Supplementary Material for

Expanded Sampling Across Ontogeny in Deltasuchus motherali (Neosuchia, Crocodyliformes): Revealing Ecomorphological Niche Partitioning and Appalachian Endemism in Cenomanian Crocodyliforms

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SUPPLEMENTARY MATERIAL FOR: EXPANDED SAMPLING ACROSS ONTOGENY IN *DELTASUCHUS MOTHERALI* (NEOSUCHIA, CROCODYLIFORMES) REVEALS ECOMORPHOLOGICAL NICHE PARTITIONING AND APPALACHIAN ENDEMISM IN CENOMANIAN CROCODYLIFORMS

APPENDIX S1: UPDATED AND EXPANDED DATASET BY TURNER (2015)

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List of characters used in the phylogenetic analyses

List of 318 phenotypic characters used in the phylogenetic analysis. The character list is adapted from Turner (2015), which in turn is based on that of Turner and Sertich (2010), Pol et al. (2009), Turner and Buckley (2008), Pol and Norell (2004a,b), Pol and Apesteguía (2005), and includes characters from Turner (2006), Brochu (1997), Pritchard et al. (2013), and Adams et al. (2017). Character definitions 1–101 are from Clark (1994) and have the same numeration as in

the original publication. Character 95 was modified with additional description of (95:1) to cover the straight anterior articular margin observed for dorsal osteoderms. Following Martin and Buffetaut (2012), character 206 was modified with an additional state added to cover the range of morphologies observed for the maxillary depression: maxillary depression absent (206:0), maxillary depression present (206:1); and maxillary depression expanding to or on jugal as a maxillojugal groove (206:2).The additional characters are also listed here and their respective sources are cited along with the character number of the original publication. Characters 319, 320, 321 were adapted from Kuzmin et. al., 2018. Character 320 was modified with an additional state added to cover the prefrontal forming most of the medial orbital margin, to the exclusion of the frontal. Characters 1, 3, 6, 10, 23, 37, 43–45, 49, 65, 67, 69, 73, 77, 79, 86, 90, 91, 96, 97, 104–106, 108, 126, 142, 143, 149, 167, 182, 197, and 226 represent potentially nested sets of homologies and/or entail presence and absence information. These characters were set as additive (also marked with a "+" in this list).

1. (modified from Clark, 1994: char. 1): + External surface of dorsal cranial bones: smooth (0), slightly grooved (1) and heavily ornamented with deep pits and grooves (2).

2. (modified from Clark, 1994: char. 2): Skull expansion at orbits: gradual (0), or abrupt (1).

3. (modified from Clark, 1994: char. 3): + Rostrum proportions: narrow oreinirostral (0), broad oreinirostral (1), nearly tubular (2), or platyrostral (3).

4. (Clark, 1994: char. 4): Premaxilla participation in internarial bar: forming at least the ventral half (0), or with little participation (1).

5. (modified from Clark, 1994: char. 6): + External nares facing anterolaterally or anteriorly (0), dorsally not separated by premaxillary bar from anterior edge of rostrum (1), or dorsally separated by premaxillary bar (2).

6. (Clark, 1994: char. 7): Palatal parts of premaxillae: do not meet posterior to incisive foramen (0), or meet posteriorly along contact with maxillae (1).

7. (Clark, 1994: char. 8): Premaxilla-maxilla contact: premaxilla loosely overlies maxilla (i.e. posterodorsal process of the premaxilla overlaps anterodorsal surface of the maxilla) (0), or sutured together along a butt joint (1).

8. (modified from Clark, 1994: char. 9): Ventrally opened notch on ventral edge of rostrum at premaxilla-maxilla contact: absent (0), present as a notch (1), or present as a large fenestra (2).

9. (modified from Clark, 1994: char. 10 by Pol et al., 2009): + Posterior palatal branches of maxillae anterior to palatines: do not meet (0), or meet extensively but posterior-most parts fail to meet (1), or meet entirely (2).

10. (Clark, 1994: char. 11): Nasal contacts lacrimal (0), or do not contact (1).

11. (Clark, 1994: char. 12): Lacrimal contacts nasal along medial edge only (0), or medial and anterior edges (1).

12. (Clark, 1994: char. 13): Nasal contribution to narial border: yes (0), or no (1).

13. (Clark, 1994: char. 14): Nasal-premaxilla contact: present (0), or absent (1).

14. (modified from Clark, 1994: char. 15): Descending process of prefrontal: does not contact palate (0), or contacts palate (1).

15. (Clark, 1994: char. 16): Postorbital-jugal contact: postorbital anterior to jugal (0), or postorbital medial to jugal (1), or postorbital lateral to jugal (2).

16. (Clark, 1994: char. 17): Anterior part of the jugal with respect to posterior part: as broad (0), or twice as broad (1).

17. (Clark, 1994: char. 18): Jugal bar beneath infratemporal fenestra: flattened (0), or rod-shaped (1).

18. (Clark, 1994: char. 19): Quadratojugal dorsal process: narrow, contacting only a small part of postorbital (0), or broad, extensively contacting the postorbital (1).

19. (Clark, 1994: char. 20): Frontal width between orbits: narrow, as broad as nasals (0), or broad, twice as broad as nasals (1).

20. (Clark, 1994: char. 21): Frontals: paired (0), unpaired (1).

21. (Clark, 1994: char. 22): Dorsal surface of frontal and parietal: flat (0), or with midline ridge (1).

22. (modified from Clark, 1994: char. 23 by Buckley and Brochu, 1999: char. 81): + Parieto-postorbital suture: absent from dorsal surface of skull roof and supratemporal fossa (0), absent from dorsal surface of skull roof but broadly present within supratemporal fossa (1), or present within supratemporal fossa and on dorsal surface of skull roof (2).

23. (Clark, 1994: char. 24): Supratemporal roof dorsal surface: complex (0), or dorsally flat "skull table" developed, with postorbital and squamosal with flat shelves extending laterally beyond quadrate contact (1).

24. (modified from Clark, 1994: char. 25) Postorbital bar: sculpted (if skull sculpted) (0), or unsculpted (1).

25. (modified from Clark, 1994: char. 26): Postorbital bar: transversely flattened (0), or cylindrical (1).

26. (Clark, 1994: char. 27): Vascular opening in dorsal surface of postorbital bar: absent (0), or present (1).

27. (modified from Clark, 1994: char. 28): Postorbital anterolateral process: absent or poorly developed (0), or well developed, long, and acute (1).

28. (Clark, 1994: char. 29): Dorsal part of the postorbital: with anterior and lateral edges only (0), or with anterolaterally facing edge (1).

29. (Clark, 1994: char. 30): Dorsal end of the postorbital bar broadens dorsally, continuous with dorsal part of postorbital (0), or dorsal part of the postorbital bar constricted, distinct from the dorsal part of the postorbital (1).

30. (Clark, 1994: char. 31): Bar between orbit and supratemporal fossa broad and solid, with broadly sculpted dorsal surface if sculpture present (0), or bar narrow, sculpting restricted to anterior surface (1).

31. (modified from Clark, 1994: char. 32): Parietal: with broad occipital portion (0), or without broad occipital portion (1).

32. (Clark, 1994: char. 33) Parietal: with broad sculpted region separating fossae (0), or with sagittal crest between supratemporal fossae (1).

