

ANGUIMORPHA CHARACTERS

1. Premaxilla: (0) paired, (1) fused (Gauthier et al. 2012 #1)
2. Alveolar margin of premaxilla: (0) blunt, nearly straight, (1) gently rounded, (2) acutely rounded (Bhullar 2011)
3. Premaxilla palatal shelf: (0) not bifid posteriorly, (1) bifid posteriorly (Gauthier et al. 2012 #2)
4. Premaxilla maxillary process development: (0) normal size, (1) reduced (Gauthier et al. 2012 #3)
5. Premaxillary-maxillary fenestra: (0) absent, (1) present (Gauthier et al. 2012 #5)
6. Premaxilla, groove entering posterior premaxillary foramen: (0) absent, (1) present (NEW)
7. Premaxilla body anterior ethmoidal foramina number: (0) single pair, (1) one side paired, the other single, (2) two pairs or more (Gauthier et al. 2012 #6)
8. Premaxilla body anterior ethmoidal foramina exit via: (0) external naris, (1) premaxilla notch, (2) premaxilla body (Gauthier et al. 2012 #7)
9. Premaxilla body ventral ethmoidal foramen: (0) small, (1) large, (2) absent (Gauthier et al. 2012 #8)
10. Premaxilla-maxilla suture: (0) firm, (1) loose (Gauthier et al. 2012 #9)
11. Premaxilla nasal process length: (0) extremely short, (1) less than half nasal length, (2) more than half way to frontal between nasals, (3) nearly to, or articulates with, frontal (Gauthier et al. 2012 #10)
12. Premaxilla nasal process shape in cross-section: (0) subtriangular, (1) compressed, (2) depressed (Gauthier et al. 2012 #11)
13. Premaxilla nasal process shape in anterior view: (0) tapers apically or parallel-sided across nares, (1) widens across nares (Gauthier et al. 2012 #13)
14. Nasals: (0) paired, (1) fused (Gauthier et al. 2012 #17)
15. Nasals anterior width: (0) exceeds nasofrontal joint width, (1) is subequal to nasofrontal joint width, (2) less than anterior frontal width (Gauthier et al. 2012 #18)
16. Nasal-prefrontal suture: (0) present, (1) absent (Gauthier et al. 2012 #19)
17. Nasal-maxilla suture: (0) present, (1) absent (Gauthier et al. 2012 #20)
18. Nasal supranarial process in dorsal view: (0) well-developed, (1) reduced/absent (Gauthier et al. 2012 #22)
19. Nasal-maxilla suture in cross section anteriorly: (0) maxilla overlaps nasal at roof of nasal chamber, (1) nasal partly overlaps maxilla dorsally (Gauthier et al. 2012 #23)

20. Nasals ventral contact beneath premaxillary nasal process: (0) broad contact below, (1) or not in contact except near apex (Gauthier et al. 2012 #24)
21. Nasals dorsal contact over premaxilla nasal process: (0) no contact, (1) in contact over apex (Gauthier et al. 2012 #25)
22. Nasals reduced to narrowly elliptic elements attached to either side of premaxilla internasal process: (0) absent, (1) present (Gauthier et al. 2012 #26)
23. Nasal length relative to frontal length: (0) nasals shorter than frontals, (1) nasals longer than frontals (Gauthier et al. 2012 #28)
24. Nasal anterior extent toward premaxilla: (0) nasal extends anterior to maxillary tooth row or vomer, (1) nasal terminates posterior to end of maxillary tooth row or vomer tip (Gauthier et al. 2012 #29)
25. Frontals: (0) paired, (1) fused (Gauthier et al. 2012 #36)
26. Frontal-maxilla suture: (0) frontal separated from maxilla by nasal-prefrontal contact, (1) frontal contacts maxilla, separating nasal from prefrontal (Gauthier et al. 2012 #37)
27. Frontal subolfactory processes: (0) absent, (1) arch beneath brain but do not contact, (2) arch beneath brain to articulate on ventral midline (Gauthier et al. 2012 #38)
28. Frontal subolfactory process depth: (0) 25–35%, (1) 42–53%, (2) 58–68%, (3) 75–85%, (4) >89% (Gauthier et al. 2012 #39)
29. Frontal subolfactory processes delimit deep narrow canal across most of orbit: (0) absent, (1) present (Gauthier et al. 2012 #42)
30. Frontal interorbital width/frontoparietal suture width I: (0) $\leq 23\%$, (1) 24–26%, (2) 28–34%, (3) $\geq 36\%$ (Gauthier et al. 2012 #48)
31. Frontal interorbital width/frontoparietal suture width II: (0) $< 44\%$, (1) 44–47%, (2) 50–53%, (3) $\geq 54\%$ (Gauthier et al. 2012 #49)
32. Skull compression, frontal width at frontoparietal suture/frontal length ratio: (0) > 0.70 , (1) ≤ 0.70 (McDowell and Bogert 1954; Smith and Gauthier 2013)
33. Frontal broadly overlaps prefrontal dorsally: (0) absent, (1) present (Gauthier et al. 2012 #50)
34. Frontal supraorbital shelf: (0) absent, (1) present (Gauthier et al. 2012 #51)
35. Frontoparietal suture interdigitation: (0) frontal overlaps parietal dorsally, (1) lightly interdigitate or simple abutment, (2) moderate interdigitation (Gauthier et al. 2012 #56)
36. Frontoparietal suture dorsal outline: (0) bowed anteriorly/inverted U, (1) roughly transverse (Gauthier et al. 2012 #57)

37. Frontal/parietal lateral overlap: (0) frontal deeply overlaps parietal, (1) frontal barely overlaps parietal laterally, (2) frontal underlaps parietal laterally (Gauthier et al. 2012 #58)
38. Postfrontal: (0) discrete, (1) fused to postorbital (Gauthier et al. 2012 #62)
39. Postfrontal shape: (0) triradiate (notched distally or not), with subequal frontal and parietal processes wrapping around frontoparietal suture, (1) parietal process absent, postfrontal subtriangular (Gauthier et al. 2012 #63)
40. Postfrontal distal shape: (0) tapering to point (passing anterior to postorbital), (1) bifid (clasps postorbital) (Gauthier et al. 2012 #64)
41. Postfrontal relative to parietal table: (0) ventrolateral, (1) dorsal overlap present, (2) dorsal overlap extensive (Gauthier et al. 2012 #65)
42. Postfrontal-jugal articulation: (0) widely separated, (1) nearly in contact, but still separated, (2) in contact (Gauthier et al. 2012 #66)
43. Postfrontal supratemporal shelf: (0) absent, (1) present as thin shelf extending over anterodorsal corner of supratemporal fenestra (Gauthier et al. 2012 #67)
44. Postorbital: (0) present, (1) absent (Gauthier et al. 2012 #68)
45. Postorbital shape: (0) widens anteriorly, (1) narrows anteriorly (Gauthier et al. 2012 #69)
46. Postorbital-parietal contact: (0) postorbital entirely distal, separated by postfrontal from parietal, (1) postorbital contacts parietal ventrolaterally at frontoparietal suture (Gauthier et al. 2012 #71)
47. Postorbital squamosal process: (0) present, (1) absent (Gauthier et al. 2012 #75)
48. Postorbital restricts upper temporal fenestra: (0) absent, postorbital tapers to tip, (1) partly occludes upper temporal fenestra, as postorbital expands medially posteriorly (Gauthier et al. 2012 #76)
49. Postorbital (nearly) excludes squamosal from upper temporal fenestra: (0) absent, (1) present (Gauthier et al. 2012 #77)
50. Postorbital overlaps squamosal: (0) laterally into V-shaped recess in squamosal, (1) dorsomedially as slender tapering rod attached superficially, (2) postorbital in long V-shaped trough dorsally and then rotating dorsolaterally posteriorly (Gauthier et al. 2012 #78)
51. Postorbital-squamosal suture: (0) firm, suture no wider than those among surrounding elements, (1) loose, sutural gap wider than that between postorbital and postfrontal, or postorbital and jugal (Gauthier et al. 2012 #79)
52. Postorbital jugal ramus: (0) extends ventral to quadrate head, (1) level with quadrate head, (2) or above quadrate head (Gauthier et al. 2012 #82)
53. Postorbital-jugal suture: (0) long, firm, immobile, tongue-in-groove suture, with jugal largely ventrolateral to postorbital, (1) jugal tapers smoothly to apex, which is loosely joined

to lateral face of postorbital via connective tissue, (2) postorbital with process extending lateral to tapering apex of jugal (Gauthier et al. 2012 #83)

54. Postorbital spreads onto dorsal surface of postfrontal: (0) absent, (1) present (Gauthier et al. 2012 #85)

55. Postorbital extent posteriorly: (0) to end of parietal table or less, (1) posterior to parietal table (Gauthier et al. 2012 #87)

56. Parietal fusion: (0) paired, (1) fused (Gauthier et al. 2012 #88)

57. Parietal temporal muscles originate: (0) dorsally on parietal table and supratemporal process of parietal, (1) ventrally on parietal table and dorsally on supratemporal process, (2) ventrally on parietal table and supratemporal process (Gauthier et al. 2012 #90)

58. Parietal sagittal crest: (0) absent, (1) present (Gauthier et al. 2012 #93)

59. Parietal nuchal fossa width: (0) narrow, (1) wide, (2) overgrown by parietal (nearly) to midline (Gauthier et al. 2012 #94)

