

Taking the first of these lines (in table, p. 120), it is found that the organisms which diverged towards the Thaliacea from the ancestral Appendiculariidae allied to Moss' form remained free-swimming, but acquired the power of passing currents of water through their respiratory systems of cavities (the branchial sac, and the peribranchial cavity formed by the union posteriorly and dorsally of the two ventral tubes leading in the Appendiculariidae from the stigmata to the exterior) in such a way as to propel themselves through the water. This would naturally result in the great enlargement of these cavities, and in the arrangement of the muscle fibres of the body-wall in a series of transversely placed bands, which would serve to drive out with force the contained water. The posterior region of the body, or tail, being now superseded as an organ of locomotion, would become gradually suppressed, and thus the ancestral Thaliacea would be evolved.

From these Protothaliacea, in which also reproduction by gemmation from a stolon and consequently alternation of generations became established, two diverging lines lead to the Salpidæ and to the Doliolidæ. The test or outer tunic, that remarkable structure so characteristic of the group, was probably first formed in the ancestral Appendiculariidae, since it is found represented at the present day not only in the Ascidiacea, but also in the Thaliacea and in the Larvacea. Probably at first it was merely a temporary cuticular secretion of the ectoderm formed as a protection during some particular period, and comparable with the "Haus" now produced by some members of the Appendiculariidae. It afterwards, however, became converted into a permanent layer of considerable thickness covering the outer surface of the body, and then finally became organised by the migration into it of ectoderm cells which proliferated and became modified in various ways, to form the complicated test structures found in many Tunicata.

In the line of ancestral forms leading to the Doliolidæ, however, the test must have remained in a very slightly developed condition, or may even have become more rudimentary, since in the Doliolidæ as now known the test is almost absent, being merely represented by a very delicate film covering the ectoderm. The Doliolidæ are much less modified than the Salpidæ, they still retain a "tailed" stage in their life history, and their branchial sac differs comparatively little from that of *Appendicularia mossi*, and therefore we may consider that the Doliolidæ (see Fig. 15) represent more nearly than do any of the Salpidæ the essential structure of the Protothaliacea.

In these ancestral forms the transverse muscles were probably diffuse, and scattered irregularly through the mantle; the branchial sac would be in much the same condition as in *Appendicularia mossi*, but the atrial aperture, the common excretory opening leading from the peribranchial cavity, had come to be placed at the posterior end of the body so as to be directly opposite to the branchial aperture, and so allow the water to pass straight through the body (see Figs. 15 and 16).