33. (Clark, 1994: char. 34): Postparietal (dermosupraoccipital): a distinct element (0), or not distinct (fused with parietal?) (1).

34. (Clark, 1994: char. 35): Posterodorsal corner of the squamosal: squared off, lacking extra "lobe" (0), or with unsculptured "lobe" (1).

35. (modified from Clark, 1994: char. 36): Posterolateral process of squamosal: poorly developed and projected horizontally at the same level of the skull (0), elongated, thin, and

posteriorly directed, not ventrally deflected (1), or elongated, posterolaterally directed, and ventrally deflected (2).

36. (Clark, 1994: char. 37): + Palatines: do not meet on palate below the narial passage (0), form palatal shelves that do not meet (1), or meet ventrally to the narial passage, forming part of secondary palate (2).

37. (Clark, 1994: char. 38): Pterygoid: restricted to palate and suspensorium, joints with quadrate and basisphenoid overlapping (0), or pterygoid extends dorsally to contact laterosphenoid and form ventrolateral edge of the trigeminal foramen, strongly sutured to quadrate and laterosphenoid (1).

38. (modified from Clark, 1994: char. 39): Choanal opening: continuous with pterygoid ventral surface except for anterior and anterolateral borders (0), or opens into palate through a deep midline depression (choanal groove) (1).

39. (Clark, 1994: char. 40): Palatal surface of pterygoids: smooth (0), or sculpted (1).

40. (Clark, 1994: char. 41): Pterygoids posterior to choanae: separated (0), or fused (1).

41. (modified from Clark, 1994: char. 42 by Ortega et al., 2000: char. 139): Depression on primary pterygoidean palate posterior to choana: absent or moderate in size being narrower than palatine bar (0), or wider than palatine bar (1).

42. (Clark, 1994: char. 43): Primary pterygoidean palate, role in forming choanal opening: does not enclose choana (0); completely encloses choana (1).

43. (modified from Pol and Norell, 2004 by Pol et al., 2009; modified from Clark, 1994: char. 44): + Anterior edge of choanae situated between the suborbital fenestra (or anteriorly) (0), situated near the posterior edge of suborbital fenestra (1), or near posterior edge of pterygoid flange (2).

44. (Clark, 1994: char. 45): + Quadrate: without fenestrae (0), with single fenestrae (1), or with three or more fenestrae on dorsal and posteromedial surfaces (2).

45. (Clark, 1994: char. 46): Posterior edge of quadrate: broad medial to tympanum, gently concave (0), or posterior edge narrow dorsal to otoccipital contact, strongly concave (1).

46. (Clark, 1994: char. 47): Dorsal, primary head of quadrate articulates with: squamosal, otoccipital, and prootic (0), or with prootic and laterosphenoid (1).

47. (Clark, 1994: char. 48): Ventrolateral contact of otoccipital with quadrate: very narrow (0), or broad (1).

48. (Clark, 1994: char. 49): + Quadrate, squamosal, and otoccipital: do not meet to enclose cranioquadrate passage (0), enclose passage near lateral edge of skull (1), or meet broadly lateral to the passage (2).

49. (Clark, 1994: char. 50): Pterygoid ramus of quadrate: with flat ventral edge (0), or with deep groove along ventral edge (1).

50. (Clark, 1994: char. 51): Ventromedial part of quadrate: does not contact otoccipital (0), or contacts otoccipital to enclose carotid artery and form passage for cranial nerves IX--XI (1).

51. (Clark, 1994: char. 52): Eustachian tubes: not enclosed between basioccipital and basisphenoid (0), or entirely enclosed (1).

52. (Clark, 1994: char. 53): Basisphenoid rostrum (cultriform process): slender (0), or dorsoventrally expanded (1).

53. (Clark, 1994: char. 54): Basipterygoid process: prominent, forming movable joint with pterygoid (0), or basipterygoid process small or absent, with basisphenoid joint suturally closed (1).

54. (modified from Clark, 1994: char. 55 by Ortega et al., 2000: char. 68): Basisphenoid ventral surface: shorter than the basioccipital (0), or wide and similar to, or longer in length than basioccipital (1).

55. (Clark, 1994: char. 56): Basisphenoid: exposed on ventral surface of braincase (0), or virtually excluded from ventral surface by pterygoid and basioccipital (1).

56. (Clark, 1994: char. 57): Basioccipital: without well-developed bilateral tuberosities (0), or with large pendulous tubera (1).

57. (Clark, 1994: char. 58): Otoccipital: without laterally concave descending flange ventral to subcapsular process (0), or with flange (1).

58. (Clark, 1994: char. 59): Cranial nerves IX--XI: pass through common large foramen vagi in otoccipital (0), or cranial nerve IX passes medial to nerves X and XI in separate passage (1).

59. (Clark, 1994: char. 60): Otoccipital: without large ventrolateral part ventral to paroccipital process (0), or with large ventrolateral part (1).

60. (Clark, 1994: char. 61): Crista interfenestralis between fenestrae pseudorotunda and ovalis nearly vertical (0), or horizontal (1).

61. (Clark, 1994: char. 62): Supraoccipital: forms dorsal edge of the foramen magnum (0), or otoccipitals broadly meet dorsal to the foramen magnum, separating supraoccipital from foramen (1).

62. (Clark, 1994: char. 63): Mastoid antrum: does not extend into supraoccipital (0), or extends through transverse canal in supraoccipital to connect middle ear regions (1).

63. (Clark, 1994: char. 64): Posterior surface of supraoccipital: nearly flat (0), or with bilateral posterior prominences (1).

64. (modified from Clark, 1994: char. 65): + Palpebrals: absent (0), or one small palpebral present in orbit (1), or one large palpebral (2), or two large palpebrals (3).

65. (Clark, 1994: char. 66): External nares: divided by a septum (0), or confluent (1).

66. (Clark, 1994: char. 67): + Antorbital fenestra: as large as orbit (0), about half the diameter of the orbit (1), much smaller than the orbit (2), or absent (3).

67. (modified from Clark, 1994: char. 68 by Ortega et al., 2000: char. 41): Supratemporal fenestrae extension: relatively large, covering most of surface of skull roof (0), or relatively short, fenestrae surrounded by a flat and extended skull roof (1).

68. (modified from Clark, 1994: char. 69): + Choanal groove: undivided (0), partially septated (1), or completely septated (2).

69. (Clark, 1994: char. 70): Dentary: extends posteriorly beneath mandibular fenestra (0), or does not extend beneath fenestra (1).

70. (modified from Clark, 1994: char. 71): Retroarticular process: absent or extremely reduced (0), very short, broad, and robust (1), with an extensive rounded, wide, and flat (or slightly concave) surface projected posteroventrally and facing dorsomedially (2), posteriorly elongated, triangular- or paddle-shaped and facing dorsally (3), or posteroventrally projecting and paddle-shaped (4).

71. (Clark, 1994: char. 72): Prearticular: present (0), or absent (1).

72. (modified from Clark, 1994: char. 73): + Articular without medial process (0), with short process not contacting braincase (1), or with process articulating with otoccipital and basisphenoid (2).

73. (Clark, 1994: char. 74): Dorsal edge of surangular: flat (0), or arched dorsally (1).

74. (Clark, 1994: char. 75): Mandibular fenestra: present (0), or absent (1).

75. (Clark, 1994: char. 76): Insertion area for M. pterygoideous posterior: does not extend onto lateral surface of angular (0), or extends onto lateral surface of angular (1).

