

junction with the cerato-branchial elements, present a cartilaginous portion which is never completely ossified.

THE VERTEBRAL COLUMN.

The vertebral column of the adult *Eudyptes chrysocome* from Tristan d'Acunha, consists of forty-two vertebræ, of which thirteen are cervical, nine dorsal, twelve lumbosacral, and eight coccygeal.

*Cervical Vertebræ.*¹

The cervical vertebræ, as defined below, are thirteen in number in every species of Penguin which I have examined.

The atlas presents the form characteristic of birds in general, and consists of a simple bony ring which is divided into two segments, a dorsal and a ventral, by means of a transverse bar of bone. In the Penguins the transverse ligament is converted into an osseous bar which intervenes between the neural and articular portions of the bone. The cup-shaped cavity for the reception of the occipital condyle is perforated, the perforation being filled up by the apex of the odontoid process of the axis, which thus enters into the formation of the articulation between the occipital bone and the atlas. The dorsal arch of the atlas is quite complete, and is destitute of a spinous process. Its extremities are prolonged backwards in the form of two small osseous cornua.

The odontoid process of the axis resembles that of birds in general.

The bodies of the other cervical vertebræ in *Eudyptes chrysocome* from Tristan d'Acunha, have the usual form, their extremities being provided with the saddle-shaped articular surfaces met with in other birds. The lower surfaces of the second, third, tenth, eleventh, and twelfth cervical vertebræ are provided with well-developed hypapophyses. These processes are absent in the other cervical vertebræ, with the exception of the thirteenth, in which, however, the hypapophysis is reduced to a mere nodular rudiment. In the case of the second and third vertebræ, the hypapophyses present the form of sharp bony spines, while in the tenth, eleventh, and twelfth they are broad and laterally compressed plates of bone.

The lower (ventral) surfaces of the bodies of the cervical vertebræ are longitudinally grooved for the accommodation of the two carotid arteries. These are not, however, contained in a complete bony canal as in many birds, inasmuch as the bony nodules of opposite sides which arise from the cervical ribs, do not unite with one another across the middle line in the Penguins.

The carotid arteries come into contact with the vertebral column at the ninth, and

¹ Under the term "cervical" I include those vertebræ, and those only, which, lying pre-axial of the thorax, are destitute of moveable ribs. Adopting Huxley's definition ("Anatomy of Vertebrates," p. 277), the cervical segment of the column includes two additional vertebræ, which, however, I regard as appertaining to the dorsal series along with which they will be described.