On the use of the xiphoid bone and its muscles in the corvorant [sic] / [William Yarrell].

Art. XXVIII. *On the use of the xiphoid bone and its muscles in the Corvorant*, (Pelecanus carbo, *Linn.*) *By* William Yarrell, *Esq., F.L.S., &c.*

Of the different modes by which the study of Natural History in its various branches is pursued, none afford greater gratification to the inquirer, or are attended with more solid advantages than a close examination of those multiplied peculiarities of anatomical structure, from which all classes of animals derive their varied and extraordinary powers.

This department of Natural History has the additional recommendation that neither rare nor costly specimens are necessary for its pursuit. The wisdom and power of the great Creator pervades every species. The most beautiful examples of organic structure, peculiarly adapted to the exigencies of the animal, are to be found in many of those of the most ordinary occurrence; and the anatomical and physiological views of those Naturalists who have preceded in the inquiry may be confirmed, rejected, or probably be found capable of still further illustration, according to

the varying perceptions of the different minds of those engaged in the pursuit.

Most of those authors who have written on the comparative anatomy of birds, agree in describing an additional bone as peculiar to the back part of the head of the Corvorant; but the muscles attached to this bone, and the services they are destined to render the animal by their united action, have been either overlooked or misconceived.

Plate VII, figure 1, represents the head of the Corvorant, somewhat reduced in size, with the peculiar bone attached.

This additional bone is about one inch in length, triangular in shape, somewhat grooved on its surfaces, and from its articulation with the *occiput* tapers gradually to a point. The mode by which this bone is articulated to the *occiput* is similar to that observed in the ribs of serpents, in which the condyle is situated upon each *vertebra*, and the cavity is at the end of the rib; so in the Corvorant, the condyle is upon the occipital bone, the cavity at the triangular end of the xiphoid bone: the joint is therefore hemispherical: admitting great extent of motion, the advantages of which will be hereafter pointed out.

Another subject deserving notice is the great length of the *os quadratum* (letter c, same figure) from above downwards in this bird, and in all others accustomed to feed on fishes. The articulation of this bone both with the *cranium* itself as well as with the lower mandible admits also great latitude of motion; it moves with facility backwards, forwards, outwards and inwards by the action of the numerous muscles attached to it, thus increasing the capacity of the *pharynx* for the more easy passage of any unusually large fish that happens to become the prey.

The plates of bone forming the *rami* of the lower mandibles in all the species of the genera *Colymbus*, *Alca*, *Uria* and *Larus* are much deeper and thicker in proportion to the size of the different species, than in the Corvorant, in which bird these parts will be found slender, weak and elastic, and hence the value to him of the additional pair of muscles now to be described, and which are not possessed by any of the other birds before mentioned.

I have before stated that this additional sword-shaped bone in the Corvorant has three surfaces each slightly concave, forming together an isosceles triangle, the base of which is downwards. From the upper edge

of this bone to its lateral angle throughout its whole length from the extreme point to the *occiput*, there arises on each side a triangular-shaped long muscle, the fibres of which are directed forwards, downwards and outwards to be inserted by a strong tendon upon the upper edge of the lower mandible, immediately behind the the insertion of the tendon of the temporal muscle. The muscles of the upper part of the neck, giving motion to the head, are inserted upon the occipital bone and its elevated crest, over which these additional muscles slide with every movement of the head, the particular articulation of the xiphoid bone only permitting it to become a fixed point of support to its own particular muscles, when both act simultaneously as additional elevators of the lower mandible, thus assisting in prehension, and materially increasing the power of the bird in securing a slippery prey. I may here also observe that the various other species of fish-feeding birds before referred to as having their lower mandibles so much stouter and stronger than the Corvorant, have also much deeper *fossæ* and more elevated ridges for the origin and attachment of their temporal muscles, and are in this way the better able to prevent the escape of their natural food, without the additional muscles of the Corvorant.

From these comparative remarks it will be perceived that the Corvorant does not possess the same strength of bone in the mandibles with the other oceanic fish feeders, though not less inclined than they are to pursue and take fish of large size. The dilatation of which the lower mandible is capable from its elasticity, the length and freedom of motion of the *ossa quadrata*, the great size of the *æsophagus* which when distended measures 10 inches in circumference, all afford facilities for the swallowing of prey, which, but for his additional muscles he would probably be unable to hold. This peculiarity of structure is most likely to be found in other species of the genus *Pelecanus*, but it is only in our common Corvorant that I have had opportunities of ascertaining the fact.

