

## Appendix 2 Characters and states for the cladogram of Appendix 1

### Annexe 2 Caractères et états des caractères pour le cladogramme de l'Annexe 1

N Character	State 0	State 1	State 2	State 3	State 4
1 Mineralized endoskeletal tissue	Perichondral bone	Tessellate mineralization			
2 Frontal clasper	Absent	Median	Median, very long	Single pair	Multiple pairs
3 Extended neurocranial rostrum	Absent	Present			
4 Anterior braincase opening	Large/precerebral fontanelle	Closed/small opening			
5 Rostrum:basal plane	Greater than 180 degrees	180 degrees			
6 Ethmoid % of neurocranium	< 25%	25–40%	40–50%	> 50%	
7 Orbital % of neurocranium	35–46%	< 35%	> 46%		
8 Postorbital % of neurocranium	25–40%	15–25%	> 40%	< 15%	
9 Anterior ventral braincase (X-section)	Narrow v-shaped	Platybasic, narrow	Platybasic wide		
10 Posterior ventral braincase (X-section)	Narrow v-shaped	Narrow shelf	Wide shelf		
11 Palatoquadrate-basitrabecular articulation	Present	Fused	Absent		
12 Palatoquadrate-postorbital articulation	Absent	Under PO process	Posterior to PO process		
13 Basitrabecular process attitude	In line with postorbital edge	Ventrolateral to postorbital	Anteroventrolateral	Absent	
14 Basitrabecular-palatoquadrate articulation	Postorbital	Orbital	Antorbital	Absent	
15 Chondrocranial construction (adult)	3 moieties	2 moieties	Continuous	vault	
16 Occipital moiety	Separate vertebral elements	Fused vertebral elements	Single separate unit	Fused to otic moiety	
17 Occipital joint/fissure	Open fissure	Immobile/fusion			
18 Ethmo-sphenoid joint/fissure	joint/fissure	Open fissure	Immobile/fusion	Mobile joint	
19 Suspensorium	Autodistyly	Hyostyly	Amphistyly	Holostyly	Methyostyly
20 Extravisceral cephalic cartilages	Premandibular feeding element	Prominent labials	Few/reduced labials	None	
21 Palatoquadrate arteriad	Separate	Parallel (parasymphysial) extension	Median symphysis		
22 Palatoquadrate-pterygoid process shape	Slight/postorbital	Dorsally recurved	Posteriorly extended	Dorsally expanded	
23 Meckel's-quadrangle articulation	Postorbital	Orbital	preorbital		
24 Mandibular mineralization	Bone	Spheritic	Random tesserae	Solid fibrocartilage	Prismatic calcified cartilage
25 Upper parasymphysial/cartilage(s)	Multiple	Small	Anteriorly extended	Absent	
26 Lower symphysial element(s)	Multiple	Present between mandibles	Extended arteriad	Absent	
27 Gill openings	Single opercular valve	Separate gill openings			
28 Epal hyoid	Opercular support	Mandibular arch support			
29 Buccopharyngeal/palatal denticles	Simple to compound odontodes	Absent			
30 Branchial basket	Subotic to postcranial	Subcranial	Principally postcranial		
31 Tooth row/jaw length	Absent/NA	> 50%	< 40%		