**Supplemental Material**

**A large-sized mesoeucrocodylian from the Late Cretaceous of Brazil with possible neosuchian affinities**

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# **CHARACTER LISTS**

## *Martínez et al. (2018):*

**The last 7 characters are newly proposed.**

Character 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).

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

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

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

Character 5 (Clark, 1994: char. 5): Premaxilla anterior to nares: narrow (0), or broad (1).

Character 6 (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).

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

Character 8 (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).

Character 9 (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 notch (2), or present as a notch that is closed ventrally (or largely constrained at its ventral edge) (3).

Character 10 (modified from Clark, 1994: char. 10): + 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).

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

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

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

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

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

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

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

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

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

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

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

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

Character 23 (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).

Character 24 (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).

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

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

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

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

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

Character 30 (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).

Character 31 (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).

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

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

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

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

Character 36 (modified from Clark, 1994: char. 36 and Riff, 2007: 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), or elongated and ventrally directed forming an angle of approximately 90 degrees with the skull roof (3), or posterodorsally deflected (4).

Character 37 (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).

Character 38 (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).

Character 39 (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).

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

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

Character 42 (modified from Clark, 1994: char. 42 and from Ortega et al., 2000: char. 139): Choanal opening size: moderately broad or narrow, equal or less than 30% the width between the lateral margins of the pterygoid flanges (0), or extremely broad approximately 50% the width between the lateral margins of the pterygoid flanges (1).

Character 43 (modified from Clark, 1994: char. 43): + Primary pterygoidean palate: forms posterior half of the choanal opening (0), or forms posterior, lateral and part of the anterior margin of the choana (1), or completely enclose choana (2).

Character 44 (modified from Pol and Norell, 2004 and 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 posterior to the suborbital fenestra (reaching in some cases the edge of pterygoid flange) (2).

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

Character 46 (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).

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

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

Character 49 (Modified from 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 lateral to the passage with otoccipital contacting the quadrate lateral to the posterior opening of the passage (2).

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

Character 51 (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).

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

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

Character 54 (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).

Character 55 (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).

Character 56 (modified from Clark, 1994: char. 56): Basisphenoid: exposed on ventral surface of braincase (0), or hidden from ventral surface by pterygoid flanges that extend posteriorly up to the level of the basioccipital-basisphenoid suture (1).

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

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

Character 59 (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).

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

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

Character 62 (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).

Character 63 (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).

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

Character 65 (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).

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

Character 67 (Modified from Clark, 1994: char. 67): + Antorbital fenestra as large as orbit (0) or less than half the diameter of the orbit (1) or absent (2).

Character 68 (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).

Character 69 (modified from Clark, 1994: char. 69): + Choanal groove: undivided (0), partially septated, with parts of the septum located dorsal to the lateral choanal margins (1), or completely septated, with septum leveled with the lateral margins of the choana along its entire length (2).

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

Character 71 (modified from Clark, 1994: char. 71): + Lateral flange of retroarticular process: straight and directed ventrally forming an angle of approximately 90 degrees with the longitudinal axis of the mandibular ramus (0), directed posteroventrally or posteriorly, with posterior end slightly upturned (1), directed posteroventrally or posteriorly, with posterior end markedly recurved dorsally (2).

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

Character 73 (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).

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

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

Character 76 (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).

Character 77 (modified from Clark, 1994: char. 77 and Brochu, 1999: char. 43): + Splenial involvement in symphysis in ventral view: not involved (0), involved slightly in symphysis forming up to 20% symphyseal length (1), or forming close to 30% of the symphyseal length (2), or extensively involved forming up to 50% of the symphyseal length and occupying more than the length of five alveoli (3).

Character 78 (Clark, 1994: char. 78): Posterior premaxillary teeth: similar in size to anterior teeth (0), or hypertrophied (1).

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

Character 80 (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).

Character 81 (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).

Character 82 (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).

Character 83 (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).

Character 84 (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).

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

Character 86 (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).

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

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

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

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

Character 91 (modified from Clark, 1994: char. 91; by Buscalioni and Sanz, 1988: char. 37; 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 at least up to the third dorsal vertebra (3); or up to the fourth dorsal vertebrae; (4) or present beyond to the fourth dorsal vertebrae (5).

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

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

Character 94 (Modified from Clark, 1994: char. 94): First caudal vertebrae: amphicoelous or amphyplatian (0), biconvex (1), or opisthocoelous (2), or procoelous (3).

Character 95 (Clark, 1994: char. 95): Dorsal osteoderms: rounded or ovate (0), or rectangular, broader than long (1), or square (2), or rectangular, longer than broad (3).

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

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

Character 98 (Modified from Clark, 1994: char. 98): Osteoderms: some or all imbricated (0), or sutured to one another (1), or not in contact (2).

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

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

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

Character 102 (Wu and Sues, 1996: char. 14): Jugal: participating in margin of antorbital fossa (0), or separated from it (1).

Character 103 (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).

Character 104 (modified from Wu and Sues, 1996: char. 23): Articular facet for quadrate condyle: wider than broad (0), or elongated, equal to or more than twice the length of the quadrate condyles (1).

Character 105 (modified from Wu and Sues, 1996: char. 24 and Wu et al., 1997: char. 124): + Jaw joint: placed at level with basioccipital condyle (0), below basioccipital condyle about above level of lower toothrow (1), or below level of toothrow (2).

Character 106 (modified from Wu and Sues, 1996: char. 27 and Ortega et al., 2000: char.133): Premaxillary teeth: five or more (0), four (1), three (2), or two (3).

Character 107 (modified from Wu and Sues, 1996: char. 29): Unsculptured region along alveolar margin on lateral surface of maxilla: absent (0), or present (1).

Character 108 (Wu and Sues, 1996: char. 30): Maxilla: with eight or more teeth (0), seven (1), six (2), five (3), or four teeth (4).

Character 109 (Wu and Sues, 1996: char. 33): Coracoid: without posteromedial or ventromedial process (0), with elongate posteromedial process (1), or distally expanded ventromedial process (2).

Character 110 (Wu and Sues, 1996: char. 40): Radiale and ulnare: short and massive (0), or elongate (1).

Character 111 (modified from Gomani, 1997: char. 4): Prefrontals anterior to orbits: elongated, oriented parallel to anteroposterior axis of the skull (0), or short and broad, oriented posteromedially-anterolaterally (1).

Character 112 (modified from Gomani, 1997: char. 32): Basioccipital and ventral part of otoccipital: facing posteriorly (0), or posteroventrally (1).

Character 113 (Buscalioni and Sanz, 1988: char. 35): Vertebral centra: cylindrical (0), or spool shaped (1).

Character 114 (modified from Buscalioni and Sanz, 1988: char. 39): Transverse process of posterior dorsal vertebrae dorsoventrally low and laminar (0), or dorsoventrally high (1).

Character 115 (Buscalioni and Sanz, 1988: char. 44): Number of sacral vertebrae: two (0), or more than two (1).

Character 116 (modified from Buscalioni and Sanz, 1988: char. 49): + Development and orientation of the rugose surface for the insertion of the M. iliotibialis that forms the supracetabular crest: lateromedially narrow and facing dorsally or slightly laterodorsally (0), lateromedially broad, forming a wide and markedly rugose attachment surface facing laterodorsally (1), or lateromedially broad and rugose that is highly deflected laterally forming a remarkably deep acetabulum (2).

Character 117 (Buscalioni and Sanz, 1988: char. 54): Proximal end of radiale expanded symmetrically, similarly to the distal end (0), or more expanded proximolaterally than proximomedially(1).

Character 118 (modified from Pol and Gasparini, 2009: char. 118): Lateral surface of the anterior region of surangular and posterior region of dentary: without a longitudinal depression (0), or with a deep, well-defined longitudinal groove (1).