One misfortune attending the promulgation of error is, that the evil increases in exact proportion to the weight of the authority with whom the mistake originates; and if any apology be considered necessary for thus occupying a portion of the Zoological Journal with a description and representations of a small part only of the anatomy of so common a bird as the Corvorant, I trust that apology and excuse will be found in the following quotations; and that the view of the structure and its uses

entertained in the foregoing observations will be considered the correct one.

Leçons d'Anatomie Comparée de G. Cuvier, tom. I, p. 229.

" Dans le cormoran, la protuberance occipitale supporte un os alongé, " triangulaire, qui paroit provenir de l'ossification du ligament cervical."

A manual of comparative anatomy translated from the German of I. F. Blumenbach with additional notes, by William Lawrence, Esq., the second edition, revised and augmented by William Coulson, Esq., p. 56.

" A peculiarity, which seems to be confined to the cormorants, must " be here mentioned. There is a small sabre-shaped bone at the back of " its *vertex*, which is supposed to serve as a lever in throwing back the " head, when the animal tosses the fishes which it has taken, into the " air, and catches them in its open mouth. But the same motion is per- " formed by some other piscivorous birds, who are unprovided with this " particular bone."

Traité complet de l'anatomie de l'homme, comparée dans ses points les plus importans a celle des animaux. Par H. Cloquet, Paris, 1826, p. 200 and 201. " Chez le cormoran *(Phalacrocorax carbo)* comme l'a " noté M. Cuvier, la protuberance occipitale supporte un os alongé, " triangulaire, et qui parait être le resultat de l'ossification du ligament " cervical."

Fife's outlines of comparative anatomy, and the more recent publication of Mr. Gore's translation of the comparative anatomy of Carus, contain no notice of this structure.

Ryder Street,
August, 1828.

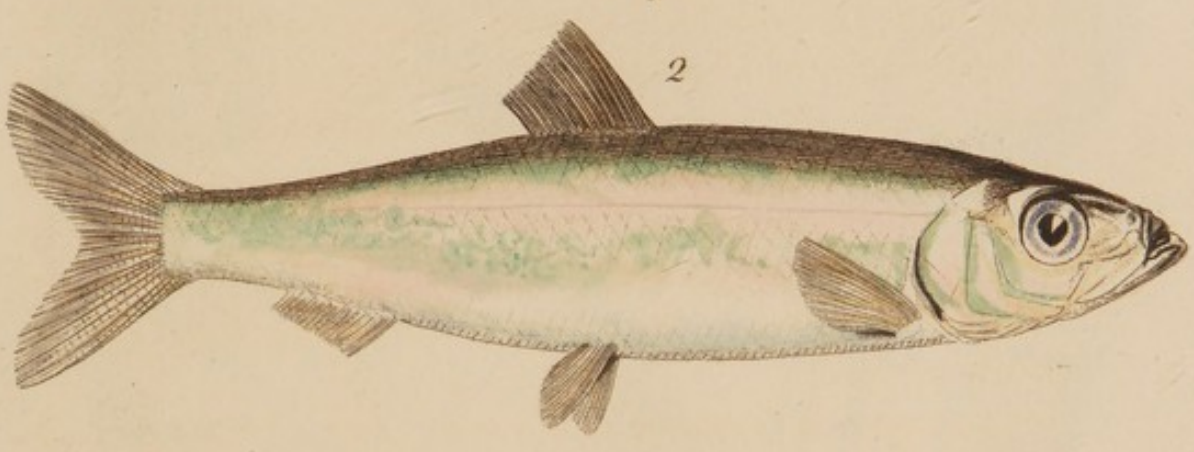
Description of the Plate, lower part.

Pl. VII.

Fig. 5. Cranium of the Corvorant, reduced in size. *a*, the occipital crest; *b*. the xiphoid bone; *c*. the os quadratum.

6. Cranium of the Corvorant, with the muscles moving the lower mandible. *a*. and *b*. muscles aswering to the masseter and temporal. *c*. the muscle arising from the xiphoid bone.