76. (modified from Clark, 1994: char. 77): + Splenial involvement in symphysis in ventral view: not involved (0), involved slightly in symphysis (1), or extensively involved (2).

77. (modified from Clark, 1994: char. 78 by Turner and Sertich, 2010): Posterior premaxillary teeth, size: similar in size to anterior teeth (0); longer but does not form an enlarged caniniform tooth (1); much longer forming one large premaxillary caniniform tooth (2); much longer forming two large premaxillary caniniform teeth (3).

78. (modified from Clark, 1994: char. 79): + Maxillary teeth waves: absent, no tooth size variation (0), one wave of teeth enlarged (1), or enlarged maxillary teeth curved in two waves (festooned) (2).

79. (Clark, 1994: char. 80): Anterior dentary teeth opposite premaxilla-maxilla contact: no more than twice the length of other dentary teeth (0), or more than twice the length (1).

80. (modified from Clark, 1994: char. 81): Dentary teeth posterior to tooth opposite premaxilla-maxilla contact: equal in size (0), or enlarged dentary teeth opposite to smaller teeth in maxillary toothrow (1).

81. (modified from Clark, 1994: char. 82 by Ortega et al., 2000: char. 120): Anterior and posterior scapular edges: symmetrical in lateral view (0), anterior edge more strongly concave than posterior edge (1), or dorsally narrow with straight edges (2).

82. (modified from Clark, 1994: char. 83 by Ortega et al., 2000: char. 121): Coracoid length: up to two-thirds of the scapular length (0), or subequal in length to scapula (1).

83. (Clark, 1994: char. 84): Anterior process of ilium: similar in length to posterior process (0), or one-quarter or less of the length of the posterior process (1).

84. (Clark, 1994: char. 85): Pubis: rodlike without expanded distal end (0), or with expanded distal end (1).

85. (Clark, 1994: char. 86): + Pubis: forms anterior half of ventral edge of acetabulum (0), or pubis contacting the ilium but partially excluded from the acetabulum by the anterior process of the ischium (1), or pubis completely excluded from the acetabulum by the anterior process of the ischium (2).

86. (Clark, 1994: char. 87): Distal end of femur: with large lateral facet for the fibula (0), or with very small facet (1).

87. (Clark, 1994: char. 88): Fifth pedal digit: with phalanges (0), or without phalanges (1).

88. (Clark, 1994: char. 89): Atlas intercentrum: broader than long (0), or as long as broad (1).

89. (modified from Clark, 1994: char. 90): + Cervical neural spines: all anteroposteriorly large (0), only posterior ones rod-like (1), or all spines rod-like (2).

90. (modified from Clark, 1994: char. 91 by Buscalioni and Sanz, 1988: char. 37 and by Brochu, 1997a: char. 7): + Hypapophyses in cervicodorsal vertebrae: absent (0), present only in cervical vertebrae (1), present in cervical and the first two dorsal vertebrae (2), present up to the third dorsal vertebra (3), or up to the fourth dorsal vertebrae (4).

91. (Clark, 1994: char. 92): Cervical vertebrae: amphicoelous or amphyplatian (0), or procoelous (1).

92. (Clark, 1994: char. 93): Trunk vertebrae: amphicoelous or amphyplatian (0), or procoelous (1).

93. (Clark, 1994: char. 94): All caudal vertebrae: amphicoelous or amphyplatian (0), first caudal biconvex with other procoelous (1), or procoelous (2).

94. (modified from Clark, 1994: char. 95 by Turner and Sertich, 2010): Dorsal osteoderms, shape: rounded or ovate (0); rectangular, broader than long (1); square (2); rectangular, longer than broad (3).

95. (modified from Clark, 1994: char. 96, and Brochu, 1997a: char. 40): + Dorsal osteoderms: without articular anterior process (0), with a straight or discrete convexity on anterior margin (1), or with a well-developed process located anterolaterally in dorsal parasagittal osteoderms (2).

Re-evaluation of the morphology of osteoderms suggests variability in the anterior margin of character state 1. Additional work is need to clarify this morphology.

96. (modified from Clark, 1994: char. 97 by Ortega et al., 2000: chars. 107 and 108 and this paper): + Rows of dorsal primary osteoderms (sensu Frey, 1988): two parallel rows (0), more than two (1), or more than four (2).

97. (Clark, 1994: char. 98): Osteoderms: some or all imbricated (0), or sutured to one another (1).

98. (Clark, 1994: char. 99): Tail osteoderms: dorsal only (0), or completely surrounded by osteoderms (1).

99. (Clark, 1994: char. 100): Trunk osteoderms: absent from ventral part of the trunk (0), or present (1).

100. (Clark, 1994: char. 101): Osteoderms: with longitudinal keels on dorsal surfaces (0), or without longitudinal keels (1).

101. (Wu and Sues, 1996: char. 14): Jugal: participating in margin of antorbital fossa (0), or separated from it (1).

102. (modified from Wu and Sues, 1996: char. 17): Mandibular symphysis in lateral view: shallow and tapering anteriorly (0), deep and tapering anteriorly (1), deep and anteriorly convex (2), or shallow and anteriorly convex (3).

103. (modified from Wu and Sues, 1996: char. 23): + Articular facet for quadrate condyle: equal in length to the quadrate condyles (0), slightly longer (1), or close to three times the length of the quadrate condyles (2).

104. (modified from Wu and Sues, 1996: char. 24 and Wu et al., 1997: char. 124): + Jaw joint: placed at level with occipital condyle (0), below basioccipital condyle about above level of lower toothrow (1), or below level of toothrow (2).

105. (modified from Wu and Sues, 1996: char. 27 and Ortega et al., 2000: char. 133): + Premaxillary tooth number: six (0); five (1); four (2); three (3); two (4); one (5).

106. (modified from Wu and Sues, 1996: char. 29): Unsculptured region along alveolar margin on lateral surface of maxilla: absent (0), or present (1).

107. (Wu and Sues, 1996: char. 30): + Maxilla, number of teeth: eight or more (0); seven (1); six (2); five (3); four (4).

108. (Wu and Sues, 1996: char. 33): Coracoid, posteromedial or ventromedial process: absent (0); elongate posteromedial process present (1); distally expanded ventromedial process present (2).

109. (Wu and Sues, 1996: char. 40): Radiale and ulnare, size: short and massive (0); elongate (1).

110. (modified from Gomani, 1997: char. 4): Prefrontals anterior to orbits: elongated, oriented parallel to anteroposterior axis of the skull (0); short and broad, oriented posteromedially-anterolaterally (1).

111. (modified from Gomani, 1997: char. 32): Basioccipital and ventral part of otoccipital, orientation: facing posteriorly (0); posteroventrally (1).

112. (Buscalioni and Sanz, 1988: char. 35): Vertebral centra, shape: cylindrical (0); spool shaped (1).

113. (modified from Buscalioni and Sanz, 1988: char. 39): Transverse process of posterior dorsal vertebrae, shape: dorsoventrally low and laminar (0); dorsoventrally high (1).

114. (Buscalioni and Sanz, 1988: char. 44): Number of sacral vertebrae two (0); more than two (1).

115. (Buscalioni and Sanz, 1988: char. 49): Supra-acetabular crest: present (0); absent (1).