Character 119 (modified from Ortega et al., 1996: char. 9): Ventral exposure of splenials along mandibular rami, posterior to the symphysis: absent (0), or present (1).

Character 120 (Modified from Ortega et al., 1996: char. 11, Ortega et al., 2000: char. 100, Andrade and Bertini 2008a: char. 132, and Turner and Sertich, 2010: char. 120): Tooth margins in posterior region of the toothrow: with denticulate carinae formed by homogeneous and symmetrical denticles with a sharp cutting edge (0), or without carinae or with smooth or crenulated carinae (1), or with tubercular, rounded denticles (anisomorph sensu Andrade and Bertini, 2008b) (2).

Character 121 (modified from Pol, 1999a: char. 133 and Ortega et al., 2000: char. 145): Lateral surface of anterior process of jugal: flat or convex (0), or bearing a longitudinal ridge or shelf running along its lateral surface and triangular depression underneath it (1).

Character 122 (Pol, 1999a: char. 134): Jugal: does not exceed the anterior margin of orbit (0), or exceeds margin (1).

Character 123 (Pol, 1999a: char. 135): Notch in premaxilla on lateral edge of external nares: absent (0), or present on the dorsal half of the external nares lateral margin (1).

Character 124 (Pol, 1999a: char. 136): Dorsal border of external nares: formed mostly by the nasals (0), or by both the nasals and premaxilla (1).

Character 125 (Pol, 1999a: char. 138): Posterodorsal process of premaxilla: absent (0), or present extending posteriorly wedging between maxilla and nasals (1).

Character 126 (Pol, 1999a: char. 139 and Ortega et al., 2000: char. 9): + premaxilla maxilla suture in palatal view, medial to alveolar region: anteromedially directed (0), sinusoidal, posteromedially directed on its lateral half and anteromedially directed along its medial region (1), or posteromedially directed (2).

Character 127 (modified from Pol, 1999a: char. 140): Nasal-premaxilla suture: laterally concave (0), or straight (1).

Character 128 (modified from Pol, 1999a: char. 141): Nasal lateral edges along the suture with the maxilla: nearly parallel (0), oblique to each other converging anteriorly (1), or oblique to each other diverging anteriorly (2).

Character 129 (Pol, 1999a: char. 143): Palatine anteromedial margin: exceeding the anterior margin of the palatal fenestrae extending anteriorly between the maxillae (0), or not exceeding the anterior margin of palatal fenestrae (1).

Character 130 (Pol, 1999a: char. 144): Dorsoventral height of jugal antorbital region respect to infraorbital region: equal or lower (0), or antorbital region more expanded than infraorbital region of jugal (1).

Character 131 (Pol, 1999a: char. 145): Maxilla-lacrimal contact: partially included in antorbital fossa (0), or completely included (1).

Character 132 (Pol, 1999a: char. 146): Lateral eustachian tube openings: located posteriorly to the medial opening (0), or aligned anteroposteriorly and dorsoventrally (1).

Character 133 (Pol, 1999a: char. 147): Anterior process of ectopterygoid: developed (0), or reduced-absent (1).

Character 134 (Pol, 1999a: char. 148): Posterior process of ectopterygoid: developed (0), or reduced-absent (1).

Character 135 (Pol, 1999a: char. 149 and Ortega et al., 2000: char. 13): Small neurovascular foramen located in the premaxillo-maxillary suture on the lateral surface of the rostrum (not for large mandibular teeth): absent (0), or present (1).

Character 136 (Modified from Pol, 1999a: char. 150): Jugal suture with quadratojugal directed: obliquely posteroventrally (0), or vertically as a blunt suture (1).

Character 137 (modified from Pol, 1999a: char. 151): Orientation of distal carina on upper posterior teeth and mesial carina on lower posterior teeth: oriented parallel to the longitudinal axis of skull (0), or obliquely oriented, at an angle of approximately 45 degrees with the longitudinal axis of the skull (1).

Character 138 (Pol, 1999a: char. 152): Large and aligned neurovascular foramina on lateral maxillary surface: absent (0), or present (1).

Character 139 (modified from Pol, 1999a: char. 153): External surface of maxilla: with a single plane facing laterally (0), or with ventral region facing laterally and dorsal region facing dorsolaterally (1).

Character 140 (Modified from Pol, 1999a: char. 154 and Ortega et al., 2000: char. 104): + Mid to posterior elements of the toothrows: crowns not compressed laterally, subcircular in cross section (0), or crowns slightly compressed laterally (1), or roots and crowns highly compressed laterally (2).

Character 141 (Pol, 1999a: char. 155): Posteroventral corner of quadratojugal: reaching the quadrate condyles (0), or not reaching the quadrate condyles (1).

Character 142 (modified from Pol, 1999a: char. 156): + Base of postorbital process of jugal: directed posterodorsally (0), or dorsally (1), or anterodorsally (2).

Character 143 (Pol, 1999a: char. 157): + Postorbital process of jugal: anteriorly placed (0), in the middle (1), or posteriorly positioned (2).

Character 144 (Pol, 1999a: char. 158 and Ortega et al., 2000: char. 36): Postorbitalectopterygoid contact: present (0), or absent (1).

Character 145 (Pol, 1999a: char. 161): Quadratojugal: not ornamented (0), or ornamented in the base (1).

Character 146 (Pol, 1999a: char. 162): Prefrontal-maxillary contact in the inner anteromedial region of orbit: absent (0), or present (1).

Character 147 (Pol, 1999a: char. 163): Basisphenoid: without lateral exposure (0), or with lateral exposure on the braincase (1).

Character 148 (modified from Pol, 1999a: char. 165): Quadrate process of pterygoids: well developed (0), or extremely short and poorly developed, failing to extend along the lateral margin of the basisphenoid and ending far away from the level of the lateral eustachian openings (1).

Character 149 (modified from Pol, 1999a: char. 166 and Ortega et al., 2000: char. 44): + Quadrate major axis directed: posteroventrally (0), ventrally (1), or anteroventrally (2).

Character 150 (Pol, 1999a: char. 167): Quadrate distal end: with only one plane facing posteriorly (0), or with two distinct faces in posterior view divided by a ridge, a posterior one and a medial one bearing the foramen aerum (1).

Character 151 (Pol, 1999a: char. 168): Anteroposterior development of neural spine in axis: well developed covering all the neural arch length (0), or poorly developed, located over the posterior half of the neural arch (1).

Character 152 (Pol, 1999a: char. 169): Prezygapophyses of axis: not exceeding anterior edge of neural arch (0), or exceeding the anterior margin of neural arch (1).

Character 153 (Pol, 1999a: char. 170): Postzygapophyses of axis: well developed, curved laterally (0), or poorly developed (1).

Character 154 (modified from Pol, 1999b: char. 212): Shape of dentary symphysis in ventral view: tapering anteriorly forming an angle (0), U-shaped, smoothly curving anteriorly (1), or lateral edges longitudinally oriented, convex anterolateral corner, and extensive transversely oriented anterior edge (2).

Character 155 (Pol, 1999b: char. 213): Unsculpted region in the dentary below the tooth row: absent (0), or present (1).

Character 156 (Buckley and Brochu, 1999: char. 102): Surangular forms only the lateral wall of glenoid fossa and quadratojugal lacks an articular condyle (0) or surangular forms approximately one-third of the glenoid fossa and quadratojugal bears an articular condyle (1).

Character 157 (modified from Buckley and Brochu, 1999: char. 102): Anterior margin of femur at the area of insertion of M. puboischiofemoralis internus 1 (PIFI1) and M. caudofemoralis longus (CFL): anterior margin of femur linear (0), or bearing a distinct flange (that projects anteriorly the insertion areas for these muscles) and a marked concavity above this region (1).