1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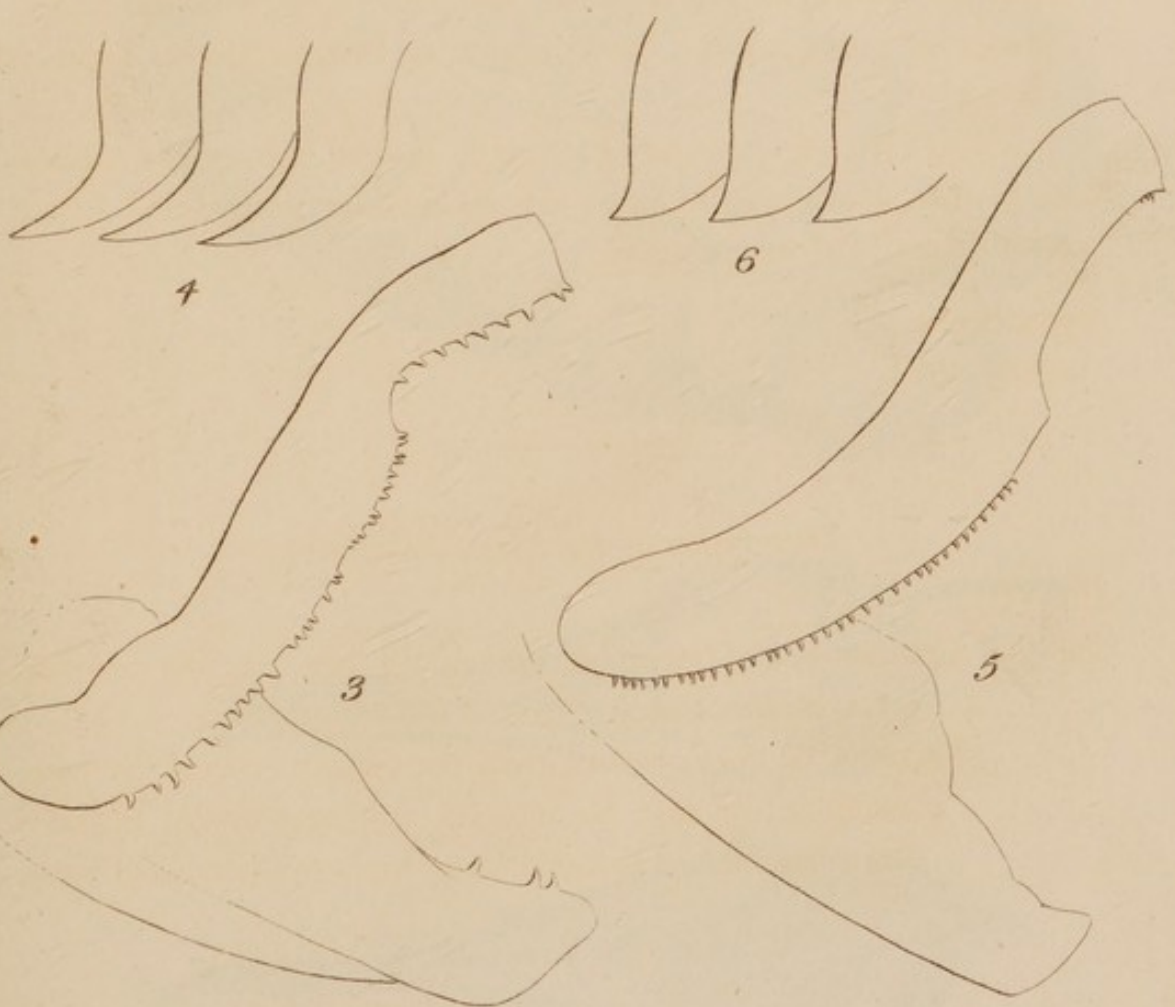
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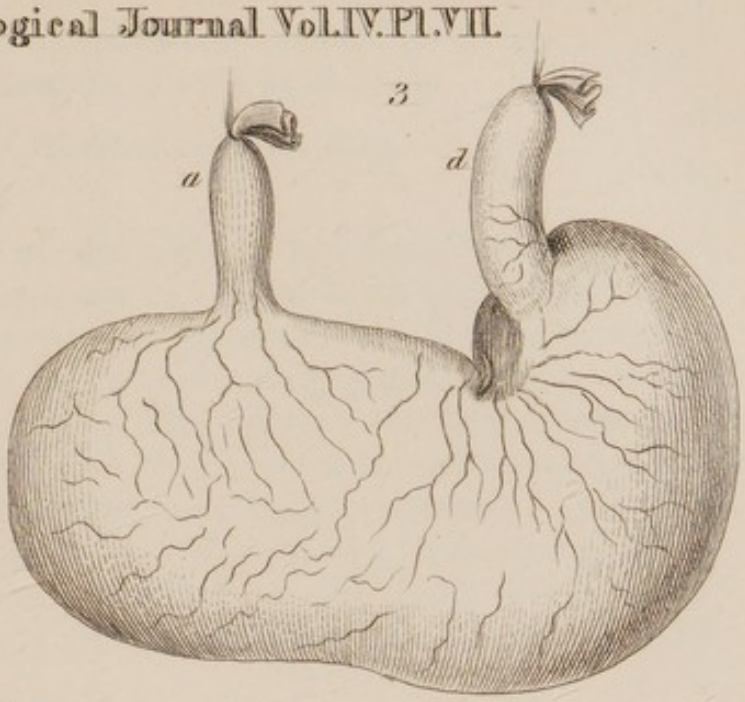
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