

SECTION XI.

RESPIRATION.

Here, again, we meet with a very striking ordinal character. The Turtles swallow the air they breathe.¹ The breast-box, which includes the lungs, being immovable, a respiration like that of the other Reptiles, the Birds, and Mammalia, performed by the expansion and compression of the breast-box, and consequently of the lungs, is impossible. Owing to the peculiar structure of their trunk, breathing is, therefore, only possible for Turtles by a pressure of the air from the mouth down into the lungs; but, though we are persuaded that this swallowing of the air constitutes the main act in the process of breathing, still we are inclined to believe, against the opinion of other anatomists, that the diaphragm, which in Turtles is very much developed, and attached to the lungs, takes also its part in that act.² Moreover, the muscles of the shoulder and of the pelvic region may assist in that operation, either by immediately compressing the lungs, which generally extend in Turtles from one end of the trunk to the other, or by pressing the bowels against them.

The act of swallowing the air is chiefly performed by the apparatus of the tongue-bone, and the tongue itself, which, by its large size, facilitates the operation. Being drawn backwards and upwards, this organ shuts up the choannæ, and at the same time opens the slit of the windpipe, situated just at its base, thus giving to the air a passage into the windpipe, and at the same time preventing its entrance through the choannæ into the nose. In this way, the tongue takes the place, in a certain sense, of the velum palatinum of the higher Vertebrata, which is wanting in Turtles. After the air has passed into the windpipe, the tongue is drawn forwards, and thus the longitudinal glottis is again closed, while now the choannæ are again opened to a free communication with the cavity of the mouth.³

¹ We find the same mode of breathing in the class of Batrachians; but for an entirely different reason, namely, on account of the absence of ribs.

² The existence of a diaphragm is erroneously denied to Turtles by Duméril and Bibron, *Erpétologie générale*, I., p. 175. This work, however, worked out as it seems almost entirely by Bibron, is to this day the best illustration of the Zoölogy of Turtles, as it also is of the Saurians and Frogs,

while the part relating to Ophidians, completed after the early death of that able herpetologist, Bibron, contains the most superficial descriptions of genera and species.

³ In Amphibia, this process is similar, though not the same. It is easy to observe, that in this class the eye-bulbus is often active in swallowing the air; these large balls, when pressing downwards, narrow the cavity of the mouth, and the air moves