

*The Mantle* (The Second, Inner, or Muscular Tunic, Muscular Sac).

The second layer covering a Tunicate is the muscular and connective tissue part of the body wall, and lies immediately inside the ectoderm or epidermis. It varies greatly in its characters in different groups, and is to a certain extent a reliable, distinguishing feature, especially for families and genera. It is formed of connective tissue, uniting and enclosing bundles of muscular fibres, nerves, and blood-vessels. In some cases numbers of the connective tissue corpuscles become pigmented, so as to give a coloured or variegated appearance to the mantle.

In the living animal the mantle is in direct union with the ectoderm lying over it (fig. 9, page 40), so that there is no space between the mantle and the test, but in specimens preserved in alcohol the mantle contracts away from the test and leaves a large cavity between, the only points of union being the sides of the branchial and atrial siphons, and the place near the posterior end of the body where the large blood-vessels pass across from the mantle to the test. This separation takes place much more readily in some species than in others, while in some (*Pelonaia corrugata*, *Polycarpa viridis*, &c.) it apparently never occurs.

The muscular fibres of the mantle are in all cases unstriped. They are either fusiform, or very long filiform fibres, usually more or less united together into bundles. Round the two siphons they are arranged so as to form strong sphincters, sometimes of considerable size (fig. 3, *sph.* page 32).

In the Molgulidæ the mantle is usually thin and membranous, and the muscular bundles have a most characteristic appearance. They are united into short fusiform packets, which present a striking resemblance to the typical form of a muscle in the higher animals; each having a broad central portion or belly, and two long tapering tendon-like extremities. Another characteristic feature of the mantle in the Molgulidæ is the arrangement of a large number of the bundles in lines radiating from the lower edges of the sphincters so as to form a stellate figure round the base of each siphon.

In the Cynthiidæ the mantle attains its greatest thickness, and in some cases the muscular system is developed to an enormous extent. The sphincters are always strong, and the musculature is usually equally developed in the whole mantle, except in some cases in the region over the intestine. The bundles are, as a rule, placed regularly and parallel, forming longitudinal and circular coats. In most typical Cynthiidæ there is an internal circular covered by an external longitudinal coat, and in some (*e.g.*, *Polycarpa varians* and *Styela canopus*) a third internal longitudinal layer is added. In some Bolteninæ the muscular system, though arranged upon the same plan, is so reduced in amount that continuous coats are not formed, and the longitudinal and circular bundles form a network with large rectangular meshes.