60. Parietal table, U-shaped notch for processus ascendans: (0) absent, (1) present, distinct from curvature of occipital recess (NEW)

61. Parietal postparietal projection near midline (bifid distally or not): (0) absent, (1) present (Gauthier et al. 2012 #95)

62. Parietal-supraoccipital contact: (0) absent, (1) abuts supraoccipital on midline, (2) dorsoventral parasagittal abutment (Gauthier et al. 2012 #96)

63. Parietal extent over braincase in dorsal view: (0) does not cover occiput, (1) covers nearly all of occiput (Gauthier et al. 2012 #99)

64. Parietal supratemporal process length: (0) well-developed, (1) reduced, <25% of parietal width (Gauthier et al. 2012 #101)

65. Parietal supratemporal process orientation: (0) directed laterally, (1) directed posterolaterally (Gauthier et al. 2012 #102)

66. Parietal contribution to back of the upper temporal fenestra: (0) short supratemporal process, parietal only forms about half of the upper temporal fenestra posterior arch, with supratemporal forming distal half, (1) long parietal supratemporal process extends distally to near the quadrate head (Gauthier et al. 2012 #103)

67. Parietal foramen: (0) present, (1) absent (Gauthier et al. 2012 #104)

68. Parietal foramen position: (0) in parietal, (1) at frontoparietal suture (Gauthier et al. 2012 #105)

69. Parietal epipterygoid process: (0) absent, (1) distinct process, (2) reaches alar process of prootic (Gauthier et al. 2012 #108)

70. Parietal-protic contact: (0) absent, (1) extensive conformable contact, with parietal overlapping protic laterally throughout length, (2) discrete ventral process of parietal overlaps protic alar process laterally (Gauthier et al. 2012 #109)
71. Maxilla (post-) premaxillary process contact: (0) not in contact, (1) in contact, or nearly so, but always excluding premaxilla from vomer dorsally (Gauthier et al. 2012 #111)
72. Maxilla premaxillary process dorsal surface grooved (often enclosed) for passage of a deeper and more internally placed ramus of the subnarial artery: (0) absent, (1) present (Gauthier et al. 2012 #112)
73. Maxilla and vomer: (0) do not meet at anterior margin of fenestra exochoanalis, (1) meet at anterior margin of fenestra exochoanalis (Gauthier et al. 2012 #113)
74. Maxilla, position of anterior alveolar foramen: (0) at base of facial process between cristae transversalis and lateralis, (1) posteromedial to crista transversalis (posterior to crista transversalis) (NEW)
75. Maxilla facial process length/maxilla length: (0) 16-23%, (1) 25-36%, (2) 38-55%, (3) >56% (Gauthier et al. 2012 #114)
76. Maxilla facial process height: (0) tall, to skull roof, (1) absent (Gauthier et al. 2012 #115)
77. Maxilla facial process apical surface faces: (0) laterally, (1) dorsolaterally, (2) anterodorsally (Gauthier et al. 2012 #116)
78. Maxilla facial process medial face with a posterodorsally trending ridge demarcating the anterior limits of a shallow, oval fossa—the nasolacrimal fossa—bordered by the lacrimal and infraorbital canals posteriorly: (0) absent, (1) present (Gauthier et al. 2012 #117)
79. Maxilla narial margin rises at: (0) high angle, (1) low angle (Gauthier et al. 2012 #118)
80. Maxilla suborbital ramus extends posteriorly: (0) to roughly mid-orbit (or anterior), (1) to posterior quarter of orbit, (2) to posterior edge of orbit (Gauthier et al. 2012 #120)
81. Maxilla suborbital process tip shape at jugal articulation: (0) suborbital margin slopes smoothly to tip, (1) with distinct step or V-shaped notch distally at jugal articulation (Gauthier et al. 2012 #123)
82. Maxilla posterior process shortens: (0) to mid-orbit or longer, (1) to anterior half of orbit (Gauthier et al. 2012 #124)
83. Prefrontal orbitonasal margin: (0) slopes ventrolaterally, (1) vertical, (2) extends beneath subolfactory processes (Gauthier et al. 2012 #128)
84. Prefrontal posterior extent along orbital margin: (0) terminates in anterior half of orbit, (1) extends to mid-orbit, (2) extends posterior to mid-orbit (Gauthier et al. 2012 #129)
85. Prefrontal boss: (0) absent, (1) present (Gauthier et al. 2012 #130)
86. Lacrimal: (0) present, (1) absent (Gauthier et al. 2012 #137)

87. Lacrimal boss: (0) absent, (1) present (NEW)
88. Lacrimal position relative to lacrimal duct: (0) lacrimal with broad exposure laterally, reaching from lateral floor of lacrimal duct up the medial face of the maxilla to contact a lateral process of the prefrontal that roofs the lacrimal duct in cross section, (1) lacrimal arches over the lacrimal duct to replace the prefrontal dorsally, broadly floors the lacrimal duct with a medial process posteriorly passing up the lateral face of the prefrontal (Gauthier et al. 2012 #138)
89. Lacrimal foramen number: (0) one, (1) divided on orbital surface, (2) divided through to olfactory surface (Gauthier et al. 2012 #140)
90. Jugal, lateral foramina: (0) absent, (1) one, (2) more than one (NEW)
91. Jugal extent anteriorly with respect to tooth row: (0) jugal broadly overlaps level of posterior maxillary tooth row, (1) jugal overlaps the most posterior maxillary tooth, (2) jugal just reaches base of, or stops short of, the most posterior maxillary tooth (Gauthier et al. 2012 #143)
92. Jugal anterior extent: (0) broadly separated from prefrontal, (1) reaches level of prefrontal (Gauthier et al. 2012 #144)
93. Jugal-lacrimal overlap: (0) jugal lateral to lacrimal, (1) jugal medial to lacrimal (Gauthier et al. 2012 #145)
94. Jugal articulation with maxilla in cross-section: (0) rounded ventral margin of jugal and shallow and more rounded contour of the maxilla supradental shelf, (1) acute ventral margin of jugal lies in narrow longitudinal groove on dorsal surface of maxillary supradental shelf (Gauthier et al. 2012 #146)
95. Jugal with inverted V-shaped notch clasping suborbital edge of maxilla: (0) absent, (1) present (Gauthier et al. 2012 #148)
96. Jugal lateral exposure below orbit: (0) absent, (1) partly exposed above orbital margin of maxilla, (2) entirely exposed above orbital margin of maxilla (Gauthier et al. 2012 #149)
97. Jugal suborbital ramus: (0) shallow, (1) deep (Gauthier et al. 2012 #150)
98. Jugal postorbital ramus development: (0) complete bony postorbital bar, (1) incomplete bony postorbital bar (Gauthier et al. 2012 #152)
99. Jugal postorbital ramus shape in lateral outline: (0) narrow, (1) wide (Gauthier et al. 2012 #153)
100. Jugal contacts squamosal: (0) present, (1) absent (Gauthier et al. 2012 #154)
101. Jugal posterior process: (0) complete lower temporal bar, (1) reduced to a discrete bony posterior process, (2) absent (Gauthier et al. 2012 #155)
102. Jugal posterior process orientation: (0) more posterior in orientation, (1) more ventral in orientation (Gauthier et al. 2012 #156)

103. Jugal medial ridge: (0) medial ridge weak, jugal lateral to ectopterygoid at base in dorsal view, (1) medial ridge pronounced, base of medial ridge projects behind ectopterygoid base in dorsal view (Gauthier et al. 2012 #157)
104. Jugal cross-section at level of ectopterygoid: (0) subtriangular, (1) depressed (Gauthier et al. 2012 #158)
105. Squamosal: (0) present, (1) absent (Gauthier et al. 2012 #159)
106. Squamosal length relative to epipterygoid position: (0) squamosal does not extend anterior to level of epipterygoid, (1) squamosal extends anterior to level of epipterygoid (Gauthier et al. 2012 #160)
107. Squamosal temporal ramus-parietal contact: (0) temporal ramus diverges from parietal supratemporal process, (1) temporal ramus broadly contacts parietal supratemporal process (Gauthier et al. 2012 #161)
108. Squamosal base of temporal ramus: (0) diverges from parietal, (1) base lies against parietal (Gauthier et al. 2012 #162)
109. Squamosal temporal ramus width: (0) slender, (1) widens posteriorly (Gauthier et al. 2012 #163)
110. Squamosal temporal ramus shape: (0) compressed, (1) depressed (Gauthier et al. 2012 #164)
111. Squamosal ascending process: (0) present, (1) absent (Gauthier et al. 2012 #165)
112. Supratemporal: (0) present, (1) absent (Gauthier et al. 2012 #166)
113. Supratemporal shortens: (0) supratemporal longer than squamosal-parietal contact, (1) supratemporal shorter than squamosal-parietal contact (Gauthier et al. 2012 #167)
114. Supratemporal lengthens: (0) posterior to level of parietal notch, (1) near to level of parietal notch, (2) anterior to level of parietal notch (Gauthier et al. 2012 #168)
115. Supratemporal anterior suture with parietal shape: (0) supratemporal lies flat against supratemporal process of parietal, (1) inserts in slot in supratemporal process of parietal (Gauthier et al. 2012 #169)
116. Supratemporal position on parietal: (0) partly ventral, (1) partly ventrolateral (Gauthier et al. 2012 #170)
117. Supratemporal hidden in dorsal view: (0) supratemporal at least partly exposed dorsally on lateral side of parietal supratemporal process, (1) slender and hidden completely from view by parietal-squamosal contact dorsally (Gauthier et al. 2012 #175)
118. Supratemporal shelf: (0) absent, (1) extends anteriorly to partly close supratemporal fenestra between squamosal and parietal (NEW)