Character 158 (modified from Buckley and Brochu, 1999: char. 105): Dentary smooth lateral to seventh alveolus (0), or with lateral concavity for the reception of the enlarged maxillary tooth (1).

Character 159 (modified from Ortega et al., 1995: 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), or sinusoidal, with two concave waves (3).

Character 160 (modified from Ortega et al., 1995: char. 2 and Buckley and Brochu, 1999: char. 108): Dentary compression and lateroventral surface anterior to mandibular fenestra: compressed and vertical (0), or not compressed and convex (1).

Character 161 (modified from Ortega et al., 1995: char. 7 and Buckley and Brochu, 1999: char. 110): Splenial: thin posterior to symphysis (0), or splenial robust dorsally posterior to symphysis, being much broader than the lateral alveolar margin of the dentary at the same region (1).

Character 162 (Ortega et al., 1996: char. 13 and Buckley et al., 2000: char. 117): Cheek teeth: not constricted at base of crown (0), or constricted (1).

Character 163 (Ortega et al., 2000: char. 10): Ventral edge of premaxilla located: at the same height that ventral edge of maxilla (0), or located deeper, with the dorsal contour of anterior part of dentary strongly concave (1).

Character 164 (modified from Ortega et al., 2000: char. 19): Maxillary dental implantation: teeth in isolated alveoli (0), or located on a dental groove (1).

Character 165 (Ortega et al., 2000: char. 24): Caudal tip of nasals: converge at sagittal plane forming a transversely straight or a shallow posteriorly concave arch along their posterior margins (0), or caudally separated by an anterior acute sagittal projection of frontals (1).

Character 166 (Ortega et al., 2000: char. 33): Relative length between squamosal and postorbital: squamosal is longer (0), or postorbital is longer (1).

Character 167 (modified from Ortega et al., 2000: character 34): + Jugal portion of postorbital bar: flushes with lateral surface of jugal (0), anteriorly continuous but posteriorly inset (1), or medially displaced and a ridge separates postorbital bar from lateral surface of jugal (2).

Character 168 (modified from Ortega et al., 2000: char. 42): Outer surface of squamosal along the site of attachment of ear valve groove: laterodorsally oriented and extensive (0), or reduced and vertically oriented (1).

Character 169 (Ortega et al., 2000: char. 47): Quadratojugal spine at caudal margin of infratemporal fenestra: absent (0), or present (1).

Character 170 (modified from Ortega et al., 2000: char. 53): Quadrate condyles with poorly developed intercondylar groove (0), or medial condyle expands ventrally, being separated from the lateral condyle by a deep intercondylar groove (1).

Character 171 (Ortega et al., 2000: char. 62): Exposure of supraoccipital in skull roof: absent (0), or present (1).

Character 172 (Ortega et al., 2000: char. 70): Nasal participation in antorbital fenestra: yes (0), or no (1).

Character 173 (Ortega et al., 2000: char. 75): Anterior opening of temporo-orbital in dorsal view exposed (0), or hidden in dorsal view and overlapped by squamosal rim of supratemporal fossa (1).

Character 174 (modified from Ortega et al., 2000: char. 90): Foramen intermandibularis oralis: small or absent (0), or big and slot like, with their anteroposterior length being approximately or more than 50% of the depth of the splenial (1).

Character 175 (modified from Ortega et al. 2000: char 98): Coronoid size: short and located below the dorsal edge of the mandibular ramus (0), or anteriorly extended with posterior region elevated at the dorsal margin of the mandibular ramus (1).

Character 176 (Ortega et al., 2000: char. 101): Width of root of teeth respect to crown: much narrower (0), or subequal or wider (1).

Character 177 (Ortega et al., 2000: char. 109): Gap in cervico-thoracic dorsal armor: absent (0) or present (1).

Character 178 (Ortega et al., 2000: char. 130): Lateral contour of snout in dorsal view: straight (0) or sinusoidal (1).

Character 179 (Modified from Ortega et al., 2000: char. 138): Pterygoid flanges: laminar and with anteroposteriorly broad lateral end (0) or lateromedially elongated with anteroposteriorly short lateral end (1), or lateromedially short and with narrow lateral end (2).

Character 180 (modified from Ortega et al., 2000: char. 146): Ectopterygoid medial process: single, projected posteriorly on the ventral or lateral surface of the pterygoid flanges (0) or forked, with an accessory anteromedial branch reaching the palatine and forming part of the lateral margin of the choanal opening (1).

Character 181 (modified from Ortega et al., 2000: char. 157): Skull roof: rectangular shaped in dorsal view (0), trapezoidal shape (1).

Character 182 (Ortega et al., 2000: char. 30): + Prefrontal pillars when integrated in palate: pillars transversely expanded (0), transversely expanded in their dorsal part and columnar (or slightly anteroposteriorly elongated) in the ventral end (1), or longitudinally expanded in their dorsal part and columnar ventrally (2).

Character 183 (Ortega et al., 2000: char. 21): Ventral edge of maxilla in lateral view: straight or convex (0), or sinusoidal (1).

Character 184 (modified from Ortega et al., 2000: char. 156): Position of first enlarged maxillary teeth: second or third alveoli (0), or fourth or fifth (1).

Character 185 (Pol and Apesteguia, 2005: char. 180): Splenial-dentary suture at symphysis on ventral surface: v-shaped (0), or transversal (1).

Character 186 (Pol and Apesteguia, 2005: char. 181): Posterior peg at the posterior edge of the mandibular symphysis: absent (0), or present (1).

Character 187 (Pol and Apesteguia, 2005: char. 182): Posterior ridge on glenoid fossa of articular: present (0), or absent (1).

Character 188 (modified from Gomani, 1997: char. 46 and Buckley et al., 2000: char. 113): Cusps of posterior teeth: unique apical cusp (0), at least three cusps, a major central cusp with smaller cusps arranged along the mesial and distal margins of the crown (1).

Character 189 (Pol and Apesteguia, 2005: char. 184): Dorsal surface of mandibular symphysis: flat or slightly concave (0), or strongly concave and narrow, trough shaped (1).

Character 190 (Pol and Apesteguia, 2005: char. 185): Medial surface of splenials posterior to symphysis: flat or slightly convex (0), or markedly concave (1).

Character 191 (modified from Pol and Apesteguia, 2005: char. 186): Choanal septum shape: narrow vertical bony sheet (0), or T-shaped bar expanded ventrally (1).

Character 192 (Pol and Norell, 2004a: char. 164): Cross section of distal end of quadrate: mediolaterally wide and anteroposteriorly thin, being approximately three times as wide as long (0), or subquadrangular or up to twice as broad as anteroposteriorly long (1).

Character 193 (modified from Pol and Apesteguia, 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), or flat surface facing laterally or laterodorsally but divided by a ridge from rest of the lateral surface of the dentaries (1), or posterior region of alveolar facing dorsally, forming a broad alveolar shelf that is strongly inset medially from the lateral surface of the dentaries (2).

Character 194 (Pol and Norell, 2004a: char. 165): Palatine-pterygoid contact on anterior region of palate: palatines overlie pterygoids (0), or palatines firmly sutured to pterygoids (1).

Character 195 (Pol et al., 2004: char. 164): Ectopterygoid main axis oriented: laterally or slightly anterolaterally (0), or anteriorly, subparallel to the skull longitudinal axis (1).

Character 196 (Wu et al., 1997: char. 103): Squamosal descending process: absent (0), or present (1).

Character 197 (modified from Wu et al., 1997: char. 105): + Development of distal quadrate body ventral to otoccipital-quadrate contact: distinct (0), incipiently distinct (1), or indistinct (2).