116. (Buscalioni and Sanz, 1988: char. 54): Proximal end of radiale, shape: expanded symmetrically, similarly to the distal end (0); more expanded proximolaterally than proximomedially (1).

117. (Ortega et al., 1996: char. 5): Lateral surface of the anterior region of surangular and posterior region of dentary: without a longitudinal depression (0); with a longitudinal depression (1).

118. (Ortega et al., 1996: char. 9): Ventral exposure of splenials: absent (0); present (1).

119. (modified from Andrade and Bertini, 2008: char. 120; Ortega et al., 1996: char. 11; Ortega et al., 2000: char. 100): Tooth margin carinae: without carinae or with smooth or crenulated carinae (0); with homogeneous denticulate carinae (denticles are small and symmetrical in form as in ziphodont teeth (1); with heterogeneous carinae possessing rounded tubercle-like denticles, developed preferentially along posterior margin (2).

120. (modified from Pol, 1999a: char. 133 and Ortega et al., 2000: char. 145):

Lateral surface of anterior process of jugal: flat or convex (0); with broad shelf below the orbit with triangular depression underneath it (1).

121. (Pol, 1999a: char. 134): Jugal, extension below the orbit: does not exceed the anterior margin of orbit (0); exceeds margin of orbit (1).

122. (Pol, 1999a: char. 135): Notch in premaxilla on lateral edge of external nares: absent (0); present on the dorsal half of the external nares lateral margin (1).

123. (Pol, 1999a: char. 136): Dorsal border of external nares: formed mostly by the nasals (0); formed by both the nasals and premaxilla (1).

124. (Pol, 1999a: char. 138): Posterodorsal process of premaxilla: absent (0); present extending posteriorly wedging between maxilla and nasals (1).

125. (Pol, 1999a: char. 139 and Ortega et al., 2000: char. 9): + Premaxillamaxilla suture in palatal view, medial to alveolar region, orientation of suture: anteromedially directed (0); sinusoidal, posteromedially directed on its lateral half and anteromedially directed along its medial region (1); posteromedially directed (2); straight (3); posteromedially curved (U shaped) (4).

126. (Pol, 1999a: char. 140): Nasal lateral border posterior to external nares: laterally concave (0); straight (1).

127. (Pol, 1999a: char. 141): Nasal lateral edges: nearly parallel (0); oblique to each other converging anteriorly (1); oblique to each other diverging anteriorly (2).

128. (Pol, 1999a: char. 143): Palatine anteromedial margin: exceeding the anterior margin of the palatal fenestrae extending anteriorly between the maxillae (0); not exceeding the anterior margin of palatal fenestrae (1).

129. (Pol, 1999a: char. 144): Dorsoventral height of jugal antorbital region with respect to infraorbital region equal or lower (0); antorbital region more expanded than infraorbital region of jugal (1).

130. (Pol, 1999a: char. 145): Maxilla-lacrimal contact: partially included in antorbital fossa (0); completely included (1).

131. (Pol, 1999a: char. 146): Lateral eustachian tube openings, location: located posteriorly to the medial opening (0); aligned anteroposteriorly and dorsoventrally (1).

132. (Pol, 1999a: char. 147): Anterior process of ectopterygoid: developed (0); reduced-absent (1).

133. (Pol, 1999a: char. 148): Posterior process of ectopterygoid: developed (0); reduced-absent (1).

134. (Pol, 1999a: char. 149 and Ortega et al., 2000: char. 13): Small foramen located in the premaxillo-maxillary suture in lateral surface (not for big mandibular teeth): absent (0); present (1).

135. (Pol, 1999a: char. 150): Jugal posterior process, extent of process: exceeding posteriorly the infratemporal fenestrae (0); does not exceed infratemporal fenestrae (1).

136. (Pol, 1999a: char. 151): Compressed crown of maxillary teeth, orientation: oriented paraleel to the longitudinal axis of skull (0); obliquely disposed (1).

137. (Pol, 1999a: char. 152): Large and aligned neurovascular foramina on lateral maxillary surface: absent (0); present (1).

138. (modified from Pol, 1999a: char. 153): External surface of maxilla and premaxilla, general shape: with a single plane facing laterally (0); with ventral region facing laterally and dorsal region facing dorsolaterally (1).

139. (modified from Pol, 1999a: char. 154; Ortega et al., 2000: char. 104; Andrade and Bertini, 2008: char. 135): +Maxillary teeth, lateral compression: absent (0); present, compression assymetrically occuring only along distal margin giving teeth a teardrop shape (1); present, lateral compression symmetrically developed (2).

140. (Pol, 1999a: char. 155): Posteroventral corner of quadratojugal: reaches the quadrate condyles (0); does not reach the quadrate condyles (1).

141. (modified from Pol, 1999a: char. 156): + Base of postorbital process of jugal, orientation: directed posterodorsally (0); directed dorsally (1); directed anterodorsally (2).

142. (Pol, 1999a: char. 157): + Postorbital process of jugal, location on jugal: anteriorly placed (0); in the middle (1); posteriorly places (2).

143. (Pol, 1999a: char. 158 and Ortega et al., 2000: char. 36): Postorbital ectopterygoid contact: present (0); absent (1).

144. (Pol, 1999a: char. 161): Quadratojugal, ornamentation: absent (0); ornamented on the base (1).

145. (Pol, 1999a: char. 162): Prefrontal-maxillary contact in the inner anteromedial region of orbit absent (0); present (1).

146. (Pol, 1999a: char. 163): Basispenoid, exposure on braincase: without lateral exposure (0); with lateral exposure (1).

147. (Pol, 1999a: char. 165): Quadrate process of pterygoids: well developed (0); poorly developed (1).

148. (modified from Pol, 1999a: char. 166 and Ortega et al., 2000: char. 44): + Quadrate major axis, direction of orientation: posteroventrally (0); ventrally (1); anteroventrally (2).

149. (Pol, 1999a: char. 167): Quadrate distal end: with only one plane facing posteriorly (0); with two distinct faces in posterior view, a posterior one and a medial one bearing the foramen aereum (1).

150. (Pol, 1999a: char. 168): Anteroposterior development of neural spine in axis: well developed covering all the neural arch length (0); poorly developed, located over the posterior half of the neural arch (1).

151. (Pol, 1999a: char. 169): Prezygapophyses of axis, development relative to neural arch: not exceeding edge of neural arch (0); exceeding the anterior margin of neural arch (1).

152. (Pol, 1999a: char. 170): Postzygapophyses of axis: well developed, curved laterally (0); poorly developed (1).

153. (modified from Pol, 1999b: char. 212): Shape of dentary symphysis in ventral view: tapering anteriorly forming an angel (0); U-shaped, smoothly curving anteriorly (1); lateral edges longitudinally oriented, convex anterolateral corner, and extensive transversally oriented anterior edge (2).

154. (Pol, 1999b: char. 213): Unsculpted region in the dentary below the tooth row: absent (0); present (1).

155. (Buckley and Brochu, 1999: char. 102): Surangular, contribution to the glenoid fossa: forms only the lateral wall of glenoid (0); forms approximately one-third of the glenoid (1).

156. (modified from Buckley and Brochu, 1999: char. 102): Femur, anterior margin: linear (0); bears flange for coccygeofemoralis musculature (1).

157. (modified from Buckley and Brochu, 1999: char. 105): Dentary, lateral surface: smooth lateral to seventh alveolous (0); with lateral concavity for the reception of the enlarged maxillary tooth (1).

