

IV.—THE GEOLOGICAL HISTORY OF THE COMATULÆ.¹

So far as our present information goes the family Comatulidæ first appeared in the time of the Middle Lias and is therefore of somewhat less antiquity than the Pentacrinidæ which date back to the Trias. Comatulæ were fairly abundant all through the Jurassic and Cretaceous epochs and were especially so at certain periods, that of the Corallian in Germany and Switzerland, for instance.

The geographical distribution of recent Comatulæ is far more extensive than that of their predecessors. The distribution of the former is practically world-wide; but so far as is yet known, with the exception of an *Antedon* from Algeria and another from Syria, no fossil Comatulæ have been discovered out of Europe, not even in the Indian Tertiaries, which contain so many Echinoderm remains. None are known in America, though stem-joints of the remarkable *Pentacrinus asteriscus* are very common at certain horizons of the Jura-Trias over wide areas of the western territories; and this shows that the conditions of that long-distant age were not altogether unfavourable to the development of Crinoid life. On the other hand, the Middle Lias of France contains two species of *Antedon*, the oldest yet known; and the genus occurs, together with *Actinometra*, in the lower Oolites of both France and England; while if *Bourgueticrinus ooliticus*, M'Coy, is a *Thiolliericrinus*, as supposed by de Loriol, it is the earliest known species of this very singular genus.

Both *Antedon* and *Actinometra*, especially the former, are well represented in the Corallian of the Jura, and there are several species of *Antedon* in the Neocomian of the continent, together with a few in Britain. The Gault of Folkestone has yielded typical forms of both genera, and there are several Cretaceous species of *Antedon* scattered through Europe, the formerly obscure *Glenotremites paradoxus* being the best known. We are only acquainted with one Eocene *Comatula*; though three species occur in the French Miocene, and there are others in the Pliocene both of England and of Italy.

In the majority of cases only the centro-dorsal is preserved, though it is not uncommon for the radials to remain attached to it. But individuals with any arm-joints preserved beyond the calyx-radials are decidedly rare; and in this respect the Comatulæ differ widely from the *Pentacrinus*-type, isolated calyces of which are not often met with, though the arms are frequently extraordinarily well preserved.

One singular instance of the retention of the arms or arm-bases is afforded by *Eudiocrinus hyselyi*.² But for this fact the existence of *Eudiocrinus* in the fossil state

¹ I am indebted to the kindness of M. P. de Loriol for much information respecting the fossil Comatulidæ of France and Switzerland, some of it being as yet unpublished.

² See de Loriol, *Monographie des Crinoïdes fossiles de la Suisse*, Geneva, 1877-79, pl. xxi. fig. 14.