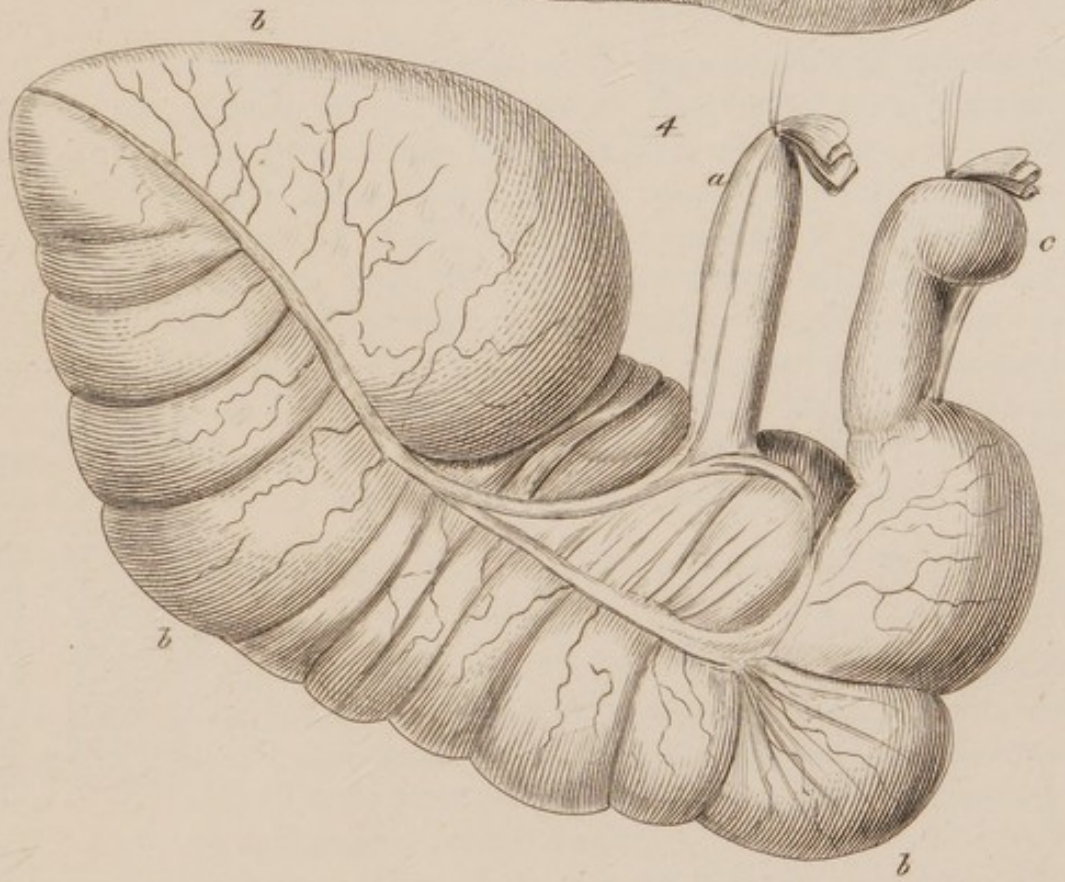
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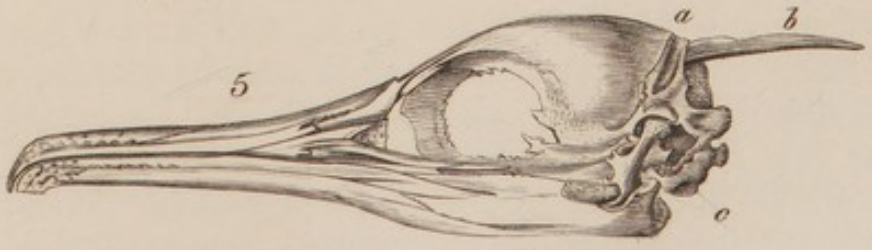
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a
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