158. (modified from Ortega et al., 1996: char. 1 and Buckley and Brochu, 1999: char. 107): Dorsal edge of dentary: slightly concave or straight and subparallel to the longitudinal axis of skull (0); straight with an abrupt dorsal expansion, being straight posteriorly (1); with a single dorsal expansion and concave posterior to this (2); sinusoidal, with two concave waves (3).

159. (modified from Ortega et al., 1996: char. 2 and Buckley and Brochu, 1999: char. 108): Dentary compression and lateroventral surface anterior to mandibular fenestra: compressed and vertical (0); not compressed and convex (1).

160. (Ortega et al., 1996: char. 7 and Buckley and Brochu, 1999: char. 110): Splenial posterior to symphysis: thin (0); robust dorsally (1).

161. (Ortega et al., 1996: char. 13 and Buckley et al., 2000: char. 117): Cheek teeth: not constricted at base of crown (0); constricted (1).

162. (Ortega et al., 2000: char. 10): Ventral edge of premaxilla, location relative to maxilla: at the same height as the ventral edge of maxilla (0); located deeper, with the dorsal contour of anterior part of dentary strongly concave (1).

163. (modified from Ortega et al., 2000: char. 19): Maxillary dental implantation: teeth in isolated alveoli (0); located on a dental groove (1).

164. (Ortega et al., 2000: char. 24): Caudal tip of nasals: converge at sagittal plane (0); caudally separated by anterior sagittal projection of frontals (1).

165. (Ortega et al., 2000: char. 33): Relative length between squamosal and postorbital: squamosal is longer (0); postorbital is longer (1).

166. (modified from Ortega et al., 2000: character 34): + Jugal portion of postorbital bar, relative to lateral surface of jugal: flush with lateral surface (0); anteriorly continuous but

posteriorly inset (1); medially displaced and a ridge separate postorbital bar from lateral surface of jugal (2).

167. (Ortega et al., 2000: char. 42): Outer surface of squamosal laterodorsally oriented: extensive (0); reduced and sculpted (1); reduced and unsculpted (2).

168. (Ortega et al., 2000: char. 47): Quadratojugal spine at caudal margin of infratemporal fenestra: absent (0); present (1).

169. (modified from Ortega et al., 2000: char. 53): Quadrate condyles: poorly developed intercondylar groove (0); medial condyle expands ventrally, being separate from the lateral condyle by a deep intercondylar groove (1).

170. (Ortega et al., 2000: char. 62): Exposure of supraoccipital in skull roof: absent (0); present (1).

171. (Ortega et al., 2000: char. 70): Nasal participation in antorbital fenestra: present (0); absent (1).

172. (Ortega et al., 2000: char. 75): Anterior opening of temporo-orbital canal, in dorsal: exposed (0); hidden in dorsal view and overlapped by squamosal rim of supratemporal fossa (1).

173. (Ortega et al., 2000: char. 90): Foramen intramandibularis oralis: small or absent (0); big and slot-like (1).

174. (modified from Ortega et al., 2000: char 98): Coronoid size: short and located below the dorsal edge of the mandibular ramus (0); anteriorly extended with posterior region elevated at the dorsal margin of the mandibular ramus (1).

175. (Ortega et al., 2000: char. 101): Width of root of teeth with respect to crown: narrower or equal (0); wider (1).

176. (Ortega et al., 2000: char. 109): Gap in cervico-thoracic dorsal armor: absent (0); present (1).

177. (Ortega et al., 2000: char. 130): Lateral contour of snout in dorsal view: straight (0); sinusoidal (1).

178. (Ortega et al., 2000: char. 138): Pterygoidean flanges: laminar and expanded (0); bar-like and elongated (1); bar-like and poorly developed (2).

179. (Ortega et al., 2000: char. 146): Ectopterygoid medial process, shape: single process (0); forked (1).

180. (modified from Ortega et al., 2000: char. 157): Skull roof, shape in dorsal view: rectangular (0); trapezoidal (1).

181. (Ortega et al., 2000: char. 30): + Prefrontal pillars when integrated in palate: pillars transversely expanded (0); transversely expanded in their dorsal part and columnar ventrally (1); longitudinally expanded in their dorsal part and columnar ventrally (2).

182. (Ortega et al., 2000: char. 21): Ventral edge of maxilla in lateral view: straight or convex (0); sinusoidal (1).

183. (modified from Ortega et al., 2000: char. 156): Position of first enlarged maxillary teeth: second or third alveoli (0); fourth or fifth (1).

184. (Pol and Apesteguía, 2005: char. 180): Splenial-dentary suture at symphysis on ventral surface: v-shaped (0); transversal (1).

185. (Pol and Apesteguía, 2005: char. 181): Posterior peg at symphysis: absent (0); present (1).

186. (Pol and Apesteguía, 2005: char. 182): Posterior ridge on glenoid fossa of articular: present (0); absent (1).

187. (modified from Pol et al., 2009; previously from Gomani, 1997: char. 46; Buckley et al., 2000: char. 113; Andrade and Bertini, 2008: char 149): Cusps of teeth, number and conformation: one unique cusp (0); one main cusp with smaller cusps arranged in one row (1); one main cusp with smaller cusps arranged in more than one row (2); several cusps of equal size arranged in more than one row (3); multiple small cusps along edges of occlusal surface (4).

188. (Pol and Apesteguía, 2005: char. 184): Dorsal surface of mandibular symphysis: flat or slightly concave (0); strongly concave and narrow, trough shaped (1).

189. (Pol and Apesteguía, 2005: char. 185): Medial surface of splenials posterior to symphysis: flat or slightly convex (0); markedly concave (1).

190. (Pol and Apesteguía, 2005: char. 186): Choanal septum shape: narrow vertical bony sheet (0); T-shaped bar expanded ventrally (1); massive and blocky (2).

191. (Pol and Norell, 2004a: char. 164): Cross section of distal end of quadrate: mediolaterally wide and anteroposteriorly thin (0); subquadrangular (1).

192. (Pol and Apesteguía, 2005: char. 188): Lateral surface of dentaries below alveolar margin, at mid to posterior region of tooth row: vertically oriented, continuous with rest of lateral surface of the dentaries (0); flat surface exposed laterodorsally, divided by a ridge from rest of the lateral surface of the dentaries (1).

193. (Pol and Norell, 2004a: char. 165): Palatine-pterygoid contact on palate: palatines overlies pterygoids (0); palatines firmly sutured to pterygoids (1).

194. (Pol et al., 2004: char. 164): Ectopterygoid main axis orientation: laterally or slightly anterolaterally (0); anteriorly, subparallel to the skull longitudinal axis (1).

195. (Wu et al., 1997: char. 103): Squamosal descending process: absent (0); present (1).

196. (modified from Wu et al., 1997: char. 105): + Development of distal quadrate body ventral to otoccipital-quadrate contact: distinct (0); incipiently distinct (1); indistinct (2).

197. (Wu et al., 1997: char. 106): Pterygoid flanges, size: thin and laminar (0); dorsoventrally thick, with pneumatic spaces (1).

198. (Wu et al., 1997: char. 108): Postorbital participation in infratemporal fenestra: almost or entirely excluded (0); bordering infratemporal fenestra (1).