119. Quadrate head attachment: (0) tapering peg-like head loosely attached in socket formed largely by squamosal, (1) quadrate head pivots on slender tapering tip of squamosal (Gauthier et al. 2012 #177)
120. Quadrate head suspension: (0) supratemporal and squamosal separate quadrate head from braincase (except narrowly beneath tip of supratemporal), (1) quadrate head abuts braincase ventral to supratemporal (Gauthier et al. 2012 #178)
121. Quadrate suprastapedial process: (0) absent, (1) present (Gauthier et al. 2012 #179)
122. Quadrate lateral conch: (0) present, (1) absent (Gauthier et al. 2012 #180)
123. Quadratojugal: (0) present, (1) absent (Gauthier et al. 2012 #181)
124. Quadrate-pterygoid overlap: (0) extensive, (1) short overlap or small lappet, (2) very narrow overlap or lappet absent (Gauthier et al. 2012 #182)
125. Quadrate height to braincase depth ratio (braincase depth measured from near the quadrate head): (0) $\leq 59\%$, (1) 60–69%, (2) 70–79%, (3) $> 79\%$ (Gauthier et al. 2012 #185)
126. Quadrate “pythonomorph”: (0) bowed more or less, but not in both lateral and posterior views, (1) massive, and strongly bowed anteriorly in lateral view and laterally in posterior view, throughout length, and with prominent ventrally-directed suprastapedial process forming cavum tympani (Gauthier et al. 2012 #186)
127. Quadrate foramen size: (0) large, (1) small, (2) tiny (Gauthier et al. 2012 #187)
128. Quadrate slopes anteroventrally (>90 equals anterior slope from quadrate head): (0) vertical to posterior slope, (1) 108–121, (2) 122–135, (3) ≥ 136 (Gauthier et al. 2012 #188)
129. Stapedial shaft: (0) long and slender, (1) short and thick (Gauthier et al. 2012 #191)
130. Stapedial footplate: (0) small, (1) large (Gauthier et al. 2012 #192)
131. Stapedial footplate: (0) does not fill fenestra ovalis, (1) fills fenestra ovalis (Gauthier et al. 2012 #193)
132. Fenestra ovalis orientation: (0) opens directly laterally, (1) opens anterolaterally (Gauthier et al. 2012 #194)
133. Septomaxilla position relative to vomeronasal organ: (0) occupies a lateral position, not contributing to nasal cavity or to roofing of vomeronasal organ, (1) occupies a more medial position, contributing to nasal cavity and roofing vomeronasal organ (Gauthier et al. 2012 #199)
134. Septomaxilla, dorsal expansion: (0) flat or weakly convex, vomeronasal organ small, (1) expanded and convex, reflecting large size of vomeronasal organ (Gauthier et al. 2012 #200)
135. Septomaxilla: (0) does not contact the dorsal surface of the palatal shelf of the maxilla, (1) contacts the dorsal surface of the palatal shelf of the maxilla (Gauthier et al. 2012 #201)

136. Septomaxilla lateral flange: (0) absent, (1) present (2) reaches well above roof of vomeronasal organ (Gauthier et al. 2012 #204)
137. Septomaxilla medial flange: (0) absent, (1) present (Gauthier et al. 2012 #205)
138. Septomaxilla, posterior extent of medial flange: (0) short, not reaching level of prefrontal, (1) long, extends posteriorly to anteroposterior level of anterior margin of prefrontal (Gauthier et al. 2012 #206)
139. Nervus ethmoidalis medialis: (0) above septomaxilla, (1) enclosed in septomaxilla anteriorly, (2) in anterior half of septomaxilla, (3) enclosed posteriorly in septomaxilla (Gauthier et al. 2012 #208)
140. Vomer nasal organ, concha: (0) simple diverticulum of nasal capsule, (1) completely separated from nasal capsule, with fungiform body (Gauthier et al. 2012 #209)
141. Vomer size: (0) vomer extends backwards no further than anteriormost contact of palatine with maxilla, (1) vomer extends backwards beyond anteriormost contact of palatine with maxilla (Gauthier et al. 2012 #213)
142. Vomer: (0) main portion plate-like (1) main portion rodlike (Gauthier et al. 2012 #214)
143. Vomer overlaps (dorsally) the palatal shelf of the maxilla behind posterior margin of opening of vomeronasal organ: (0) absent, (1) present (Gauthier et al. 2012 #215)
144. Vomer: (0) does not establish any sutural contact with the palatal shelf of the maxilla behind the incisura Jacobsoni, (1) establishes narrow contact with the palatal shelf of the maxilla behind the incisura Jacobsoni (Gauthier et al. 2012 #216)
145. Vomer to vomeronasal organ relation: (0) vomer ventral to vomeronasal organ, (1) encapsulates vomeronasal organ posteriorly and medially (Gauthier et al. 2012 #217)
146. Vomer nasal nerve exit: (0) dorsal to vomer, (1) via canals dorsally on vomer (Gauthier et al. 2012 #220)
147. Vomer ventral longitudinal ridges: (0) absent, (1) long and converge toward midline, well-developed below vomeronasal nerve exit from septomaxilla, (2) discrete parasagittal canals anteriorly on vomer delimited by lateral and median ridges (Gauthier et al. 2012 #222)
148. Vomer, descending tubercle (or ridge) at vomero-palatine junction: (0) absent, (1) tubercle present (Gauthier et al. 2012 #228)
149. Vomer, teeth: (0) present, (1) absent (Gauthier et al. 2012 #230)
150. Palatines: (0) separated, (1) anterior contact (Gauthier et al. 2012 #231)
151. Palatine relative to maxilla-lacrimal-jugal articulation: (0) palatine sits medial to lacrimal and/or jugal and maxilla in cross section, (1) palatine inserts between lacrimal and/or jugal and maxilla in cross section (Gauthier et al. 2012 #232)

152. Palatine, vomerine process dorsally on vomer: (0) vomer attaches over entire face of vomerine process of palatine, (1) long slender palatine process clasped in groove on dorsal surface of vomer (Gauthier et al. 2012 #234)
153. Palatine contribution to suborbital fenestra: (0) reduced posteromedially, and pterygoid broadly exposed in suborbital fenestra, (1) palatine extends posteriorly along lateral edge of pterygoid so that pterygoid narrowly enters suborbital fenestra (Gauthier et al. 2012 #240)
154. Palatine-ptyerygoid overlap: (0) palatine overlaps pterygoid at tip and ectopterygoid near base, otherwise lateral in position, (1) palatine overlaps pterygoid dorsally from lateral to near medial margin of pterygoid, with loose abutment laterally, (2) palatine barely overlaps pterygoid laterally and pterygoid does not extend well anterior to ectopterygoid-jugal-maxilla juncture, (3) palatine barely overlaps pterygoid, joint nearly transverse (Gauthier et al. 2012 #241)
155. Infraorbital canal position: (0) lateral, between palatine and dorsal surface of supradental shelf of maxilla, (1) medial, entirely in palatine (Gauthier et al. 2012 #245)
156. Palatine: (0) simplicipalatinata, (1) incipient duplicipalatinata, (2) intermediate between incipient and fully duplicipalatinata (Gauthier et al. 2012 #249)
157. Palatine choanal fossa development: (0) absent, (1) present anteriorly on palatine, (2) extending about half way back on palatine, (3) fully developed to end of element (Gauthier et al. 2012 #250)
158. Palatine, posterior emargination of anterodorsal margin of choanal fossa: (0) anterior to anteroposterior midpoint of palatine-maxilla suture, (1) extends posterior to anteroposterior midpoint of palatine-maxilla suture (Gauthier et al. 2012 #252)
159. Palatine, shape of posterolateral margin at pterygoid suture: (0) unmodified, (1) transversely broad palatine at pterygo-palatine suture strongly restricts suborbital fenestra (Gauthier et al. 2012 #254)
160. Palatine teeth: (0) present, (1) absent (Gauthier et al. 2012 #255)
161. Palatine teeth size: (0) small conical denticles, (1) enlarged, but smaller than marginal teeth, (2) highly enlarged, similar in size to marginal teeth (Gauthier et al. 2012 #256)
162. Palatine, arrangement of teeth: (0) one to three lines, (1) tooth patch (more than three teeth in transverse section) (NEW)
163. Pterygoids: (0) contacting each other, (1) palatal rami fully separated (Gauthier et al. 2012 #257)
164. Pterygoid separation on midline: (0) pterygoids narrowly separated for most of their length, (1) broad at base, narrow anteriorly, (2) broad at base, but not as narrowly separated anteriorly, (3) broad throughout length (Gauthier et al. 2012 #258)
165. Pterygoid, palatine ramus: (0) contacts vomer, (1) does not contact vomer (Gauthier et al. 2012 #259)