Character 198 (Modified from Wu et al., 1997: char. 106): Posterior margin of pterygoid flanges: thin and laminar (0), or dorsoventrally thick, with pneumatic spaces (1).

Character 199 (Wu et al., 1997: char. 108): Postorbital participation in infratemporal fenestra: almost or entirely excluded (0), or bordering infratemporal fenestra (1).

Character 200 (Wu et al., 1997: char. 109): Palatines: form margin of suborbital fenestra (0), or excluded from margin of suborbital fenestra (1).

Character 201 (Wu et al., 1997: char. 110): Angular posterior to mandibular fenestra: widely exposed on lateral surface of mandible (0), or shifted to the ventral surface of mandible (1).

Character 202 (Wu et al., 1997: char. 112): Posteroventral edge of mandibular ramus: straight or convex (0), or markedly deflected (1).

Character 203 (modified from Wu et al., 1997: char. 119): Quadrate process of pterygoid in ventral view: narrow (0), or broad (1).

Character 204 (Wu et al., 1997: char. 121): Pterygoids: not in contact anterior to basisphenoid on palate (0), or pterygoids in contact (1).

Character 205 (modified from Wu et al., 1997: char. 122): Olecranon: well developed (0), or reduced or absent (1).

Character 206 (Wu et al., 1997: char. 123): Cranial table width respect to ventral portion of skull: as wide as ventral portion (0), or narrower than ventral portion of skull (1).

Character 207 (modified from Wu et al., 1997: char. 127): Depression on posterolateral surface of maxilla: absent (0); o present as a large circular fossa, being at least half the size of the orbit (1); or present as a small fossa, being smaller than one third of the size of the ortbit (2).

Character 208 (modified from Wu et al., 1997: char. 128): Anterior palatal fenestra: absent (0), or present (1).

Character 209 (Pol and Norell, 2004a: char. 179): Paired ridges located medially on ventral surface of basisphenoid: absent (0), or present (1).

Character 210 (Pol et al., 2004a: char. 179): Ventral margin of infratemporal bar of jugal: straight (0), or dorsally arched (1).

Character 211 (Pol and Norell, 2004a: char. 180): Posterolateral end of quadratojugal: acute or rounded, tightly overlapping the quadrate (0), or with sinusoidal ventral edge and wide and rounded posterior edge slightly overhanging the lateral surface of the quadrate (1).

Character 212 (Pol and Norell, 2004a: char. 181): Orientation of quadrate body distal to otoccipital-quadrate contact in posterior view: ventrally (0), or ventrolaterally (1).

Character 213 (Gasparini et al., 1993: char. 3): Wedge-like process of the maxilla in lateral surface of premaxilla-maxilla suture: absent (0), or present (1).

Character 214 (Pol and Norell, 2004b: char. 181): Palpebrals: separated from the lateral edge of the frontals (0), or extensively sutured to each other and to the lateral margin of the frontals (1).

Character 215 (Pol and Norell, 2004b: char. 182): External surface of ascending process of jugal: exposed laterally (0), or exposed posterolaterally (1).

Character 216 (Pol and Norell, 2004b: char. 183): Longitudinal ridge on lateral surface of jugal below infratemporal fenestra: absent (0), or present (1).

Character 217 (Pol and Norell, 2004b: char. 184): Oblique ridges on the dorsal surface of posterolateral region of squamosal: without ridges (0), or with three curved ridges oriented longitudinally (1).

Character 218 (Pol and Norell, 2004b: char. 185): Ridge along dorsal section of quadratequadratojugal contact: absent (0), or present (1).

Character 219 (modified from Pol and Norell, 2004b: char. 186): Sharp ridge on the surface of the angular: absent (0), or present on the ventral-most margin (1), or present along the lateral surface (2).

Character 220 (Pol and Norell, 2004b: char. 187): Longitudinal ridge along the dorsolateral surface of surangular: absent (0), or present (1).

Character 221 (Pol and Norell, 2004b: char. 188): Dorsal surface of osteoderms ornamented with anterolaterally and anteromedially directed ridges (fleur de lys pattern of Osmolska et al., 1997): absent (0), or present (1).

Character 222 (Pol and Norell, 2004b: char. 189): Cervical region surrounded by lateral and ventral osteoderms sutured to the dorsal elements: absent (0), or present (1).

Character 223 (Pol and Norell, 2004b: char. 190): Appendicular osteoderms: absent (0), or present (1).

Character 224 (Ortega et al., 2000: character 72): Supratemporal fenestra: present (0), or absent (1).

Character 225 (modified from Pol and Apesteguia, 2005: char. 220): Flat ventral surface of internal nares septum: parallel sided (0), or tapering anteriorly (1), or tapering posteriorly (2).

Character 226 (Pol and Apesteguia, 2005: char. 221): + Perinarial fossa: restricted extension (0), extensive, with a distinctly concave surface facing anteriorly (1), or large concave surface facing anteriorly, projecting anteroventrally from the external nares opening toward the alveolar margin (2).

Character 227 (Sereno et al., 2001: char. 67): Premaxillary palate circular paramedian depressions: absent (0), or present located anteriorly on the premaxilla (1).

Character 228 (modified from Pol and Apesteguia, 2005: char. 223): + Posterolateral region of nasals: flat surface facing dorsally and well separated from the anterodorsal corner of the orbit (0), or expanded posterolaterally reaching the anterior tip of the palpebral facet but limited to the dorsal surface of the skull (1), or well developed posterolateral process that deflects ventrally, forming part of the lateral surface of the snout (2).

Character 229 (Zaher et al., 2006: char. 193): Ventral half of the lacrimal: extending ventroposteriorly widely contacting the jugal (0), or tapering ventroposteriorly, does not contact or contacts the jugal only slightly (1).

Character 230 (Zaher et al., 2006: char. 194): Large foramen on the lateral surface of jugal, near its anterior margin: absent (0), or present (1).

Character 231 (modified from Zaher et al., 2006: char. 195): Procumbent premaxillary alveoli absent (0) or present (1).

Character 232 (modified from Martinelli, 2003: char. 36, Zaher et al., 2006: char. 196, and Turner, 2004: char. 119): Posterolateral end of palatines, completely sutured to the pterygoids (0) or project posterolaterally as rodlike palatine bars (1).

Character 233 (Modified from Zaher et al., 2006: char. 197): Participation of ectopterygoid in the lateral margin of the choanal opening: absent or reduced, less than one third of this margin (0), or extensive forming half or more of this margin (1).

Character 234 (Pol and Norell, 2004a: char. 183): Choanal opening: opened posteriorly and continuous with pterygoid surface (0), or closed posteriorly by an elevated wall formed by the pterygoids (1).

Character 235 (Modified from Zaher et al., 2006: char. 198): Ectopterygoid width at its contact with the ventral surface of pterygoid flanges: lateromedially thin process (0), or lateromedially expanded with respect to the shaft of the ectopterygoid, covering approximately the lateral half of the ventral surface of the pterygoid flanges (1).

Character 236 (Pol and Gasparini, 2009: char. 236): Evaginated maxillary alveolar edges: absent (0), or present as a continuous sheet (1), or present as discrete evaginations at each alveoli (2).

Character 237 (Pol and Gasparini, 2009: char. 237): Foramen in perinarial depression of premaxilla: absent (0), or present (1).

Character 238 (Sereno et al., 2001: char. 27): Frontal anterior ramus with respect to tip of prefrontal: ending posteriorly (0), or ending anteriorly (1).

Character 239 (modified from Sereno et al., 2001: char. 68): Premaxillary anterior alveolar margin orientation: vertical (0), or inturned (1).

Character 240 (Sereno et al., 2001: char. 69): Premaxillary tooth row orientation: arched posteriorly from midline (0), or angled posterolaterally, at 120 degree angle (1).