199. (Wu et al., 1997: char. 109): Palatines, contribution to suborbital fenestra: form margin of suborbital fenestra (0); excluded from margin of suborbital fenestra (1).

200. (Wu et al., 1997: char. 110): Angular posterior to mandibular fenestra, location on mandible: widely exposed on lateral surface of mandible (0); shifted to the ventral surface of mandible (1).

201. (Wu et al., 1997: char. 112): Posteroventral edge of mandibular ramus, shape: straight or convex (0); markedly deflected (1).

202. (modified from Wu et al., 1997: char. 119): Quadrate ramus of pterygoid, width in ventral view: narrow (0); broad (1).

203. (Wu et al., 1997: char. 121): Pterygoids, contact on palate: not in contact anterior to basisphenoid on palate (0); pterygoids in contact (1).

204. (modified from Wu et al., 1997: char. 122): Olecranon: well developed (0); absent (1).

205. (Wu et al., 1997: char. 123): Cranial table width with respect to ventral portion of skull: as wide as ventral portion (0); narrower than ventral portion of skull (1).

206. (Wu et al., 1997: char. 127): Depression on posterolateral surface of maxilla: absent (0); present (1); maxillary depression expanding to or on jugal as a maxillojugal groove (2).

207. (modified from Wu et al., 1997: char. 128 by Pol et al., 2009): Paired anterior palatal fenestra: absent (0); present (1).

208. (Pol and Norell, 2004a: char. 179): Paired ridges located medially on ventral surface of basisphenoid: absent (0); present (1).

209. (Pol et al., 2004a: char. 179): Ventral margin of infratemporal bar of jugal: straight (0); dorsally arched (1).

210. (Pol and Norell, 2004a: char. 180): Posterolateral end of quadratojugal, shape and relationship with quadrate: acute or rounded, tightly overlapping the quadrate (0); with sinusoidal ventral edge and wide and rounded posterior edge slightly overhanging the lateral surface of the quadrate (1).

211. (Pol and Norell, 2004a: char. 181): Quadrate body distal to otoccipitalquadrate, orientation of contact in posterior view: ventrally oriented (0); ventrolaterally oriented (1).

212. (Gasparini et al., 1993: char. 3): Wedge-like process of the maxilla in lateral surface of premaxilla-maxilla: absent (0); present (1).

213. (Pol and Norell, 2004b: char. 181): Palpebrals: separated from the lateral edge of the frontal (0); extensively sutured to each other and to the lateral margin of the frontals (1).

214. (Pol and Norell, 2004b: char. 182): External surface of ascending process of jugal: exposed laterally (0); exposed posterolaterally (1).

215. (modified from Pol and Norell, 2004b: char. 183 by Pol et al., 2009 and Turner and Sertich, 2010): Longitudinal ridge on lateral surface of jugal below infratemporal fenestra: absent (0); present, running entire length of of posterior process of jugal (1); present, running entire length of jugal (2).

216. (Pol and Norell, 2004b: char. 184): Dorsal surface of posterolateral region of squamosal: without ridges (0); with three curved ridges oriented longitudinally (1).

217. (Pol and Norell, 2004b: char. 185): Ridge along dorsal section of quadrate-quadratojugal contact: absent (0); present (1).

218. (modified from Pol and Norell, 2004b: char. 186 by Pol et al., 2009): Sharp ridge on the surface of the angular: absent (0); present on the ventral-most margin (1); present along the lateral surface (2).

219. (Pol and Norell, 2004b: char. 187): Longitudinal ridge along the dorsolateral surface of surangular: absent (0); present (1).

220. (Pol and Norell, 2004b: char. 188): Dorsal surface of osteoderms ornamented with anterolaterally and anteromedially directed ridges (fleur de lys pattern of Osmólska et al., 1997): absent (0), or present (1).

221. (Pol and Norell, 2004b: char. 189): Cervical region surrounded by lateral and ventral osteoderms sutured to dorsal elements: absent (0), or present (1).

222. (Pol and Norell, 2004b: char. 190): Appendicular osteoderms: absent (0), or present (1).

223. (Ortega et al., 2000: character 72): Supratemporal fenestra: present (0), or absent (1).

224. (modified from Pol and Apesteguía, 2005: char. 220 and Pol et al., 2009): Flat ventral surface of internal nares septum: parallel sided (0), tapering anteriorly (1), or expanding anteriorly (2).

225. (modified from Pol and Apesteguía, 2005: char. 221): + Perinarial fossa: restricted extension (0); extensive, with distinctly concave surface facing anteriorly (1); large concave surface facing anteriorly, projecting anteroventrally from external nares and opening toward

alveolar margin (2); or extremely large and well-developed, occupying nearly entire surface of premaxilla ventral to external naris (3).

226. (modified from Sereno et al., 2001: char. 67): Premaxillary palate, circular paramedian depressions: absent (0); present, located anteriorly on the premaxilla (1); present, located at the premaxilla-maxilla suture (2).

227. (Pol and Apesteguía, 2005: char. 223): Nasals, shape of posterolateral region: flat surface facing dorsally (0); lateral region deflected ventrally, forming part of the lateral surface of the snout (1).

228. (Zaher et al., 2006: char. 193): Lacrimal, posterior extent and relationship with jugal: extends ventroposteriorly, widely contacting the jugal (0); tapers ventroposteriorly, does not contact or contacts the jugal only slightly (1).

229. (Zaher et al., 2006: char. 194): Jugal, large foramen on the lateral surface near the anterior margin: absent (0); present (1).

230. (modified from Zaher et al., 2006: char. 195): Procumbent premaxillary alveoli: absent (0); present (1).

231. (modified from Martinelli, 2003: char. 36 by Zaher et al., 2006: char. 196 and Turner, 2004: char. 119): Palatines, orientation: run parasagittally along midline (0); diverge laterally becoming rodlike caudally forming palatine bars (1).

232. (Zaher et al., 2006: char. 197): Ectopterygoid, participation in the palatine bar: absent (0); present (1).

233. (Pol and Norell, 2004a: char. 183): Choanal opening: opened posteriorly and continuous with pterygoid surface (0); closed posteriorly by an elevated wall formed by the pterygoids (1).

234. (Zaher et al., 2006: char. 198): Ectopterygoid, extent of medial projection on the ventral surface of pterygoid flanges: barely extended (0); widely extended covering approximately the lateral half of the ventral surface of the pterygoid flanges (1).

235. (Gasparini et al., 2006: char. 236): Evaginated maxillary alveolar edges: absent (0); present as a continuous sheet (1); present as discrete evaginations at each alveoli (2).

236. (Gasparini et al., 2006: char. 237): Premaxilla, foramen in perinarial depression: absent (0); present (1).

237. (Sereno et al., 2001: char. 27): Frontal, anterior ramus with respect to the tip of the prefrontal: ending posteriorly (0); ending anteriorly (1).

238. (modified from Sereno et al., 2001: char. 68): Premaxilla, anterior alveolar margin orientation: vertical (0); inturned (1).

239. (modified from Sereno et al., 2001: char. 69): Premaxillary tooth row orientation: arched posteriorly from midline (0); angled posterolaterally, at 120 degree angle (1); transverse (2).

240. (Sereno et al., 2001: char. 70): Last premaxillary tooth position relative to tooth row: anterior (0); anterolateral (1).

241. (Gasparini et al., 2006: char. 242): Posterior teeth with rings of undulated enamel: absent (0); present (1).