166. Pterygoid posterior extent: (0) pterygoid does not reach level of occipital condyle, (1) pterygoid reaches level of occipital condyle (Gauthier et al. 2012 #263)
167. Pterygoid teeth: (0) present, (1) absent (Gauthier et al. 2012 #267)
168. Pterygoid teeth: (0) small conical denticles, (1) enlarged, but smaller than marginal teeth, (2) highly enlarged, similar in size to marginal teeth (Gauthier et al. 2012 #268)
169. Pterygoid, arrangement of teeth: (0) one line, (1) two or three lines, (2) tooth patch (more than three teeth in transverse section) (NEW)
170. Ectopterygoid angulation in dorsal view (in whole skull): (0) nearly orthogonal, (1) obtuse angle (Gauthier et al. 2012 #272)
171. Ectopterygoid anterior length: (0) well separated from palatine above maxilla, (1) near to or in contact with palatine (Gauthier et al. 2012 #273)
172. Ectopterygoid-maxilla suture: (0) ectopterygoid lies dorsally along supradental shelf of maxilla, (1) ectopterygoid with slot laterally clasping maxilla (Gauthier et al. 2012 #275)
173. Ectopterygoid maxillary process shape in dorsal view: (0) tapers or parallel-sided, (1) widens anteriorly more than three times relative to ectopterygoid shaft (Gauthier et al. 2012 #276)
174. Ectopterygoid-maxilla posterior process suture: (0) ectopterygoid medial and mainly dorsal to maxilla, (1) ectopterygoid abuts maxilla on posteromedial edge only, (2) ectopterygoid contacts jugal only (Gauthier et al. 2012 #278)
175. Ectopterygoid, prefrontal and palatine relations: (0) ectopterygoid does not underlap palatine posteriorly below prefrontal, (1) ectopterygoid underlaps palatine below prefrontal (Gauthier et al. 2012 #280)
176. Ectopterygoid-palatine ventral articulation: (0) palatine-maxilla contact excludes ectopterygoid, (1) ectopterygoid anterior process largely separates palatine from maxilla posteriorly (Gauthier et al. 2012 #281)
177. Ectopterygoid posterolateral process: (0) prominent, (1) small lateral knob, (2) absent (Gauthier et al. 2012 #283)
178. Ectopterygoid dorsal process height: (0) tall, (1) short, (2) absent (Gauthier et al. 2012 #285)
179. Epipterygoid: (0) present, (1) absent (Gauthier et al. 2012 #290)
180. Epipterygoid, in resting position: (0) located lateral to prootic (even if only narrowly so), (1) located entirely anterior to prootic (Gauthier et al. 2012 #291)
181. Epipterygoid shortens: (0) long (reaches nearly to level of top of braincase, or above quadrate head, or more than half distance between pterygoid and parietal table), (1) short (reaches only to level of quadrate head, barely to semicircular canal, or half or less of distance between pterygoid and parietal table) (Gauthier et al. 2012 #293)

182. Epipterygoid-parietal contact: (0) absent, (1) overlaps parietal temporal muscle origin (Gauthier et al. 2012 #294)
183. Epipterygoid: (0) expanded dorsoventrally and ventrally, (1) columelliform (Gauthier et al. 2012 #295)
184. Braincase fusion: (0) unfused in adult, (1) complete braincase fusion in adult (Gauthier et al. 2012 #296)
185. Processus ascendens of synotic tectum: (0) absent, (1) present (Gauthier et al. 2012 #297)
186. Prootic, alar process: (0) small or absent, (1) prominent (Gauthier et al. 2012 #305)
187. Prootic, supratrigeminal process: (0) absent, (1) weakly developed, not projecting beyond cupola anterior (Gauthier et al. 2012 #306)
188. Crista prootica (ridge on lateral surface of the prootic, overhanging facial foramen): (0) well-developed lateral flange, (1) reduced to weak ridge, (2) absent (Gauthier et al. 2012 #307)
189. Crista interfenestralis: (0) prominent, (1) reduced (Gauthier et al. 2012 #311)
190. Crista tuberalis: (0) prominent, (1) reduced (Gauthier et al. 2012 #312)
191. Facial foramen (lateral exit on prootic for the facial or VII cranial nerve): (0) single, (1) double (Gauthier et al. 2012 #313)
192. Posterior auditory foramen: (0) bordered by opisthotic (oto-occipital) posteromedially, (1) enclosed entirely in prootic (Gauthier et al. 2012 #315)
193. Orbitosphenoid, calcified/ossified: (0) absent, (1) present (Gauthier et al. 2012 #316)
194. Orbitosphenoid: (0) well developed, (1) reduced (Gauthier et al. 2012 #317)
195. Dorsum sellae shape in longitudinal cross-section: (0) crista sellaris forms posterior wall, usually low and vertically disposed with more or less anterior slope, (1) dorsum sellae poorly differentiated with, at most, shallow fossa with low crista sellaris (Gauthier et al. 2012 #324)
196. Dorsum sella fossa roofed posteriorly by crista sellaris (not scored in species with reduced/absent crista sellaris): (0) fossa only modestly roofed by crista sellaris, (1) roofing more extensive over deep fossa (Gauthier et al. 2012 #325)
197. Parabasisphenoid keel: (0) absent, (1) present below dorsum sellae, (2) deep keel (Gauthier et al. 2012 #326)
198. Cultriform process: (0) long, (1) short, (2) absent (Gauthier et al. 2012 #328)
199. Basipterygoid process: (0) long, i.e., projecting far beyond the body of the basisphenoid, (1) short, i.e., not projecting very far beyond the body of the basisphenoid (Gauthier et al. 2012 #333)

200. Basipterygoid process: (0) not expanded at distal end, (1) distal end expanded (Gauthier et al. 2012 #334)
201. Vidian canal formed by the basisphenoid enclosing the internal carotid artery, and the base of the palatine artery, as they pass over the basipterygoid process: (0) absent, (1) present (Gauthier et al. 2012 #336)
202. Vidian canal caudal opening: (0) within basisphenoid, (1) anterior margin at basisphenoid-prootic suture (Gauthier et al. 2012 #337)
203. Carotid artery exits rostral end of Vidian canal: (0) at same level (or slightly above) as the remnant of the embryonic neurocranial trabeculae, (1) below the level of the remnant of the embryonic neurocranial trabeculae (Gauthier et al. 2012 #338)
204. Basal tubera position: (0) posterolateral, with apex on lateral edge of basioccipital just behind base of prootic-opisthotic suture, (1) anteromedial, with apex at lateral juncture of sphenoid and basioccipital, anterior and medial to prootic-opisthotic suture (Gauthier et al. 2012 #339)
205. Apophyseal ossification (Element "X") caps basal tubera: (0) absent, (1) present (Gauthier et al. 2012 #340)
206. Occipital condyle: (0) posterior surface of condyle straight in ventral view, (1) posterior surface of condyle concave in ventral view (Gauthier et al. 2012 #341)
207. Medial aperture of the recessus scala tympani (MARST): (0) between basioccipital and opisthotic, (1) entirely in opisthotic (Gauthier et al. 2012 #344)
208. Cranial nerve IX exits braincase via: (0) foramen magnum, (1) laterally via LARST (Gauthier et al. 2012 #346)
209. Vagus foramen ("jugular foramen" in other amniotes) far from MARST: (0) with hypoglossal foramina lying below and between them medially, (1) vagus foramen closer to MARST, with hypoglossal foramina extending posterior to vagus (Gauthier et al. 2012 #348)
210. Hypoglossal (XII) foramina exit(s) relative to vagus (X-XI) foramen on external surface of braincase: (0) hypoglossal foramina separated from vagus (jugular) foramen, (1) at least one hypoglossal foramen emerges from the same fossa as the vagus foramen, (2) only one hypoglossal foramen still exits separately from the vagus foramen fossa, (3) all three hypoglossals emerge from the same fossa as the vagus foramen (Gauthier et al. 2012 #349)
211. LARST (lateral aperture of recessus scalae tympani): (0) open, (1) small, (2) closed (Gauthier et al. 2012 #350)
212. Perilymphatic foramen faces: (0) ventrally, (1) medially (Gauthier et al. 2012 #351)
213. Opisthotic-exoccipital fusion to form oto-occipital: (0) incompletely fused or separate in adult, (1) completely fused early in post-hatching ontogeny (Gauthier et al. 2012 #352)
214. Metotic fissure: (0) open, (1) subdivided by contact of basal plate and otic capsule (Gauthier et al. 2012 #354)

215. Dentary anterodorsal edge of dental parapet at tip: (0) straight, (1) tipped down (Gauthier et al. 2012 #356)

216. Dentary bowed ventrally along long axis: (0) straight to slightly bowed, (1) distinctly bowed ventrally (Gauthier et al. 2012 #357)

Although the dentary in the smallest specimen of *feisti*, SMF-ME 10954, shows approximately state 0, the largest specimen, SMNK-Me 1124, clearly shows state 1, as does *Palaeovaranus cayluxi*. We score both species "1."

217. Dentary overlaps post-dentary bones laterally: (0) extensive, (1) reduced (Gauthier et al. 2012 #358)

218. Dentary suspended from: (0) overlapping parts of coronoid, surangular, prearticular, splenial and angular, (1) prearticular (Gauthier et al. 2012 #359)

219. Dentary subdental shelf/gutter development in anterior part of dentary: (0) subdental shelf absent, (1) weakly developed subdental shelf, (2) pronounced subdental gutter (Gauthier et al. 2012 #360)

220. Dentary, number of mental foramina on lateral surface: (0) three, (1) four or more (Gauthier et al. 2012 #361)

221. Dentary, size of posterior-most mental foramen: (0) same size as others, (1) enlarged relative to others (Gauthier et al. 2012 #362)

As three of four specimens of *feisti* show an enlarged posterior-most foramen, we score the species as "1." Assuming the last mental foramen is correctly identified in each dentary, *Eosaniwa* also shows state 1. That last foramen, however, is located suspiciously far anteriorly.

