

SYMBIONTS IN SOME LATE ORDOVICIAN TABULATE CORALS

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Three types of small, vertical tubes are recognized in certain colonial corals from the Late Ordovician of southern Manitoba, Canada. They occur in the tabulates *Saffordophyllum newcombae* and *Trabeculites maculatus* (massive, cerioid coralla), and *Manipora amicarum* and *M. sp. A* (tollinaform coralla; i.e., cateniform with some multiple ranks and aggregates of corallites). The nature of these tubes and their relation to adjacent corallites suggest that they were formed by the corals in response to soft-bodied biotic associates of unknown taxonomic affinity. These tubes differ from the various tubular structures, considered to have housed vermiform symbionts, that have been described from other corals. Type 1 tubes are circular in transverse section, relatively slender (diameter typically about 1 mm), and may exceed 14 mm in length. The only example of a Type 2 tube is circular, relatively broad (maximum diameter 3.1 mm), and more than 5.7 mm long. Type 3 tubes have a lenticular transverse section (major axis up to 3.5 mm, minor axis up to 2.4 mm) and a length that may exceed 35 mm. Formation of the tubes took place in a number of situations. A tube usually developed during recovery following termination or disruption of one or more corallites, especially in cerioid coralla (*S. newcombae* and *T. maculatus*) but in one case in *M. sp. A*. It is thought that the larva of a foreign organism developed inside a polyp, or that a more mature individual settled on the coral surface, causing injury or death while upward growth of the surrounding colony formed and maintained a tubular skeletal enclosure around the associate. Less commonly, a tube formed during the contraction of a lacuna in a tollinaform corallum (*M. amicarum*). In a few cases, a tube rises at full size from the bottom of a cerioid corallum (*T. maculatus*). The tubes are of variable length. Some extend to the top of the corallum, whereas others terminate in various ways within the corallum. Gradual expansion of surrounding corallites, resulting in contraction of a tube and its eventual termination, was very common. In a few cases, abrupt termination occurred when one or more corallites expanded into a tube. Sometimes, abrupt termination occurred when a corallite moved entirely into a tube. Commonly, a lateral offset from an adjacent corallite entered a tube and rapidly expanded, transforming it into a new corallite. The biotic associates apparently preferred certain corals, and prompted particular responses from their hosts. Type 1 tubes are predominant in *S. newcombae*; just one has been found in *T. maculatus*. A divergent growth pattern, due to rapid generation of new corallites by lateral increase, occurred around this type of tube. The only example of a Type 2 tube is known in *S. newcombae*. There was a convergent growth pattern, with a reduction in the number of corallites, around this tube. Type 3 tubes are predominant in *T. maculatus* and also occur in *M. amicarum* and *M. sp. A*. Corallites adjacent to these tubes commonly record normal upward growth, but with incidents of corallite decrease or increase.