242. (modified from Brochu, 1999: char. 108 by Gasparini et al., 2006: char. 243): Maxilla-palatine suture, shape of palatines: palatine anteriorly rounded (0); palatine anteriorly pointed (1); palatine invaginated (2).

243. (Gasparini et al., 2006: char. 244): Postorbital bar, lateral surface formed by: postorbital and jugal (0); only by postorbital (1).

244. (Gasparini et al., 2006: char. 245): Surangular groove, enlarged foramen at anterior end: absent (0); present (1).

245. (Gasparini et al., 2006: char. 246): Shape of antorbital fossa: subcircular or subtriangular (0); elongated, low, and oriented obliquely (1).

246. (Gasparini et al., 2006: char. 247): Prefrontal lateral developent: reduced (0); enlarged, extending laterally over the orbit (1).

247. (Gasparini et al., 2006: char. 248): Foramen for the internal carotid artery: reduced, similar in size to the openings of cranial nerves IX-XI (0); extremely enlarged (1).

248. (Gasparini et al., 2006: char. 249): Squamosal posterolateral region, lateral to paroccipital process: narrow (0); bearing a sub-rounded flat surface (1).

249. (Gasparini et al., 2006: char. 250): Posteromedial branch of squamosal, orientation: transversely oriented (0); posterolaterally oriented (1).

250. (Gasparini et al., 2006: char. 251): Squamosal, dorsal margin of occipital flange: straight (0); dorsally concave (1).

251. (Gasparini et al., 2006: char. 252): Sculpture in external surface of rostrum: absent (0); present (1).

252. (Gasparini et al., 2006: char. 253): Longitudinal depressisons on palatal surface of maxillae and palatines: absent (0); present (1).

253. (Gasparini et al., 2006: char. 254): Angle between medial and anterior margins of supratemporal fossa: approximately 90 degrees (0); approximately 45 degrees (1).

254. (Gasparini et al., 2006: char. 255): Sacral vertebrae, direction of transverse processes: laterally (0); markedly deflected ventrally (1).

255. (Gasparini et al., 2006: char. 256): Prefrontal and lacrimal around orbits: forming flat rims (0); evaginated, forming elevated rims (1).

256. (Gasparini et al., 2006: char. 257): Nasal bones: paired (0); partially or completely fused (1).

257. (Brochu, 1997a: char. 3): Axial neural spines, width of posterior half: wide (0); narrow (1).

258. (Brochu, 1997a: char. 19): Axial hyapophysis, deep fork: present (0); absent (1).

259. (Brochu, 1997a: char. 27): Ulna, width of olecranon process: narrow and subangular (0); wide and rounded (1).

260. (Brochu, 1997a: char. 29): M. teres major and M. dorsalis scapulae insert separately on humerus: scars can be distinguished dorsal to deltopectoral crest (0); insert with common tendon, single insertion scar (1).

261. (modified from Brochu, 1997a: char. 53): Dentary, projection of anterior alveoli: anterodorsally (0); weakly procumbent (1); strongly procumbent (2).

262. (Brochu, 1997a: char. 84): Squamosal, dorsal and ventral rims of squamosal groove for external ear valve musculature: parallel (0); or squamosal groove flares anteriorly (1).

263. (Brochu, 1997a: char. 91): Ectopterygoid, contact with maxilla near toothrow: ectopterygoid abuts maxillary toothrow (0); maxilla broadly separates ectopterygoid from maxillary toothrow (1).

264. (Brochu, 1997a: char. 92): Shallow fossa at anteromedial corner of supratemporal fenestra: present (0); absent, anteromedial corner of supratemporal fenestra smooth (1).

265. (modified from Brochu, 1997a: char. 103 by Pol et al., 2009): Lateral margins of the frontal, relative to the skull surface: flush with skkull surface (0); elevated, forming ridged orbital margins (1).

266. (Brochu, 1997a: char. 130): Laterosphenoid, orientation of capitate process: laterally oriented (0); anteroposteriorly oriented toward midline (1).

267. (modified from Brochu, 1997a: char. 141 by Pol et al., 2009): Exoccipital, development of boss and paroccipital process: boss prominent on paroccipital process, process lateral to cranioquadrate opening short (0); boss small or absent on paroccipital process, process lateral to cranioquadrate opening long (1).

268. (modified from Norell, 1988: char. 32 by Brochu, 1997a: char. 149): Ectopterygoid, extent along lateral pterygoid flange, at maturity: extends to posterior tip of lateral pterygoid flange (0); does not extend to posterior tip of lateral pterygoid (1).

269. (modified from Brochu, 1997a: char. 153): Incisive foramen, location relative to premaxillary toothrow: foramen situated far from premaxillary toothrow, at the level of the second or third alveolus (0); abuts premaxillary toothrow (1); projects between first premaxillary teeth (2).

270. (modified from Turner, 2006: character 126 by Pol et al., 2009 by Pritchard et al., 2013): Ventral surface of choanal septum: smooth to slightly depressed (0); marked by a acute groove (1); vomeral septum divided by into bilateral laminae (2).

271. (modified from Turner, 2006 char. 128 by Pol et al., 2009): Proximal-most portion of fibular head: straight sided to weakly developed posteriorly (0); very sharply projecting posteriorly, forming distinct extension (1).

272. (modified from Turner, 2006: char. 129): Cervical rib shaft, posterior process, posterodorsally projecting spine at the junction with the tubercular process: absent (0); present (1); State 2 (2).

273. (modified from Pol et al., 2009: char. 274): Longitudinal keels on dorsal surface of osteoderms: restricted to the posterior edge of osteoderm (0); not restricted to the posterior edge (1).

274. (Pol et al., 2009: char. 275): Jugal, anteriorly on lateral surface below orbits: lacks a depression (0); possesses a depression (1).

275. (modified from Pol et al., 2009: char. 276 by Pritchard et al., 2013): Transverse ridge crossing the frontal anteromedial to the orbits: absent (0); present as a ridge (1); present as prominent anteriorly-curved shelf (transverse interorbital crest sensu Andrade and Hornung 2011) (2); present as anteroposteriorly-oriented crest on frontal (3).

276. (Pol et al., 2009: char. 278): Anterior half of interfenestral bar between suborbital fenestrae: lateral margins are parallel to subparallel (0); flared anteriorly (1).

277. (Pol et al., 2009: char. 279): Posterior half of interfenestral bar between suborbital fenestrae: lateral margins are parallel to subparallel (0); flared posteriorly (1).

278. (Pol et al., 2009: char. 280): Angular, shape of posteroventral margin: straight or gently arched dorsally (0); strongly arched dorsally (1).

279. (Pol et al., 2009: char. 282): Fibula, shaft distal to iliofibularis trochanter: straight (0); bowed posteriorly (1).

280. (Buckley and Brochu, 1999: char. 106): Scapular blade width: no more than twice the length of the scapulocoracoid articulation (0); scapular blade very broad and greater than twice the length of the scapulocoracoid articulation (1).

281. (modified from Buckley et al., 2000: char. 115 by Pritchard et al., 2013): Vomer, exposure on palate: vomer contributes flattened plate to secondary palate (0); vomer forms no part of secondary palate (1).

282. (Turner and Buckley, 2008: char. 285): Supraoccipital, when present on dorsal skull roof: with narrow exposure, parietal forms portion of occipital surface (0); with broad exposure, parietal does not form portion of occipital surface (1).