222. Dentary coronoid process posterior termination: (0) below (or anterior) to level of coronoid apex, (1) just behind level of coronoid apex, (2) well posterior to level of coronoid apex (Gauthier et al. 2012 #364)

223. Dentary subdental shelf hooks around anterior rim of the anterior inferior alveolar foramen: (0) absent, (1) present (Gauthier et al. 2012 #365)

224. Dentary surangular process: (0) lies flat against the dorsolateral face of the surangular below the coronoid, (1) set in a posterodorsally trending groove, open dorsally, that supports it from below on the dorsolateral face of the surangular below the coronoid (Gauthier et al. 2012 #366)

225. Dentary coronoid process posterodorsal extension: (0) absent or with only small dorsal extension, (1) large, but extending between lateral and medial processes of coronoid (Gauthier et al. 2012 #367)

226. Dentary angular process reduced: (0) angular process extends to or past coronoid apex, (1) anterior to coronoid apex, (2) anterior to level of coronoid bone (Gauthier et al. 2012 #368)

227. Dentary posterior termination on lateral face of mandible: (0) below (or anterior to) level of coronoid apex, (1) just posterior to coronoid apex, (2) well posterior to level of coronoid apex (Gauthier et al. 2012 #369)

228. Meckel's canal: (0) opens medially for most of length, (1) opens ventrally anterior to anterior inferior alveolar foramen (Gauthier et al. 2012 #371)
229. Dentary restricts Meckel's canal: (0) does not restrict or enclose Meckelian canal, (1) Meckel's canal closed and fused anterior to splenial (Gauthier et al. 2012 #372)
230. Dentary, free margin of intramandibular septum: (0) absent, (1) present (NEW)
231. Dentary, size of ontogenetically advanced individuals: (0) >6 mm, (1) <6 mm (NEW)
232. Dentary, subdental shelf on posterior portion: (0) absent or weak, (1) strong (NEW)
233. Splenial attachment to dentary above Meckel's canal: (0) close throughout length, (1) loose, with dorsal dentary suture confined to posterodorsal corner of splenial (Gauthier et al. 2012 #373)
234. Splenial: (0) present, (1) absent (Gauthier et al. 2012 #374)
235. Splenial anterior extent: (0) around one-third (or less) length relative to dentary tooth row, (1) about one-half, (2) about two-thirds, (3) three-fourths (or more) (Gauthier et al. 2012 #375)
236. Splenial posterior extent: (0) extends posteriorly to or beyond apex of coronoid, (1) does not extend posteriorly to apex of coronoid (Gauthier et al. 2012 #376)
237. Splenial-angular articulation: (0) splenial overlaps angular, (1) with ball on angular fitting into socket on splenial (Gauthier et al. 2012 #377)
238. Splenial anterior inferior alveolar foramen position relative to dentary: (0) enclosed entirely in splenial, (1) between splenial and dentary (Gauthier et al. 2012 #378)
239. Splenial anterior inferior alveolar foramen position relative to anterior mylohyoid foramen: (0) anterodorsal, (1) dorsal to posterodorsal (Gauthier et al. 2012 #379)
240. Angular posterior extent: (0) reaches mandibular condyle, (1) does not reach mandibular condyle (Gauthier et al. 2012 #381)
241. Angular taller anteriorly, closely approaching coronoid (or, if coronoid absent, tooth-bearing margin of dentary above Meckelian canal): (0) absent, angular broadly separated from coronoid, (1) present (Gauthier et al. 2012 #382)
242. Angular medial exposure (relative degree of medial exposure scored with the teeth pointing straight up): (0) broad, (1) reduced, (2) narrow (Gauthier et al. 2012 #383)
243. Posterior mylohyoid foramen position: (0) absent, (1) medial, (2) ventral (Gauthier et al. 2012 #384)
244. Posterior mylohyoid foramen position relative to coronoid apex: (0) below, (1) posterior, (2) anterior (Gauthier et al. 2012 #385)
245. Coronoid eminence composition: (0) formed by both surangular and coronoid, (1) formed exclusively by coronoid (Gauthier et al. 2012 #387)

246. Coronoid anteromedial process fits into sulcus beneath tooth-bearing border of dentary (at or behind end of tooth row): (0) absent, (1) present (Gauthier et al. 2012 #388)
247. Coronoid bone: (0) present, well developed, (1) present, small and strap-like (Gauthier et al. 2012 #389)
248. Coronoid-surangular articulation: (0) coronoid restricted to medial aspect of mandible, (1) coronoid arches over dorsal margin of mandible to reach lateral face of surangular (Gauthier et al. 2012 #390)
249. Coronoid, anteromedial ventral margin (at/behind end of tooth row): (0) overlapped by splenial, (1) abuts splenial, (2) does not contact splenial (Gauthier et al. 2012 #392)
250. Coronoid, posteromedial process: (0) absent, (1) present (Gauthier et al. 2012 #393)
251. Coronoid, anterolateral dentary process: (0) absent, (1) present (Gauthier et al. 2012 #394)
252. Coronoid, shape of anterolateral dentary process: (0) extends anteroventrally and smoothly tapers into dentary, (1) extends anteriorly, with dorsal and ventral margins more parallel sided, terminating in a blunt edge anteriorly (Gauthier et al. 2012 #395)
253. Surangular inserts into dentary lateral to the intramandibular septum, entering the intramandibular canal: (0) absent, (1) present slightly, (2) present deeply (Gauthier et al. 2012 #396)
254. Surangular, external foramina: (0) two foramina, anterior and posterior, (1) single foramen (Gauthier et al. 2012 #397)
255. Surangular adductor fossa on external face of mandible: (0) shallow and extends ventrally no more than halfway down, (1) deep and extends ventrally more than half way down (Gauthier et al. 2012 #399)
256. Surangular dorsal margin: (0) nearly horizontal, rising somewhat toward the coronoid, anterodorsal edge set below level of tooth crowns, (1) rises steeply anterodorsally to coronoid, with apex reaching above level of tooth crowns (Gauthier et al. 2012 #400)
257. Prearticular and surangular fused in adult: (0) separate, (1) fused (Gauthier et al. 2012 #401)
258. Retroarticular process: (0) present, (1) very short or absent (Gauthier et al. 2012 #404)
259. Retroarticular process orientation (scored with teeth pointing straight up): (0) not inflected medially, (1) inflected medially (Gauthier et al. 2012 #405)
260. Retroarticular process orientation in lateral (or posterior) view: (0) extends straight posteriorly, (1) inflected ventrally (Gauthier et al. 2012 #406)
261. Retroarticular process breadth (greatest width) relative to mandibular condyle (glenoid): (0) narrower, (1) wider (Gauthier et al. 2012 #410)

262. Angular process of retroarticular process: (0) absent, (1) present (Gauthier et al. 2012 #411)
263. Premaxillary teeth (apart from median tooth): (0) similar size or larger than anterior maxillary teeth, (1) distinctly smaller than anterior maxillary teeth (Gauthier et al. 2012 #412)
264. Median premaxillary tooth: (0) absent, (1) present (Gauthier et al. 2012 #413)
265. Maxillary tooth row extent posteriorly: (0) to roughly mid-orbit (or anterior), (1) to posterior third of orbit (Gauthier et al. 2012 #415)
266. Maxillary tooth crown height: (0) constant throughout tooth row, (1) length varies, resulting in convex occlusal surface, (2) length increases posteriorly (Gauthier et al. 2012 #416)
267. Maxilla tooth row length: (0) to or behind mid-orbit, (1) anterior to mid-orbit, (2) anterior to orbit (Gauthier et al. 2012 #418)
268. Premaxillary tooth count: (0) none, (1) one to three, (2) four to six, (3) seven to nine, (4) 10 or more (Gauthier et al. 2012 #419)
269. Maxillary tooth count: (0) 7–15, (1) 16–27, (2) 31 or more (Gauthier et al. 2012 #420)
270. Dentary tooth count: (0) 4–9, (1) 10–20, (2) 21–35, (3) 36 or more (Gauthier et al. 2012 #421)
271. Marginal teeth: (0) all vertical, (1) all recurved, (2) anterior teeth recurved, posterior teeth vertical (Gauthier et al. 2012 #422)
272. Position of marginal teeth relative to tooth-bearing element: (0) on medial side of tooth-bearing element, (1) near/on apical margin of tooth-bearing element (Gauthier et al. 2012 #423)
273. Bases of marginal teeth: (0) smooth, dentine and enamel not infolded, (1) dentine and enamel show a few infoldings, mostly on anterior teeth, (2) dentine and enamel extensively infolded on all teeth, restricting pulp cavity (“plicidentine”) (Gauthier et al. 2012 #425)
An intermediate character state 1 was added between the primitive condition and well-developed plicidentine.
274. Bases of marginal teeth expanded: (0) absent, (1) present (Gauthier et al. 2012 #426)
275. Marginal tooth spacing: (0) crowns closely spaced, (1) crowns separated by large gaps (Gauthier et al. 2012 #427)
276. Position of replacement teeth: (0) lingual, (1) posterolingual (Gauthier et al. 2012 #428)
277. Orientation of replacement teeth: (0) erupt upright, growing straight upwards into functional position, (1) erupt horizontally, and then rotate through 90 degrees about the base into functional position (Gauthier et al. 2012 #429)
278. Tooth replacement: (0) present, (1) absent (Gauthier et al. 2012 #430)

