

Considering as the skeleton—in the usual physiological sense—all those solid parts of the animal body which serve as a supporting frame and as a protecting carapace, we may point out, first of all, that the skeleton of the Deep-sea Keratosa in general is composed of three very different portions, viz., (1) spongin-fibres, produced in the mesoderm of the sponge, and characteristic of all true Keratosa; (2) xenophya, or solid foreign bodies, taken up from the bottom of the deep sea and disposed in the mesoderm; (3) chitinous tubes of Hydroids which live in symbiosis with the majority of our Keratosa. The two latter elements of the skeleton may be better called pseudo-skeleton, since they are foreign bodies not produced by the sponge itself; but they generally possess in our Deep-sea Keratosa a far greater importance than the true skeleton of the sponge itself, composed of its proper spongin-fibres.

The first fact that strikes one in the examination of the Deep-sea Keratosa is the circumstance, that in all cases by far the greatest part of the body is composed of various xenophya, and not of the tissues and organs of the sponge itself. The foreign enclosures are everywhere found in such large masses that their total volume is always far greater than that of all the parts of the sponge proper together. The latter form often scarcely one-third or one-fourth of the whole volume, or less; whilst the xenophya occupy two-thirds or three-fourths, or more. Comparing the weight of the two different body-components, their disproportion, of course, appears far greater. The xenophya being much heavier than the delicate soft tissues of the sponge itself, the weight of the former is probably usually more than 90 per cent., the weight of the latter less than 10 per cent.

The xenophyal skeleton is the only essential part of the skeleton in the two first families, Ammoconidæ (Pl. VIII.) and Psamminidæ (Pl. VII.); whilst it is combined with spongin-fibres, and with symbiotic Hydroid tubes in the two other families, Spongelidæ (Pls. IV.–VI.) and Stannomidæ (Pls. I.–III.). But even in these latter the foreign pseudo-skeleton, composed of the chitinous tubes of the symbiotic hydrorhiza, plays a more important part than the true spongin-skeleton of the sponge itself.

The spongin-fibres in our Deep-sea Keratosa are constantly very thin and small, and scantily developed, far less than in the well-known Keratosa of shallow water. In the former are never found the stout and strong horny main fibres, which erect the firm scaffold of the body in the latter. The place of these main fibres is taken by the chitinous tubes of the symbiotic Hydroids, and this remarkable replacement is evidently a most important consequence of that curious symbiosis. The two families which produce spongin-fibrillæ differ essentially in their relation to the xenophya. These foreign skeletal bodies are enclosed within the maltha alone in the Stannomidæ, while in the Spongelidæ a part of them, at least, is enclosed in the spongin-fibres.

*Spongin-Skeleton.*—The peculiar pure spongin-skeleton, characteristic of the true Keratosa, is found only in two of our deep-sea families, in the Stannomidæ (Pls. I.–III.)