283. (Turner and Buckley, 2008: char. 286): Jugal, anterior and posterior processes: inline dorsoventrally (0); anterior and posterior processes at a sharp angle to one another, both processes slope ventrally to form a strongly arched jugal (1).

284. (Turner and Buckley, 2008: char. 287): Lateral expansion of posterodorsal edge of surangular anterior to glenoid fossa: absent (0); present (1).

285. (Turner and Buckley, 2008: char. 288): In lateral view, anterior process of the squamosal extending to the orbital margin, overlapping the postorbital: absent (0); present (1).

286. (Turner and Buckley, 2008: char. 289): In lateral view, surangular and dentary suture: simple with little or no interdigitating (0); suture complex with interlocking prongs from both surangular and dentary, three posterior prongs from the dentary and two form the surangular (1).

287. (Turner and Buckley, 2008: char. 290): Prominent depression on the palate near alveolar margin at the level of the 6th or 7th alveoulus: absent (0); present (1).

288. (Andrade and Bertini, 2008: char. 103): Pterygoid, ventral surface of pterygoid flanges, parachoanal fossae: absent (0); present (1).

289. (Turner and Sertich, 2010: char. 292): Pterygoid, in ventral view, participation in the suborbital fenestra: pterygoid forms margin of suborbital fenestra (0); excluded from suborbital fenestra (1).

290. (Turner and Sertich, 2010: char. 293): Maxilla, lateral surface along alveolar margin, conformation of the neurovascular foramina: foramina absent or form a single continuous row (0); gap in foramina between an anterior series and a posterior series (1).

291. (Turner and Sertich, 2010: char. 294): Surface of tooth enamel: smooth or slightly crenulated (0); with ridges at base of crown (1).

292. (Turner and Sertich, 2010: char. 295): Posterior (molariform) teeeth, wear facets: absent (0); present (1).

293. (Turner and Sertich, 2010: char. 296): Tooth (with transitional morphology) present at premax-max contact absent (0); present (1).

294. (Turner and Sertich, 2010: char. 297): Basioccipital, midline crest on basioccipital plate below occipital condyle absent (0); present (1).

295. (Turner and Sertich, 2010: char. 298): Dorsal osteoderms, accessory ranges of osteoderms (sensu Frey, 1988) absent (0); present (1).

296. (Andrade and Bertini, 2008: char. 131): Maxillary tooth, size relative to maxillary palatal surface in palatal view proportionally small teeth, occupying only marginal portion of ventral surface of maxilla (0); proportionally well-developed teeth, occupying large area of maxillary palatal surface (1).

297. (Jouve, 2009: character 75; Jouve, 2004: character 68): Ventral lamina of jugal extends far anterior to the ectopterygoid (0); ends at the level of the ectopterygoid (1).

298. (Sereno and Larsson, 2009: character 199; adapted from Norell, 1988: character 42 and Brochu, 1997: character 51): Surangular extension toward posterior end of retroarticular process along entire length (0); pinched off anterior to posterior tip (1).

299. (Turner, 2015): Muscle attachment scars on ventral surface of quadrate ramus: form modest crests (0); prominent knobs (1).

300. (Turner, 2015): Pterygoid flange shape: mediolaterally broad, reaching laterally beyond medial margin of quadrate condyles (0); relatively narrow, does not reach laterally to medial margin of quadrate condyles (1).

301. (Turner, 2015): In ventral view, posterior process of maxilla relative to ITF excluded from ITF (0); forms part of ITF (1).

302. (Turner, 2015): Highly modified ectopterygoid, mediolaterally broad and flattened with greatly expanded: absent (0); present, robust anterior process larger than posterior process (1); present, anterior and posterior process roughly equal in size (2).

303. (Turner, 2015): In ventral view, palate medial to toothrow: forms a single continuous surface (0); ridge running on the palate medial to toothrow formed by maxilla and ectopterygoid (1).

304. (Turner, 2015): Maxillary tooth row, penultimate and ultimate maxillary teeth enlarged and highly modified crushing tooth: absent (0); present (1).

305. (Turner, 2015): Prefrontals: do not meet at midline (0); meet at midline (1).

306. (Turner, 2015): Pear shaped external naris: absent (0); present (1).

307. (Turner, 2015): Skull, dorsal surface at parietal-squamosal contact surface: continuous across suture (0); suture marked by groove or sulcus (1).

308. (Turner, 2015): Maxilla, lateral surface, continuous groove or sulcus extending from orbital margin to near orbital margin towards narial opening: absent (0); present (1).

309. (Turner, 2015): Maxilla, posteromedial process curving posteriorly onto palatine formed nasopharyngeal passage: absent (0); present (1).

310. (Turner, 2015): Squamosal, posterior half, dorsal and ventral rims of groove for external ear valve musculature: thin or parallel sided (0); flared posteriorly (1).

311. (Turner, 2015): Lacrimal, in dorsal view, anterior extent on rostrum relative to prefrontal: prefrontal extends farther anteriorly (0); lacrimal extends farther anteriorly (1); lacrimal and prefrontal subequal in anterior extent (2).

312. (Turner, 2015): Lacrimal, in dorsal view, mediolateral width relative to prefrontal: equal to or less than width of prefrontal (0); wider than prefrontal (1).

313. (Turner, 2015): Premaxillae, degree of contact posterior to the incisive foramen: extensive contact (0); narrow contact (1).

314. (Turner, 2015): Posterior margin of the palatines where they form the floor of the nasopharyngeal passage, shape: V- or U-shaped (0); straight (1).

315. (Turner, 2015): Posterior margin of the choanal groove, location: anteriorly on the pterygoids (0); posteriorly on the pterygoids near the posterior margin of pterygoids (1).

316. (Turner, 2015): Pterygoid-palatine contact, ventral aspect of palate, shape of the suture: transverse, or nearly so (0); prong of pterygoid projects anteriorly (1).

317. (Turner, 2015): On palate, foramen located on premaxilla/maxilla suture near the alveolar border: absent (0); present (1).

318. (Turner, 2015): Ectopterygoid/pterygoid contact in ventral view: complex, anterior part of ectopterygoid forming suture whereas posterior part of ectopterygoid overlaps the pterygoid (0); sutured along entire contact, no part of ectopterygoid overlapping pterygoid (1).

319. (Kuzmin et. al., 2019: char. 322): Length of the dentary symphysis, in dorsal view: shortened, not extending posteriorly beyond the level of the fifth dentary alveolus (0); elongated, extending posteriorly beyond the level of the fifth dentary alveolus (1).

320. (Kuzmin et. al., 2019: char. 323): Relative degree of the prefrontal-frontal participation to the medial orbital margin (in adults): equal, or the frontal forms most of the medial orbital

margin (0); the prefrontal forms most of the medial orbital margin, with the frontal forming only small posteromedial corner (1); prefrontal forms most of the medial orbital margin, excluding the frontal (2).

321. (Kuzmin et. al., 2019: char. 324): Width of the premaxillary rostrum at the level of the reception of enlarged dentary teeth, in dorsal view (the character is scored only for taxa, which have dorsally or slightly anterodorsally oriented naris in the sagittal plane): narrow, width of the premaxillary rostrum is nearly equal to the width of the naris (0); wide, width of the premaxillary rostrum is nearly twice the width of the naris (1).

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