279. Resorption pits: (0) present, (1) absent (Gauthier et al. 2012 #431)
280. Development of resorption pits: (0) at base of teeth, (1) on bony tooth pedicel (Gauthier et al. 2012 #432)
281. Palatal teeth: (0) constant in size across palatal tooth row, (1) decrease in size posteriorly (Gauthier et al. 2012 #433)
282. Cusps on posterior teeth: (0) unicuspid, (1) bicuspid, (2) tricuspid, (3) mesial and distal carinae raised to form a horizontal cutting edge (Gauthier et al. 2012 #434)
283. Dentition, grooves setting off mesial cusp (if present): (0) weak, (1) strong, resulting in well-defined accessory cusp (NEW)
284. Venom groove on anteromedial surface of teeth: (0) absent, (1) present (Gauthier et al. 2012 #435)
285. Dentition, mesial and distal carinae orientation: (0) V-shaped, with distal carina extending distolabially, (1) carinae more or less in line (NEW)
286. Dentition, labial and lingual surfaces of crown meet each other: (0) at highly acute angle, $<70^\circ$, (1) at angle of $70-90^\circ$ (chisel-shaped), (2) at angle $>90^\circ$ (blunt crown) (NEW)
287. Dentition, lingual tooth shaft: (0) straight, (1) bulges lingually (NEW)
288. Dentition, crown height above parapet in middle of dentary as proportion of total tooth height: (0) >0.5 , (1) $0.4-0.5$, (2) 0.33 (NEW)
289. Dentition, crown shape: (0) circular (with or without weak carinae), (1) labiolingually compressed (NEW)
290. Basihyal, relationship to skull (when mouth is closed): (0) anterior to braincase, (1) ventral to braincase, (2) posterior to braincase (Gauthier et al. 2012 #439)
291. Free epibranchials (second epibranchial): (0) absent, (1) present (Gauthier et al. 2012 #442)
292. Free epibranchial: (0) simple (short or sigmoidal), (1) complex (Gauthier et al. 2012 #443)
293. First epibranchial: (0) shorter than first ceratobranchial, (1) longer than or nearly equal to first ceratobranchial (Gauthier et al. 2012 #444)
294. First ceratobranchial (in lateral view): (0) no dorsolateral angulation, (1) weak dorsolateral angulation (has a distinct bend) (Gauthier et al. 2012 #445)
295. Second ceratobranchials: (0) present, (1) absent (Gauthier et al. 2012 #446)
296. Second ceratobranchial: (0) shorter than first ceratobranchial, (1) nearly equal to or longer than first ceratobranchial (Gauthier et al. 2012 #447)

297. Second ceratobranchial apposed on midline: (0) absent, (1) present (Gauthier et al. 2012 #448)

298. Large, wing-like hyoid cornu: (0) absent, (1) present (Gauthier et al. 2012 #449)

299. Hyoid cornu: (0) less than the length of the epihyal, (1) greater than or equal to the length of the epihyal (Gauthier et al. 2012 #450)

300. Epihyal: (0) expansion or elaboration at proximal end absent, (1) simple expansion at proximal end present (Gauthier et al. 2012 #452)

301. Lateral flange at midpoint of epihyal: (0) absent, (1) present (Gauthier et al. 2012 #453)

302. Presacral vertebrae number increase I: (0) 24 or fewer, (1) 25, (2) 26, (3) 28 or more (Gauthier et al. 2012 #455)

303. Presacral vertebrae number increase II: (0) ≤ 32 presacrals, (1) 33–39, (2) 50–55, (3) >60 (Gauthier et al. 2012 #456)

304. Cervical vertebrae number increase: (0) three, (1) six, (2) seven, (3) eight, (4) nine or more (Gauthier et al. 2012 #459-460)

Note that Gauthier et al. (2012) consider “cervical vertebrae” to be those bearing long ribs, rather than those anterior vertebrae lacking an attachment to the sternum. The purpose of this pragmatic choice is evidently to enable scoring of fossil species (in which the sternal attachments are usually not preserved). For instance, *Lanthanotus* is taken to have seven cervicals, rather than the usual nine (Rieppel 1980; Estes et al. 1988).

305. Cervical intercentrum position: (0) intercentral, (1) posterior end of preceding centrum (Gauthier et al. 2012 #461)

306. Cervical rib ossified portion shape: (0) widens distally, at least in last cervical, (1) tapers distally (Gauthier et al. 2012 #462)

307. Cervical ribs start on vertebra number: (0) two, (1) three, (2) four, (3) five, (4) six (Gauthier et al. 2012 #463)

308. Cervical intercentrum length relative to pedicle length: (0) intercentrum longer than pedicle, (1) intercentrum shorter than pedicle (Gauthier et al. 2012 #464)

309. Cervical pedicle (outgrowth of pleurocentrum to which intercentrum may attach): (0) absent, (1) projecting ventrally with discrete fore and aft margins (Gauthier et al. 2012 #465)

310. Vertebral centrum articulation: (0) amphicoelous (and notochordal), (1) procoelous (Gauthier et al. 2012 #467)

311. Vertebral centrum in ventral view: (0) triangular, (1) parallel-sided along most of length (NEW)

312. Vertebral centrum, ventral surface: (0) median ridge present, (1) median ridge absent, surface arched, (2) median ridge absent, surface flat (NEW)

313. Neural spine of mid-dorsal vertebrae: (0) moderately to highly developed, (1) absent or nearly so (NEW)
314. Zygosphene-zygantrum accessory intervertebral articulations: (0) absent, (1) dorsolaterally directed facet continuous with prezygapophyseal articulation located just up edge of neural arch, (2) tall, laterally directed facet continuous with prezygapophyseal articulation and extending as high as top as neural canal, (3) separate facet set on distinct pedicle and facing ventrolaterally (Gauthier et al. 2012 #468)
315. Caudal autotomic septum position relative to caudal rib: (0) within caudal rib, (1) anterior to caudal rib, (2) posterior to caudal rib, (3) absent (Gauthier et al. 2012 #470)
316. Caudal rib (transverse process) shape: (0) single rib without basal foramen, (1) foramen passing through base of rib (Gauthier et al. 2012 #471)
317. Caudal haemal arch (intercentrum) position: (0) intercentral, pedicles feeble/absent, (1) mainly contacting pedicles on preceding centrum but still bordering condyle, (2) well forward of condyle on preceding centrum (Gauthier et al. 2012 #475)
318. Caudal haemal arch pedicle length: (0) short, (1) long (Gauthier et al. 2012 #476)
319. Vertebra whose rib first attaches to sternum: (0) eighth, (1) ninth (Gauthier et al. 2012 #477)
320. Trunk ribs pachyostotic: (0) slender, cancellous ribs, (1) thick, dense ribs (Gauthier et al. 2012 #478)
321. Sternum: (0) present, (1) absent (Gauthier et al. 2012 #480)
322. Sternal fontanelle: (0) absent, (1) present (Gauthier et al. 2012 #481)
323. Sternal fontanelle number: (0) single, (1) double (Gauthier et al. 2012 #482)
324. Number of rib attachment points to sternum (including attachment of xiphisternum): (0) five or more, (1) four, (2) three, (3) two or fewer (Gauthier et al. 2012 #483)
325. Xiphisternum: (0) present, (1) absent (Gauthier et al. 2012 #484)
326. Number of xiphisternal rib attachment points: (0) one, (1) two (Gauthier et al. 2012 #486)
327. Number of post-xiphisternal (or post-sternal) inscriptional ribs united along the ventral midline to form continuous chevron shaped structures: (0) 0, (1) 1–4 (Gauthier et al. 2012 #487)
328. Scapulocoracoid: (0) large, (1) reduced, (2) absent (Gauthier et al. 2012 #488)
329. Suprascapula: (0) large (approximately equal to length of scapula), (1) small (Gauthier et al. 2012 #491)
330. Scapula, emargination on anterodorsal edge (scapular fenestra): (0) absent, (1) present (Gauthier et al. 2012 #492)

