

**Supplemental Appendix F.** List of characters analysed in the phylogenetic analysis. "macro"= macromorphology, "micro-s"= microstructure, "micro-m"= micromorphology.

Characters	Type	Model	State 0	State 1	State 2	State 3	CI	RI
Solitary	macro	Unordered	Absent	Present			0.333	0.875
Freeliving	macro	Unordered	Absent	Present, U-shaped base	Present, V-shaped base		0.5	0.846
Intracalicular budding	macro	Unordered	Absent	Present			0.5	0.929
Polymorphism-central corallite	macro	Unordered	Absent	Present			0.5	0.875
Coenosteum	macro	Unordered	Absent	Present			0.2	0.714
Corallite series	macro	Ordered	Nonserial (1-3 centres)	Uniserial (>3 centres)	Multiserial		0.286	0.75
Calice shape	macro	Unordered	Circular	Elliptical	Bilobate	Irregular	0.6	0.857
Costosepta continuity	macro	Unordered	Nonconfluent	Confluent			0.5	0.857
Number of septa	macro	Ordered	<3 cycles (<24)	3 cycles (24-48)	4-5 cycles (48-96)	6 cycles (>96)	0.214	0.71
Number of septa per 5 mm	macro	Unordered	<5	5 or more			0.25	0.769
Septa shape	macro	Unordered	Straight	Curved			0.333	0.75
1 vs 3 cycle comparison (septum thickness)	macro	Ordered	Equal	Subequal	Unequal		0.222	0.741
Columella linkage	macro	Unordered	Absent	Indirect (trabecular)	Direct (single lamella)	Direct (>1 lamellae)	0.5	0.885
Columella centre threads	macro	Unordered	Spongy (> 5)	Compact (< 5)			0.25	0.812
Septal lobes	macro	Ordered	Absent	Limited	Well-developed		0.333	0.826
Paliform lobes	macro	Unordered	Absent	Present			0.2	0.765
Epitheca	macro	Ordered	Undeveloped	Under-developed	Fully developed		0.25	0.7
Internal dissepiments	macro	Ordered	Sparse	Moderate	Abundant		0.286	0.706
Septotheca	micro-s	Unordered	Absent	Partial	Prominant		0.333	0.778
Trabeculotheca	micro-s	Unordered	Absent	Partial	Prominant		0.25	0.769
Paratheca	micro-s	Unordered	Absent	Prominant			0.167	0.706
Thickening deposits	micro-s	Unordered	Weak	Moderate	Extensive		0.222	0.562
Transverse crosses	micro-s	Unordered	Absent	Present			0.5	0.833
Centres of Rapid Accretion (CRA)	micro-s	Unordered	Absent/Weak	Moderate/Strong			0.333	0.895
CRA Distance	micro-s	Ordered	< 0.4	0.7-1.8	> 2		0.5	0.926
Costa medial line	micro-s	Ordered	Absent or weak	Moderate	Strong		0.182	0.55
Septal medial line	micro-s	Ordered	Absent	Weak	Moderate-Strong		0.154	0.56
Columella centres	micro-s	Unordered	Clustered	Aligned			0.333	0.714
Tooth base shape	micro-m	Unordered	Elliptical	Circular			0.5	0.923
Tooth base orientation	micro-m	Unordered	Parallel	Perpendicular			1	1
Tooth tip shape	micro-m	Unordered	Pointed	Multiaxial lobes	Multiaxial threads		1	1
Tooth regularity	micro-m	Unordered	Regular	Irregular			1	1
Tooth height	micro-m	Unordered	Small (< 0.3 mm)	Medium (0.3-0.6 mm)	Large (> 0.6 mm)		0.333	0.81
Number of teeth per 5 mm	micro-m	Ordered	>= 15 (narrow spacing)	6-15	< 6 (wide spacing)	Very wide spacing	0.6	0.931
Granule abundance	micro-m	Unordered	Low	High			1	1
Granule alignment	micro-m	Ordered	Unaligned	Weakly Aligned	Strongly Aligned		0.5	0.882
Granule shape	micro-m	Unordered	Rounded	Irregular	Spiked		0.5	0.875
Interarea structure (between teeth)	micro-m	Unordered	Horizontal Striations	Smooth	Vertical Striations		0.667	0.944
1 vs 3 cycle comparison (teeth)	micro-m	Ordered	Equal	Subequal	Unequal		0.333	0.862
Wall/septum tooth size	micro-m	Unordered	Equal	Unequal			1	1