Character 241(Sereno et al., 2001: char. 70): Last premaxillary tooth position relative to tooth row: anterior (0), or anterolateral (1).

Character 242: (Pol and Gasparini, 2009: char. 242): Sutural contact between premaxilla and maxilla on dorsal surface of rostrum posterior to external nares: Premaxillae posterior tip V-shaped, wedging between maxillae (0), or posterior end of premaxillae W-shaped with the anterior tip of maxillae wedging between premaxillae (1).

Character 243 (modified from Brochu, 1999: char. 108 and from Pol and Gasparini, 2009: char. 243): Maxilla-palatine suture: palatine anteriorly rounded (0), or palatine anteriorly pointed (1), or palatine anterior end slightly invaginated (2), or palatine anterior end divided by a narrow and pointed process of the palatal branches of maxilla (3).

Character 244 (Pol and Gasparini, 2009: char. 244): Lateral surface of postorbital bar: formed by postorbital and jugal (0), or only by postorbital (1).

Character 245 (Pol and Gasparini, 2009: char. 245): Enlarged foramen at anterior end of surangular groove: absent (0), or present (1).

Character 246 (Pol and Gasparini, 2009: char. 246): Shape of antorbital fossa: subcircular or subtriangular (0), or elongated, low, and oriented obliquely (1).

Character 247 (Pol and Gasparini, 2009: char. 247): Prefrontal lateral development: reduced (0), or enlarged, extending laterally over the orbit (1).

Character 248 (Pol and Gasparini, 2009: char. 248): Foramen for the internal carotid artery: reduced, similar in size to the openings for cranial nerves IX-XI (0), or extremely enlarged (1).

Character 249 (Pol and Gasparini, 2009: char. 249): Squamosal posterolateral region, lateral to paroccipital process: narrow (0), or bearing a subcircular flat surface (1).

Character 250 (Pol and Gasparini, 2009: char. 250): Posteromedial branch of squamosal oriented: transversely (0), or posterolaterally (1).

Character 251 (Pol and Gasparini, 2009: char. 251): Dorsal margin of squamosal occipital flange: straight (0), or dorsally concave (1).

Character 252 (Pol and Gasparini, 2009: char. 252): Sculpture in external surface of rostrum: absent (0), or present (1).

Character 253 (Pol and Gasparini, 2009: char. 253): Longitudinal depressions on palatal surface of maxillae: absent (0), or present (1).

Character 254 (Pol and Gasparini, 2009: char. 254): Angle between medial and anterior margins of supratemporal fossa: approximately 90 degrees (0), or approximately 45 degrees (1).

Character 255 (Pol and Gasparini, 2009: char. 255): Transverse process of sacral vertebrae directed: laterally (0), or markedly deflected ventrally (1).

Character 256 (Pol and Gasparini, 2009: char. 256): Prefrontal and lacrimal around orbits: forming flat rims (0), or evaginated, forming elevated rims (1).

Character 257 (Pol and Gasparini, 2009: char. 257): Nasal bones: paired (0), or partially or completely fused (1).

Character 258 (Brochu, 1997: char. 3): Posterior half of axis neural spine wide (0) or narrow (1).

Character 259 (Brochu, 1997: char. 19): Axial hypapophysis without (0) or with (1) deep fork.

Character 260 (Brochu, 1997: char. 27): Olecranon process of ulna narrow and subangular (0) or wide and rounded (1).

Character 261 (Brochu, 1997: char. 29): M. teres major and M. dorsalis scapulae insert separately on humerus; scars can be distinguished dorsal to deltopectoral crest (0) or insert with common tendon; single insertion scar (1).

Character 262 (modified from Brochu, 1997: char. 53): Anterior dentary alveoli project anterodorsally or weakly procumbent (0) or strongly procumbent (1).

Character 263 (Brochu, 1997: char. 84): Dorsal and ventral rims of squamosal groove for external ear valve musculature parallel (0) or squamosal groove flares anteriorly (1).

Character 264 (Brochu, 1997: char. 91): Ectopterygoid abuts maxillary toothrow (0) or maxilla broadly separates ectopterygoid from maxillary toothrow (1).

Character 265 (Brochu, 1997: char. 92): Shallow fossa at anteromedial corner of supratemporal fenestra (0) or no such fossa; anteromedial corner of supratemporal fenestra smooth (1).

Character 266 (modified from Brochu, 1997: char. 103): Lateral margins of frontal: flush with skull surface (0), or elevated, forming ridged orbital margins (1).

Character 267 (Brochu, 1997: char. 130): Capitate process of laterosphenoid oriented laterally (0) or anteroposteriorly (1) toward midline.

Character 268 (modified from Brochu, 1997: char. 141): Paroccipital process development lateral to cranioquadrate opening: short (0) or long (1).

Character 269 (modified from Norell, 1988: char. 32 by Brochu, 1997: char. 149): Ectopterygoid extends (0) or does not extend (1) to posterior tip of lateral pterygoid flange at maturity.

Character 270 (Brochu, 1997: char. 153): Incisive foramen completely situated far from premaxillary toothrow, at the level of the second or third alveolus (0) or abuts premaxillary toothrow (1).

Character 271 (Pritchard et al., 2012; modified from Pol et al., 2009 and Turner, 2004: char. 126): Ventral surface of choanal septum smooth to slightly depressed (0), marked by an acute groove (1); or, vomeral choanal septum divided into bilateral laminae.

Character 272 (modified from Turner, 2006: char. 128): Proximal-most portion of fibular head straight sided to weakly developed posteriorly (0) or very sharply projecting posteriorly, forming distinct extension (1).

Character 273 (Turner, 2006: char. 129): Posterior process of cervical rib shaft lacks (0) or possesses (1) a posterodorsally projecting spine at the junction with the tubercular process.

Character 274 (Pol et al., 2009: char. 274): Longitudinal keels on dorsal surface of osteoderms restricted to the posterior edge of osteoderm (0) or are not (1).

Character 275 (Pol et al., 2009: char. 275): Jugal below the anteroventral corner of the orbit: lacks (0) or possesses an emarginated orbital margin and an associated depression located on the dorsal region of the jugal (1).

Character 276 (Pritchard et al., 2012; modified from Pol et al., 2009: char. 276): Transverse ridge crossing frontal anteromedial to orbits: absent (0), present as ridge (1), prominent anteriorly curved shelf (transverse interorbital crest sensu Andrade and Hornung, 2011) present (2), or anteroposteriorly oriented crest on frontal (3).

Character 277 (Pol et al., 2009: char. 277): Shallow hemispherical depression on the lacrimal and/or prefrontal anterior to the orbital margin (not articulation facet for palpebral): absent (0), or present (1).

Character 278 (Pol et al., 2009: char. 278): Anterior half of palatines between suborbital fenestrae: lateral margins are parallel to subparallel (0) or flared anteriorly (1).

Character 279 (modified from Pol et al., 2009: char. 279 and Montefeltro et al., 2011: char. 41): + Posterior half of palatines between suborbital fenestrae: lateral margins are parallel to subparallel (0) or slightly constricted and flared posteriorly (1), or markedly constricted lateromedially at its posterior portion and flaring posteriorly (2).

Character 280 (Pol et al., 2009: char. 280): Posteroventral margin of the angular straight or gently arched dorsally (0) or strongly arched dorsally (1).

Character 281 (Pol et al., 2009: char. 281): Lateral margin of dorsal surface of squamosal squared off with continuous ear valve groove (0), or bears a prominent depressed area just anterior to the posterior lobe of the squamosal, groove for ear valve discontinuous (1). The posterior end of the squamosal lobe as flares distally.

Character 282 (Pol et al., 2009: char. 282): Fibular shaft distal to iliofibularis trochanter straight (0) or bowed posteriorly (1).