331. Scapulocoracoid emargination: (0) absent, (1) present (Gauthier et al. 2012 #493)
332. Scapulocoracoid emargination: (0) closed by cartilage, (1) open (Gauthier et al. 2012 #494)
333. Coracoid, anterior (primary) emargination (fenestra): (0) absent, (1) present (Gauthier et al. 2012 #495)
334. Coracoid, posterior (secondary) emargination (fenestra): (0) absent, (1) present (Gauthier et al. 2012 #496)
335. Coracoid size: (0) enlarged, extending anteriorly to level of clavicles, (1) not enlarged, not extending anteriorly to level of clavicles (Gauthier et al. 2012 #497)
336. Epicoracoid cartilage extent: (0) contacts mesoscapula and suprascapula, (1) does not contact mesoscapula and suprascapula (Gauthier et al. 2012 #498)
337. Clavicle: (0) present, (1) absent (Gauthier et al. 2012 #499)
338. Clavicular angulation: (0) simple curved rod, following contour of scapulocoracoid, (1) strongly angulated, curving anteriorly away from scapulocoracoid (Gauthier et al. 2012 #502)
339. Distal clavicle articulation: (0) with scapula, (1) with suprascapula (Gauthier et al. 2012 #503)
340. Clavicles, medial contact: (0) clavicles do not meet on midline, (1) clavicles meet on midline (Gauthier et al. 2012 #504)
341. Interclavicle: (0) present, (1) absent (Gauthier et al. 2012 #505)
342. Interclavicle lateral process: (0) present, (1) absent (Gauthier et al. 2012 #506)
343. Interclavicle anterior process (extending beyond lateral process): (0) absent, (1) present (Gauthier et al. 2012 #507)
344. Interclavicle anterior process, length (as ratio of interclavicle length): (0) 0.01-0.20, (1) >0.20 (Gauthier et al. 2012 #508)
345. Interclavicle, anterior end: (0) ventral to clavicles, (1) dorsal to clavicles, (2) abuts clavicles, (3) lies posterior to clavicles (Gauthier et al. 2012 #509)
346. Pubis: (0) present, (1) absent (Gauthier et al. 2012 #510)
347. Pubis, symphyseal process orientation in ventral view: (0) medially directed, (1) anteromedially directed (Gauthier et al. 2012 #511)
348. Pubis, symphyseal process: (0) thick, (1) thin (Gauthier et al. 2012 #512)
349. Pubis, symphyseal process: (0) expanded distally, (1) tapered, not expanded distally (Gauthier et al. 2012 #513)

350. Pectineal (pubic) tubercle: (0) closer to acetabulum than to symphysis, (1) closer to symphysis than to acetabulum (or equal distance) (Gauthier et al. 2012 #514)
351. Pubis, tubercle orientation in ventral view: (0) anteriorly directed, (1) ventrally directed (Gauthier et al. 2012 #515)
352. Ischium: (0) present, (1) absent (Gauthier et al. 2012 #516)
353. Ischial tubercle: (0) present, (1) absent, or continuous with hypoischial cartilage (Gauthier et al. 2012 #517)
354. Hypoischium: (0) well developed (expanded at distal end), (1) vestigial (no expansion at distal end) (Gauthier et al. 2012 #518)
355. Hypoischial foramen: (0) absent, (1) present (Gauthier et al. 2012 #519)
356. Ilium, tubercle: (0) present, (1) absent (Gauthier et al. 2012 #521)
357. Ilium, blade orientation: (0) slopes posterodorsally, (1) oriented anteriorly (Gauthier et al. 2012 #522)
358. Pelvic elements (ilium, ischium, pubis): (0) in close sutural contact throughout postnatal ontogeny and co-ossified into a single pelvic bone late in postnatal ontogeny, (1) distinct elements weakly united in non-sutural contacts (Gauthier et al. 2012 #524)
359. Epiphyses on long bones: (0) present, (1) absent (Gauthier et al. 2012 #527)
360. Proximal forelimb long bones (humerus, radius and ulna): (0) present, (1) absent (Gauthier et al. 2012 #528)
361. Ratio of radius/ulna to humerus: (0) 0.50–0.61, (1) 0.62–0.97, (2) 0.98–1.10 (Gauthier et al. 2012 #529)
362. Ectepicondylar foramen: (0) present, (1) absent (Gauthier et al. 2012 #530)
363. Ulnar patella: (0) present, (1) absent (Gauthier et al. 2012 #531)
364. Ulna, olecranon process on proximal epiphysis: (0) prominent, (1) short or absent (Gauthier et al. 2012 #532)
365. Ulna, enlarged distal epiphysis that is nearly hemispherical in profile and fits into a concomitantly enlarged depression on the ulnare: (0) absent, (1) present (Gauthier et al. 2012 #533)
366. Radius, styloid process: (0) absent, (1) present on posterolateral surface of distal epiphysis (Gauthier et al. 2012 #534)
367. Carpal intermedium: (0) large, (1) small, (2) absent (Gauthier et al. 2012 #535)
368. Lateral centrale in hand: (0) separated from second distal carpal, (1) contacting second distal carpal (Gauthier et al. 2012 #537)

369. Proximal end of first metacarpal: (0) separated from medial centrale, (1) contacting medial centrale (Gauthier et al. 2012 #538)
370. Metacarpals II–IV: (0) longer than proximal phalanges, (1) shorter than proximal phalanges (Gauthier et al. 2012 #540)
371. Metacarpals, sesamoids ventral to distal heads: (0) absent, (1) present (Gauthier et al. 2012 #541)
372. Phalangeal count, reduction in manus digits II–IV: (0) three, four, five, (1) reduced to four in digit IV (Gauthier et al. 2012 #542)
373. Hyperphalangy in manus: (0) absent, (1) present in more than one digit (Gauthier et al. 2012 #544)
374. Penultimate phalanges in hand: (0) shorter than or equal to antepenultimate, (1) longer than antepenultimate (Gauthier et al. 2012 #546)
375. Femur: (0) present, (1) absent (Gauthier et al. 2012 #548)
376. Femur: (0) curved in dorsoventral plane, (1) not curved in dorsoventral plane (Gauthier et al. 2012 #549)
377. Femur, internal trochanter: (0) well developed as a prominent, distinct head, (1) poorly developed or absent (Gauthier et al. 2012 #550)
378. Fibular lunula: (0) present, (1) absent (Gauthier et al. 2012 #553)
379. Tibia, notching of distal epiphysis: (0) notch not present, epiphysis gently convex for astragalocalcaneal articulation, (1) distinct notch present, fitting onto a ridge on the astragalocalcaneum (Gauthier et al. 2012 #555)
380. Fibulo-astragalar joint: (0) occupies less than half of distal end of fibula, (1) involves most of distal end of fibula (Gauthier et al. 2012 #556)
381. Tibia and fibula: (0) remain widely separated at distal ends, (1) very close or in contact at distal ends (Gauthier et al. 2012 #557)
382. Second distal tarsal: (0) present, (1) absent (Gauthier et al. 2012 #560)
383. Astragalus and calcaneum: (0) fused with no suture visible in adult, (1) co-ossified with suture visible, (2) separated (Gauthier et al. 2012 #561)
We rescore *Shinisaurus crocodilurus* as “0” based on SMF-PH XXX.
384. Metatarsal V: (0) hooked, (1) broad proximally, but not hooked (Gauthier et al. 2012 #564)
385. Metatarsals, sesamoids ventral to distal heads: (0) absent, (1) present (Gauthier et al. 2012 #565)

386. Phalangeal counts, reduction in pes: (0) two, three, four, five, four, (1) reduced to four phalanges in digit IV and three phalanges in digit V, (2) reduced to two phalanges in digit V, (3) reduced to three phalanges in digit V (Gauthier et al. 2012 #566)
387. Hyperphalangy in digits of pes: (0) absent; (1) present in more than one digit (Gauthier et al. 2012 #567)
388. Osteoderms on body (and/or tail): (0) not imbricate, (1) imbricate, with gliding surface anteriorly, (2) imbricate anteroposteriorly (Gauthier et al. 2012 #570)
389. Osteoderm ornamentation: (0) vermiculate or smooth, (1) tuberculate (Gauthier et al. 2012 #571)
390. Dermal skull bone ornamentation: (0) smooth, (1) lightly rugose about frontoparietal suture, (2) present over dorsum, (3) present on jugal postorbital bar (Gauthier et al. 2012 #572)
391. Palpebral osteoderm below supraorbital scales (and their osteoderms): (0) absent, (1) present (Gauthier et al. 2012 #573)
392. Palpebral shape: (0) roughly triangular, (1) with elongate posterolateral process (NEW)
393. Osteoderms on dorsum: (0) apically flat or rounded, (1) keeled, (2) extremely well developed keels (crestals present) (NEW)
394. Posterior cranial osteoderms, apical surface in transverse section: (0) flat or inverted V-shaped, (1) rounded, (2) highly bulbous (NEW)
395. Osteoderms, shape: (0) square or rectangular, (1) circular to oval (NEW)
396. Osteoderms, peak on gliding surface: (0) absent, (1) present (NEW)
397. Osteoderms inside supraorbital scales: (0) absent, (1) present (Gauthier et al. 2012 #575)
398. Supraorbital osteoderms insert into sulcus along frontal supraorbital margin: (0) absent, (1) present (Gauthier et al. 2012 #576)
399. Osteoderm, lateral extent of fusion over frontal: (0) fused osteoderms extend nearly to lateral edge anterior to interparietal scute, (1) considerable space devoid of fused osteoderms lateral to frontoparietal scutes, or topographical equivalents, (2) space devoid of fused osteoderms extends also lateral to frontal scute, or topographical equivalents (NEW)
400. Osteoderms in cheek scales: (0) absent, (1) present (Gauthier et al. 2012 #577)
401. Osteoderms in gular scales: (0) absent, (1) present (Gauthier et al. 2012 #578)
402. Osteoderms in dorsal scales: (0) absent, (1) present (Gauthier et al. 2012 #579)
403. Osteoderms in ventral scales: (0) absent, (1) present (Gauthier et al. 2012 #580)

