

Sponges together into a single order with the name Lithistidæ. The task of defining the characters of this order Schmidt left to others, and it was most ably accomplished by Carter,<sup>1</sup> who first furnished an exact account of the essential structure of the skeleton as it is presented in this group. Subsequently the same author made several important generic distinctions among the Lithistida.<sup>2</sup>

Zittel then followed with his great work on the order,<sup>3</sup> in which he subdivides it into four families:—the Tetracladina, Rhizomorina, Megamorina, and Anomocladina; this was a great step in advance, and has simplified the labours of subsequent writers, who have all adopted Zittel's system *en bloc*, excepting Carter, and Schmidt, the latter of whom has offered some important criticisms upon it.

The Tetracladina are distinguished by Zittel as possessing desmas with a quadri-radiate axial canal; in the Megamorina and Rhizomorina the desmas exhibit only a uniaxial canal, and in the Anomocladina there is no canal at all, the tetra-radiate or elongate axes of the desma in other families being here replaced by a massive centrum.

The characters of the families are given by Zittel as follows:—

Family I. Rhizomorina.—Desmas irregularly branched, beset with shorter or longer, simple or composite, root-like processes or nodular excrescences, with a simple or branched axial canal. Ectosomal spicules like those of the rest of the skeleton; rhabdi and dichotriænes also present.

Family II. Megamorina.—Desmas large, elongate, smooth, curved, irregularly branched, or only forked at the ends, with a simple axial canal, loosely interlocked with each other. Among them sometimes smaller desmas of Rhizomarine type. Ectosomal spicules rhabdi or dichotriænes.

Family III. Anomocladina.—Desmas consisting of four or more smooth arms meeting in a thickened centre; arms forked at the end. Bacillar spicules are also present in great abundance.

Family IV. Tetracladina.—Desmas quadri-radiate, the four arms branched or thickened at the ends, with four axial canals meeting at angles of 120°. Ectosomal spicules generally present in abundance (dichotriænes, phyllotriænes, discotriænes, and "bacillar" spicules).

As a classification of fossil Sponges this has much to recommend it, but the systematist who relies too exclusively on the characters which survive in these mere remnants of organisms cannot hope for more than a very rough approximation to the truth; with all the knowledge which we can obtain from the recent organism we cannot attain to more

<sup>1</sup> Carter, *Ann. and Mag. Nat. Hist.*, ser. 4, vol. xii. pp. 349, 437, 1873.

<sup>2</sup> Carter, *Ann. and Mag. Nat. Hist.*, ser. 4, vol. xviii. p. 460, 1876.

<sup>3</sup> Zittel, Studien ü. fossile Spongien, II. Lithistidæ, *Abhandl. d. k. bayer. Akad. d. Wiss.*, vol. xiii. pp. 65-154; translation, *Ann. and Mag. Nat. Hist.*, ser. 5, vol. ii. pp. 113, 235, 324, 385, 467, 1878.