Character 283 (Larsson and Sues, 2007: char. 55): Premaxillary teeth 1 and 2, position: separated like adjacent teeth (0), or nearly confluent (1).

Character 284 (Larsson and Sues, 2007: char. 60): Large nutrient foramen on palatal surface of premaxilla-maxilla contact: small or absent (0), or present (1).

Character 285 (Larsson and Sues, 2007: char. 62): Incisive foramen size: present and large (length equal or more than half the greatest width of premaxillae) (0), or present or small (1), or absent (2).

Character 286 (Larsson and Sues, 2007: char. 66): Premaxilla-maxilla lateral fossa excavating alveolous of last premaxillary tooth: no (0), or yes (1).

Character 287 (Pol and Powell, 2011: char. 287): Shape of antorbital fenestra: rounded or dorsoventrally high (0), or low and elongated, slit-like (1).

Character 288 (Pol and Powell, 2011: char. 288): Nasal exposure on lateral surface of rostrum: deflecting gradually from the dorsal surface (0), or deflecting abruptly, forming an almost 90 degree angle between the dorsal and lateral surfaces (1).

Character 289 (Pol and Powell, 2011: char. 289): Paired crests along the prefrontal-frontal sutures: absent (0), or present (1).

Character 290 (Pol and Powell, 2011: char. 290): Dorsal surface of frontal: flat or slightly concave (0), with a broad basin-like depressed area bordered posteriorly by a transversal ridge (1).

Character 291 (Pol and Powell, 2011: char. 291): Rugose surface on palatal surface of maxilla posterior to last tooth: absent (0), or present (1).

Character 292 (Pol and Powell, 2011: char. 292): Ectopterygoid-palatine contact posterior to the suborbital fenestra: not contacting (0), or contacting (1).

Character 293 (modified from Andrade and Bertini 2008a: char. 103 by Pol and Powell, 2011: char. 293): Pterygoid ventral surface at the origin of the pterygoid flanges: flat or slightly concave (0), or bearing a pterygoid parachoanal fossa located laterally or posterolaterally to choanal opening; a distinctly depressed area that perforates the pterygoid flanges in some taxa (1).

Character 294 (modified from Turner and Buckley, 2008: char. 286): Jugal, anterior and posterior processes: inline dorsoventrally (0) or dorsal margin of anterior and posterior processes at a sharp angle to one another, both processes slope ventrally to form a strongly arched jugal (1).

Character 295 (Larsson and Sues, 2007: char. 31): Length of anterior process of quadratojugal: either short or absent (0), or from long (less than half length of lower temporal bar) to moderate (one third of lower temporal bar) (1), or long (greater than half of lower temporal bar) (2).

Character 296 (Pol et al., 2012: char. 296). Prezygapophyseal process of anterior cervical vertebrae: anterodorsally projected and straight or slightly recurved (0), or dorsally projected and strongly recurved (1).

Character 297 (Pol et al., 2012: char. 297). Prezygapophyseal process of anterior to mid cervical vertebrae in lateral view: anterior margin straight or evenly convex (0), or anterior margin bearing a distinct bulge at the midpoint of the prezygapophyseal process (1).

Character 298 (Pol et al., 2012: char. 298). Shape of the articular surface of the parapophysis in posterior cervical and anterior dorsals: subcircular or ovoid with the major axis oriented anteroposteriorly (0), or subtriangular or ovoid with major axis oriented dorsoventrally (1).

Character 299 (modified from Pol et al., 2012: char. 299). Number of dorsal veretebrae with the parapophyses between the level of the base and the roof of the neural canal: one or less (0), or two or more (1).

Character 300 (Pol et al., 2012: char. 300). Medial surface of prezygapophyseal process of anterior to mid cervical vertebrae: with an ovoid or triangular depression close to the neural canal (0), or flat or slightly convex (1).

Character 301 (Pol et al., 2012: char. 301). Spinopostzygapophyseal lamina in dorsal vertebrae: absent (0), or present as a high and sharp lamina (1).

Character 302 (Pol et al., 2012: char. 302). Distinct rounded depression on the dorsal surface of neural arches of the anterior to mid dorsal vertebrae, located between the base of the neural spine and the postzygapophyseal process: absent (0), or present (1).

Character 303 (Pol et al., 2012: char. 303). Relative position of the transverse process and the postzygapophysis in mid dorsal vertebrae: postzygapophysis located dorsally to the transverse process (0) or postzygapophysis leveled with the transverse process (1).

Character 304 (Pol et al., 2012: char. 304). Dorsolateral end of first sacral rib: located at the level of the neural canal (0), or dorsoventrally expanded, projecting dorsally above the level of the neural canal (1).

Character 305 (Buckley and Brochu, 1999; char 106): Scapular blade no more than twice the length of the scapulocoracoid articulation (0), or scapular blade very broad and greater than twice the length of the scapulocoracoid articulation (1).

Character 306 (Pol et al., 2012: char. 306). Insertion mark dorsal to the glenoid facet of the scapula for the attachment of the M. triceps: present as a well-developed ridge or tubercle (0), or absent (1).

Character 307 (Pol et al., 2012: char. 307). Recess ventral to the glenoid facet of the coracoid: shallow and smoothly concave surface (0), or deep recess strongly concave in lateral view, overhung by a large ventral projection of the glenoid facet (1).

Character 308 (Pol et al., 2012: char. 308). Ventral expansion of the coracoid: larger or equal to the proximal expansion (0), or less expanded than the proximal region (1).

Character 309 (Pol et al., 2012: char. 309). Orientation of the area of instertion of M. subscapularis above the internal tuberosity of the humerus: obliquely oriented in anterior view, with the area of insertion facing proximomedially (0), or vertically oriented in anterior view, with the area of insertion facing medially (1).

Character 310 (Pol et al., 2012: char. 310). Anterior projection and profile of deltopectoral crest in humerus: Well-developed crest bearing a pointed tubercle for the insertion of the supracoracoideus complex (sensu Meers, 2003) (0), or low and anteriorly convex in lateral view, lacking a well-developed tubercle (1).

Character 311 (Pol et al., 2012: char. 311). Proximal third of the deltopectoral crest: originating at the proximolateral corner of the humerus and running distally along the proximal region of the lateral margin of the humerus (0), or proximal origin medially displaced from the proximolateral corner of the humerus and running distally, leaving an anteriorly facing concave surface between the crest and the lateral margin of the anterior surface of the humerus (which probably corresponds to the insertion area of the M. coracobrachialis brevis dorsalis) (1).

Character 312 (Pol et al., 2012: char. 312). Orientation and extension of the distal half of the deltopectoral crest: running along the lateral edge of the humerus or slightly deflected medially reaching, at the most, the lateromedial midpoint of the humeral shaft (0), or strongly deflected medially, surpassing the lateromedial midpoint of the anterior surface of the humeral shaft (1).

Character 313 (Pol et al., 2012: char. 313). Anterior surface of the distal half of the deltopectoral crest: lateromedially narrow, forming a sharp ridge, in some cases with a slightly bulged apex (0), or lateromedially broad forming an expanded anterior surface (1).

Character 314 (Pol et al., 2012: char. 314). Circular depression on the posterior surface of the proximal end of the humerus, related to the insertion of the M. scapulohumeralis caudalis: absent (0), or present (1).

Character 315 (Pol et al., 2012: char. 315). Posterior surface of the humerus with a distinct, sharply-delimited, pit at the proximodistal level of the apex of the deltopectoral crest, usually related to the insertion of the M. teres major and M. latissimus dorsi (sensu Meers, 2003): absent (0), or present (1).

