
Revision of the Mississippian Lithostrotionidae (Rugosa) from eastern Australian and reassessment of homeomorphy among corals

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The Mississippian colonial rugose corals from eastern Australia, long regarded as ‘*Siphonodendron*’ and ‘*Lithostrotion*’ were taxonomically reviewed and assigned to formal genera, within the new family Cionodendroninae. Fasciculate species were reassigned to the genus *Cionodendron* Benson & Smith as they share a robust columella, septotheca and two series of tabellae with the type species *C. columen*. Three morphological species groups were recognized: (1) the *C. columen* Group, characterized by the occurrence of parricidal and non-parricidal increase; (2) the *C. hallense* Group, characterized by the development of second order lonsdaleoid dissepiments; and (3) the *C. arundineum* Group, in which parricidal increase and lonsdaleoid dissepiments are rare or absent. Several morphological lineages and trends were recognized within the three groups and all species display a wide range of variation. Fourteen species of *Cionodendron* were recognized, including one new (*C. smithi* Denayer & Webb). The oldest species are late Tournaisian in age but the genus is most diverse in the middle-late Viséan. Massive species are assigned to the new genus *Australastraea* Denayer & Webb that most likely evolved from *Cionodendron* in the early Viséan. Twelve species were identified; two are new (*A. arcifera* Denayer & Webb, *A. carinata* Denayer & Webb). *Australastraea* is characterized by a septotheca that is commonly discontinuous, conferring a pseudo-ceriod or astreoid colonial habit. Two morphological groups were identified: (1) the *A. wilkinsoni* Group, characterized by small-sized corallites with a simple narrow dissepimentarium; and (2) the *A. columnare* Group (large-sized corallites with complex dissepimentarium). The small-sized fasciculate species previously referred to *Lithostrotion williamsi* Pickett were reassigned to the new genus *Pickettodendron* Denayer & Webb, which differs from *Cionodendron* Benson & Smith by the lack of minor septa and its more complete tabularium, but is nevertheless relatively closely related to that genus. *Pickettodendron* is represented by three species (including one new: *P. nudum* Denayer & Webb) that are restricted to early (-‘middle’) Tournaisian strata. The strong endemism of the Cionodendroninae assemblages, restricted to eastern Australia (and possibly Japan) may represent one of the scarce remains of the Panthalassa Province. The origin of the Cionodendroninae is thought to be polyphyletic, with two species of *Amygdalophyllum* with which the Cionodendroninae share many symplesiomorphies, possibly being at the origin of *Cionodendron* + *Australastraea* and of *Pickettodendron*. Their homeomorphy with the Eurasian genera *Siphonodendron* and *Lithostrotion* – but also *Heterostrotion* and the north

American lithostrotionids – resulted from parallel evolution within the family Lithostrotionidae. Their common evolution towards fasciculate then massive forms is thus considered to be parallelism, even if several differences (symplesiomorphies, timing, trends, variation) vary between the lineages. In any case, their similar morphologies cannot be shown to have converged upon each other from radically different progenitors as the probable ancestor of the considered groups were apparently morphologically similar. Convergence is presumed to have happened only at an ancestor level.