture is contracted and very small.

Plate VII. fig. 1, shows the manner in which the gall duct terminates in the duodenum; the parts are upon a scale of six inches to a foot.

Through the coats of the duodenum the size of the duct is very distinctly seen.

Fig. 2, shows the gall bladder upon the same scale, laid open, as well as the large duct leading to the gut, till it penetrates through its coats.

These parts are distinct from the liver, lying directly behind the duodenum, and connected to it by cellular membrane; the duct by which the bile is brought to this reservoir is also shown.

Plate VIII. represents the placenta of the seal, in which there are several peculiarities; upon a scale of half an inch to an inch: the fœtal surface of the placenta only is exposed.

The funis is nine inches long, but the blood vessels are not twisted on one another as is common in quadrupeds; and after passing three inches from the navel of the fœtus, the vein divides into two branches. At six inches the arteries and veins sub-divide so as to form three distinct chords, and these, instead of going directly into the substance of the placenta, have doublings of membrane surrounding them in form of mesenteries, in which their branches are inclosed; and these terminate in the placenta, rendering the surface very vascular.

This surface of the placenta has a lobulated appearance: but the fissures do not extend to the maternal surface, which has throughout a granulated appearance.