Character 316 (Pol et al., 2012: char. 316). Anteroproximal end of the distal articular surface of the humerus: continuous with the anterior surface of the humeral shaft or incipiently projected anteriorly (0), or separated from the humeral shaft by a distinct step, formed by a concave and proximally facing shelf surface that extends lateromedially across the entire width of the distal humerus and is bound by two well developed supracondylar ridges (1).

Character 317 (Pol et al., 2012: char. 317). Lateral and medial surface of distal end of humerus: flat and anteroposteriorly broad, similar in anteroposterior length to the lateromedial width of the distal end of humerus (0), or convex and reduced in comparison with the lateromedial width of the distal humerus (1).

Character 318 (Pol et al., 2012: char. 318). Articular surface for the ulna on the radiale: facing posterolaterally (0), or facing posteriorly, not visible in lateral view (1).

Character 319 (Pol et al., 2012: char. 319). Proximodistal development of articular surface for the ulna on the radiale: short and wide, being up to than 30% of the total length of the radiale (0), or proximodistally elongated, being more than 40% of the total length of the radiale (1).

Character 320 (Pol et al., 2012: char. 320). Distal region of articular surface for the ulnare in the radiale: merging gradually with the posterolateral surface of the ulnar shaft (0), or usually triangular shaped, and separated from the ulnar shaft by a distinct step (1).

Character 321 (Pol et al., 2012: char. 321). Proximal region of articular surface for the ulnare in the radiale: divided from the articular surface for the ulna by a crest, creating a distinct articular surface for the ulnare (0), or continuous with the articular surface for the ulna (1).

Character 322 (Pol et al., 2012: char. 322). Anterior surface of radiale: smoothly convex (0), or bearing a proximodistal crest that extends along the shaft dividing the anterior surface of the radiale (1).

Character 323 (Pol et al., 2012: char. 323). Distolateral expansion of the ulnare: absent, as (or less) expanded as the distomedial corner of the ulnare (0), or distinctly expanded and projecting more distally than the distomedial corner of the ulnare, forming a distinct process (“ulnar anterior projection” sensu Nascimento and Zaher, 2010) (1).

Character 324 (Pol et al., 2012: char. 324). Lateromedial width of shaft of metacarpal I: as broad as the shaft of other metacarpals (0), or broader than other metacarpals, being the digit I the most robust element of the metacarpus (1).

Character 325 (Pol et al., 2012: char. 325). Development of the postacetabular process of the ilium: well developed as a distinct process that extends anteroposteriorly at least 60% of the acetabular length (0), or extremely reduced or absent, extending anteroposteriorly not more than 50% of the acetabular length (1).

Character 326 (Pol et al., 2012: char. 326). Posterior end of the postacetabular process: tapering posteriorly and ending in an acute tip (0), or subrectangular shaped with the posterior end vertically oriented, with its dorsoventral height being at least 60% of the height at the origin of the postacetabular process (1).

Character 327 (Pol et al., 2012: char. 327). Orientation of the ventral margin of the postacetabular process: posterodorsally directed (0), or horizontally or slightly posteroventrally deflected (1).

Character 328 (Pol et al., 2012: char. 328). Dorsoventral position of the ventral margin of the postacetabular process (along its posterior third): located at the same height or dorsally than the acetabular roof (0), or located at or ventrally than the dorsoventral midpoint of the acetabular height (1).

Character 329 (Pol et al., 2012: char. 329). Relative position of supraacetabular crest and iliac blade at the anterior region of the acetabulum of the ilium: well separated from each other by a shallow concave surface (0), merged together forming a single rugose surface for the insertion of the M. iliotibialis 1 and 2 (sensu Romer, 1923) (1).

Character 330 (Pol et al., 2012: char. 330). Anterior peduncle of ilium: shallow concavity separating the anterior and posterior articular surface of the anterior iliac peduncle (0), or deep notch incising two well developed articular surfaces, which project anteroventrally forming an acute angle between them (1).

Character 331 (Pol et al., 2012: char. 331). Development of greater trochanter on proximal femur: prominent, ridge-like lateral border that separates lateral surface of proximal femur from a flat posterior surface of proximal femur reaching down to the level of the fourth trochanter (0), or proximodistally short trochanteric surface lacking a distinct ridge that separates the lateral and posterior surfaces of the proximal femur and ending well above the fourth trochanter (1).

Character 332 (Pol et al., 2012: char. 332). Medial edge of the greater trochanter: low ridge or convex surface (0), or forms a prominent sharp long crest offset from the medial surface of the femur (1).

Character 333 (Pol et al., 2012: char. 333). Development of insertion scar for PIFI1 and CFL anterior to fourth trochanter: deep and rugose surface (0), or shallow and smooth depression (1).

Character 334 (Pol et al., 2012: char. 334). Lateral supracondylar ridge on anterior surface of distal femur: prominent and broad lateral suprancondylar ridge separating the anterior concave surface of femur from the lateral surface (0), or absence of well developed lateral suprancondylar ridge, anterior surface of femur flat or slightly concave and continuous with the lateral surface of the distal femur (1).

Character 335 (Pol et al., 2012: char. 335). Distal half of tibial shaft in lateral view: straight (0), or posteriorly bowed (1).

Character 336 (Pol et al., 2012: char. 336). Tibial shaft in anterior or posterior view: straight or only slightly bowed (0), or markedly bowed laterally (1).

Character 337 (Pol et al., 2012: char. 337). Distal projection of tibial articular surfaces: medial region of distal articular surface of distal tibia extends further distally than the lateral region, forming a strongly oblique distal margin of the tibia (0), or medial and lateral regions subequally extended, with distal margin subhorizontally oriented (1).

Character 338 (Pol et al., 2012: char. 338). Anterior margin of the tibial facet on the astragalus: forming a well-defined ridge that reaches medially the ball-shaped region for the articulation of metatarsal I-II and closes the proximomedial corner of the anterior hollow of the astragalus (0), or forming a low ridge that is medially separated by a notch from the ball-shaped region for the articulation of the metatarsals I-II, failing to close the proximomedial corner of the anterior hollow (1).

Character 339 (Pol et al., 2012: char. 339). Planar and proximal calcaneal surfaces on the astragalus: connected to each other forming a continuous articular surface that articulates with the calcaneal condyle, the margin of which forms the distolateral ridge-like margin of the anterior hollow of the astragalus (0), or separated from each other forming two distinct articular surfaces for the planar and proximal articular surfaces of the calcaneum (1).

Character 340 (Pol et al., 2012: char. 340). Articular surface for the distal tarsal 3 on astragalus: proximodistally leveled with the distal end of the planar calcaneal facet and distal surface of the ball-like articulation for metatarsals I-II, in anterior view these structures form an elevated ridge that close the distal corner of the anterior hollow of the astagalus (0), or proximally inset creating a clear separation between the planar facet and the distal surface of the ball like articulation for metatarsals I-II, and leaving a distal notch along the margins of the anterior astragalar hollow (1).

Character 341 (Pol et al., 2012: char. 341). Astragalar-tarsal ligament pit on astragalus (sensu Sertich and Groenke, 2010) at the distal end of the anterior hollow: not differentiated from the rest of the anterior hollow of the astragalus (0), or distinct depressionseparated from the anterior hollow by an obliquely oriented ridge running along the proximolateral margin of the astragalar-tarsal ligament pit (1).

Character 342 (Pol et al., 2012: char. 342). Development of proximal astragalar depression, located posteriorly to the tibial facet of the astragalus: shallow concave depression (0), or deep depression with sharply delimited medial and anterior margins, forming a true astragalar fossa (1).

Character 343 (Pol et al., 2012: char. 343). Shape of the fibular facet on the astragalus: + subtrapezoidal with the proximodistal height of anterior margin higher than the posterior margin (0), or subrectangular with subequal anterior and posterior margins (1), or trapezoidal with the proximodistal height of its anterior margin lower that the posterior margin (2).