404. Osteoderms invest imbricate caudal scales: (0) absent, (1) present (Gauthier et al. 2012 #582)
405. Scleral ossicle count: (0) ≥ 16 , (1) 14–15, (2) 12–13, (3) ≤ 11 (Gauthier et al. 2012 #584)
406. Scleral ossicle shape: (0) complex and irregular, (1) square or rectangular (Gauthier et al. 2012 #585)
407. Interorbital septum: (0) present, (1) absent (Gauthier et al. 2012 #586)
408. Statolithic masses: (0) absent, (1) present (Gauthier et al. 2012 #587)
409. Calcified endolymph: (0) absent, (1) present, extends posteriorly into neck (Gauthier et al. 2012 #588)
410. Foretongue retracts into hind tongue: (0) absent, (1) present, (2) tongue can be retracted entirely into buccal cavity below larynx (Gauthier et al. 2012 #589)
411. Tongue tip notching, as percentage of tongue length: (0) no notch, (1) $< 10\%$, (2) 10–20%, (3) 20–40%, (4) $> 45\%$ (Gauthier et al. 2012 #590)
412. Infralingual folds: (0) absent, (1) present (Gauthier et al. 2012 #594)
413. Foretongue surface: (0) papillose, (1) smooth (Gauthier et al. 2012 #599)
414. Foretongue filamentous epithelium anterior extent: (0) extends to tongue tip as long filaments, (1) those overlying chemosensory part of tongue are depressed to varying degree (Gauthier et al. 2012 #600)
415. Tongue width across posterior notch/maximum tongue length: (0) 50–60%, (1) 40–44%, (2) $< 12\%$ (Gauthier et al. 2012 #602)
416. Hind tongue papilla: (0) not sharply pointed, (1) sharply pointed (Gauthier et al. 2012 #603)
417. Prey prehension: (0) crickets (or larger animals) taken primarily with tongue, (1) primarily with jaws (Gauthier et al. 2012 #604)
418. Amniote penis: (0) absent, (1) hemipenis present (Gauthier et al. 2012 #605)
419. Rectus abdominis muscles: (0) not attached to belly skin; (1) attached to hinges between ventral transverse scale rows (Gauthier et al. 2012 #607)
420. Ulnar nerve pathway: (0) superficial to limb muscles, (1) deep to limb muscles (Gauthier et al. 2012 #608)
421. Dorsal shank muscle innervation: (0) peroneal nerve, (1) interosseous nerve (Gauthier et al. 2012 #609)
422. Ovipary: (0) ovipary; (1) ovovivipary to vivipary (Gauthier et al. 2012 #610)

423. Enlarged rostral scale: (0) absent, undifferentiated, (1) present (Reeder et al. 2015 #611)
424. External narial opening: (0) enclosed entirely within nasal scale, (1) at edge of nasal scale (Reeder et al. 2015 #614)
425. Nasal-rostral contact: (0) absent, separated by scales, (1) present (Reeder et al. 2015 #617)
426. Contact between nasal and supralabial scales: (0) absent (separated by other scales), (1) present (Reeder et al. 2015 #618)
427. Minimum number of scales separating the nasal scales medially: (0) none (nasal scales contact medially), (1) one scale, (2) two, (3) three, (4) four or more scale rows (Reeder et al. 2015 #619)
428. Dorsal cephalic scales: (0) relatively small, (1) enlarged (larger than adjacent neck scales) (Reeder et al. 2015 #620)
The distribution clearly shows that this character is independent of the size of individual scales with respect to the underlying bones (characters 436-438 below).
429. Dorsal cephalic scales: (0) smooth, (1) some or all keeled (Reeder et al. 2015 #621)
There is a tendency for some scales of the temporal region to be keeled in *Shinisaurus crocodilurus*, but we retain its scoring of "0" for the present, as the condition is much closer to state 0.
430. Enlarged frontal scale between orbits: (0) absent, (1) present (Reeder et al. 2015 #623)
431. Median contact of frontoparietals: (0) present, (1) absent, frontoparietals reduced and separated by contact of frontal and interparietal (Reeder et al. 2015 #624)
432. Circumorbital scales (distinct semicircular row of scales bordering orbital region): (0) absent, (1) present (Reeder et al. 2015 #625)
433. Enlarged supraoculars: (0) absent, (1) present (scales over eye larger than surrounding scales) (Reeder et al. 2015 #626)
434. Supraoculars: (0) two or more rows of scales, (1) single row of enlarged scales between superciliary and frontal (Reeder et al. 2015 #627)
435. Superciliary scales: (0) non-overlapping, (1) overlapping (Reeder et al. 2015 #630)
436. Supralabial scales: (0) not entering orbit, (1) entering orbit (Reeder et al. 2015 #631)
437. Enlarged subocular scale (elongate scale ventral to orbit): (0) absent (or series of smaller scales), (1) present (single scale larger than surrounding scales) (Reeder et al. 2015 #632)
438. Subocular-supralabial contact: (0) absent, row of one or more scales between scales above lip (supralabials) and below the orbit (suborbitals), (1) present (Reeder et al. 2015 #633)

439. Large paired frontoparietal scutes: (0) absent (fragmented), (1) present (NEW)
440. Large paired parietal scutes scute: (0) absent (fragmented), (1) present (NEW)
441. Scallation, scales behind interparietal/parietal scutes: (0) small and irregular; (1) large and regular (NEW)
442. Scallation, parietal scutes: (0) confined to parietal bone, (1) significantly present over frontal bone (NEW)
443. Enlarged interparietal scale: (0) absent, (1) present (scale distinctly larger than surrounding head scales present over parietal region of skull). (Reeder et al. 2015 #634)
444. Fleishy eyelids: (0) present; (1) absent (Reeder et al. 2015 #641)
445. Lower eyelid scales: (0) homogeneous, (1) some enlarged scales (Reeder et al. 2015 #642)
446. External ear opening (0) present, (1) absent (Reeder et al. 2015 #645)
447. Tympanum: (0) large and superficial; (1) small and inset (Reeder et al. 2015 #646)
448. Postmentals (scales immediately posterior to mental): (0) two (enlarged scales sometimes separated by additional scales) or more scales immediately posterior to mental, (1) one, single unpaired scale immediately posterior to mental (Reeder et al. 2015 #651)
449. Enlarged scales medial to infralabials: (0) present, (1) absent, scales in chin more-or-less homogeneous (Reeder et al. 2015 #652)
450. Mental groove: (0) absent, (1) present, a distinct infolding of skin and scales along the anterior midline of the chin region (Reeder et al. 2015 #655)
451. Gular fold: (0) present, complete, (1) absent (Reeder et al. 2015 #656)
452. *Varanus*-type scale on dorsum, with small scale surrounded by tiny granular scales: (0) absent, (1) present (Reeder et al. 2015 #658)
453. Dorsal scales: (0) homogeneous, lacking enlarged scales, (1) heterogeneous, with enlarged scales separated by smaller scales, either in rows or scattered (Reeder et al. 2015 #659)
454. Dorsal body scales: (0) small, granular, non-overlapping, (1) cycloid (rounded, overlapping) (Reeder et al. 2015 #660)
- It is not entirely clear why Reeder et al. (2015) scored all Anguidae as having cycloid rather than rectangular scales, but perhaps the emphasis was on “overlapping.”
455. Dorsal body scales: (0) all smooth, (1) some or all keeled (Reeder et al. 2015 #661)
456. Dorsals, with longitudinal ridges in addition to mid-dorsal keels: (0) absent (including species lacking keels), (1) present (Reeder et al. 2015 #662)

457. Enlarged mid-dorsal scale row: (0) mid-dorsal scales same size as surrounding scales, (1) mid-dorsal scales enlarged relative to surrounding scales in both sexes (Reeder et al. 2015 #663)
458. Nuchal crest of enlarged scales: (0) absent, (1) present in both sexes (Reeder et al. 2015 #664)
459. Lateral body scales: (0) granular, non-overlapping, (1) imbricate overlapping (Reeder et al. 2015 #665)
460. Lateral fold along side of body: (0) absent, (1) present (often associated with row of granular scales in species with larger scales) (Reeder et al. 2015 #666)
461. Ventrals: (0) same size as adjacent laterals, (1) at least some distinctly larger than adjacent laterals (Reeder et al. 2015 #668)
462. Ventral scales: (0) all smooth, (1) some or all keeled (Reeder et al. 2015 #670)
463. Ventrals, posterior edge: (0) cycloid, mucronate, or otherwise rounded, (1) square (posterior margin more-or-less straight) (Reeder et al. 2015 #671)
464. Preanal pores: (0) absent, (1) present (Reeder et al. 2015 #673)
465. Tail tip: (0) pointed, tapered, (1) blunt and rounded (Reeder et al. 2015 #674)
466. Tail shape in cross-section: (0) rounded, (1) laterally compressed (Reeder et al. 2015 #676)
467. Caudal scales: (0) approximately same size as dorsal body scales, (1) distinctly larger than dorsal body scales (Reeder et al. 2015 #677)
468. Caudals (dorsal): (0) smooth, (1) mostly keeled (Reeder et al. 2015 #678)
469. Caudal scales: (0) not arranged in non-overlapping vertical rows, (1) annulated, arranged in non-overlapping vertical rows (Reeder et al. 2015 #679)
470. Enlarged preanal scales: (0) absent, (1) present (preanals enlarged relative to adjacent ventrals) (Reeder et al. 2015 #680)
471. External hindlimb: (0) present, (1) absent in both sexes (Reeder et al. 2015 #685)
472. Number of rows of subdigital scales along mid-ventral surface of digits (manus): (0) one, (1) two or more (some or all scales) (Reeder et al. 2015 #688)
473. Claws: (0) not covered by sheath of scales, (1) entirely or mostly covered by sheath (Reeder et al. 2015 #691)