Character 344 (Pol et al., 2012: char. 344). Ridge along dorsolateral edge of calcaneal tuber and associated fossa medially to the ridge: present (0), or absent (1).

Character 345 (Pol et al., 2012: char. 345). Calcaneal tuber with lateral tubercle and crest extending anteriorly from it: present (0), or absent (1).

Character 346 (Pol et al., 2012: char. 346). Posterolateral region of the facet for distal tarsal 4 in calcaneum: subrectangular with a right-angled posterolateral corner (0), or subtriangular shaped with an oblique posterolateral margin (1).

Character 347 (Pol et al., 2012: char. 347). Calcaneum with posterior astragalar facet: subtriangular with proximal and lateral margins forming a right angle and an oblique medioplantar edge (0), or proximal and plantar edges subparallel to each other connected through a broad and rounded medial margin (1).

Character 348 (modified from Novas et al., 2009: char. 231 by Pol et al., 2014: char. 348): Anterior margin of the suborbital fenestra: maxilla precludes the ectopterygoid-palatine contact at the anterior margin of the suborbital fenestra (0), or ectopterygoid prjects anteromedially contacting (or almost reaching) the anterolateral end of the palatine, mostly or completely excluding the maxilla from the anterior margin of the suborbital fenestra (1).

Character 349 (modified from Novas et al., 2009: char. 232 by Pol et al., 2014: char. 349): Posterior end of the glenoid facet of articular: located above the surangular-angular suture (0), or ventrally recessed, located at or below the dorsoventral midpoint of the posterior mandibular ramus (i.e., surangular forming a high lateral wall that covers the posterior end of the glenoid facet) (1).

Character 350 (Novas et al., 2009: char. 233): Ventral margin of the lateral edge of squamosal, above otic recess: straight or slightly sinusoidal (0) or bearing a highly convex ventral outgrowth anteriorly to a small but highly concave concavity located at the level of the otic aperture (1).

Character 351 (Pol et al., 2014: char. 351): Jugal anteroventral process between maxilla and ectopterygoid: absent (0), present, jugal extending anteriorly a short triangular process that wedges between the ecotpterygoid and maxilla on the lateroventral surface of the skull at the level of the orbits (“sickle-like medial process present on the ventral surface of the anterior jugal ramus” sensu Andrade and Bertini, 2008a) (1).

Character 352 (Pol et al., 2014: char. 352): Posterior maxillary surface at the anteroventral region of the orbit: dorsoventrally thin and horizontal, forming the posterior end of the palatal branch (0), or forming an orbital lamina, a vertical wall that restricts the opening of the nasal cavity into the orbit (1).

Character 353 (Pol et al., 2014: char. 353): Frontal shape along its suture with the prefrontal: relatively broad and tapering gradually anteriorly (0), or broad tabular-shaped with lateral sutures with prefrontals parallel to each other (1).

Character 354 (Pol et al., 2014: char. 354): Temporo-orbital foramen: enclosed between the parietal and squamosal (0), or completely enclosed within squamosal (1).

Character 355 (Pol et al., 2014: char. 355): Ornamentation on dorsal surface of the posterolateral process of squamosal: present (0), or absent (1).

Character 356 (modified from Sereno and Larsson, 2009: char. 69 by Pol et al., 2014: char. 356): + Anterior extension of the otic recess: restricted to the squamosal (0), or extends on the posterior region of the lateral surface of the postorbital (1), or extends along the entire length of the postorbital, which has an anterior transverse lamina that separates the otic recess from the orbit (2).

Character 357 (modified from Andrade and Bertini 2008a: char. 70 by Pol et al., 2014: char. 357): + Quadrate contact with basioccipital: absent (0), or located on the ventral surface of the braincase (1), or well developed medial crest of quadrate meets the basioccipital on the occipital surface of the skull, excluding the exoccipital from the ventral margin of the occipital surface (2).

Character 358 (Pol et al., 2014: char. 358): Supraoccipital lateromedial width: extensive, occupying half of the lateromedial width of the occipital table (0), or narrow, occupying less than one third of the lateromedial width of the occipital table (1).

Character 359 (Pol et al., 2014: char. 359): Entrance of internal carotid artery into occipital surface of the skull: located close to the ventral end of the exoccipital, ventrally separated from the opening for the cranial nerves IX-XI (0), located dorsally, close to and within the same depression as the foramina for the cranial nerves IX-XI (1).

Character 360 (Turner and Sertich, 2010: char 297): Sagittal ridge on the ventral half of the posterior surface of the basioccipital: absent or poorly developed (0), or present (1).

Character 361 (Pol et al., 2014: char. 361): Palatine width at the level of the anterior end of suborbital fenestra: broad, close to half the width of the maxillary palate (0), or narrow, approximately 25% the withd of the maxillary palate (1).

Character 362 (modified from Montefeltro et al. 2011: char. 44 by Pol et al., 2014: char. 362): Longitudinal sulcus (and associated foramina) on the ventral surface of palatines between suborbital fenestra: absent (0), or present (1).

Character 363 (Pol et al., 2014: char. 363): Anterior region of dentary symphysis in ventral view: lacking a distinct anterior process, lateral margin of the dentaries diverge gradually (0), or having a distinct anterior process with parallel lateral margins (1).

Character 364 (Pol et al., 2014: char. 364): + Relative length and width of anterior (parallel sided) process of dentary symphysis: short and as broad as long (0), elongated, being approximately twice as long as wide (1), or extremely long and narrow, being approximately three times as long as wide (2).

Character 365 (Pol et al., 2014: char. 365): Size of neurovascular foramina on mid to posterior region of alveolar edge of the dentary: small (0), or extremely large, being approximately as anteroposteirorly long as an alveolus (1).

Character 366 (Pol et al., 2014: char. 366): Sutural contact between dentary and surangular above the external mandibular fenestra: dentary overlaps surangular (0), or surangular overlaps dentary (1), or interdigitated and vertically oriented suture (2).

Character 367 (Modified from Andrade and Bertini, 2008a: char 113; and Turner and Buckley, 2008: char 289 by Pol et al., 2014: char. 367): Posterodorsal branch of dentaries (above external mandibular fenestra): single branch sutured to the ventral margin of the anterior process of the surangular (0), divided into a ventral and a dorsal process exposed on the lateral surface of the lower jaw, the dorsal process fits into the large notch between the medial and lateral rami of the bifurcated anterior end of the surangular (1).

Character 368 (modified from Brochu, 1999: character 41 by Pol et al., 2014: char. 368) +: Location of the anterior opening for the mandibular nerve (V3): located at or close to the rostral margin of the splenial (0), or enclosed in the splenial and located on the anterior region of splenial (i.e., anterior foramen intermandibularis oralis sensu Brochu, 1999) (1), or enclosed in the splenial but located at the anteroposterior midpoint of the splenial (2).

Character 369 (Pol et al., 2014: char. 369): Foramen intermandibularis caudalis: present and enclosed between the angular and splenial below the mandibular adductor fossa (0), or absent with imperforated splenial-angular suture (1)

Character 370 (Pol et al., 2014: char. 370): Location of the posterior peg in mandibular symphysis: located on the ventral surface of symphysis (0), or located above the ventral surface, on the posterior surface of the symphysis (1)

Character 371 (Pol et al., 2014: char. 371): Smooth elongated fossa extending along ventral margin of external mandibular fenestra on the angular: absent, lateral surface of the angular reaching the ventral edge of the fenestra (0), or present, separated from the lateral surface of the angular by a sharp ridge (1).

Character 372 (Pol et al., 2014: char. 372): Coronoid tuberosities on the medial surface of anterior region of surangular: absent or poorly developed (0), well developed, forming prominent elongated crests divided by a deep longitudinal sulcus (1).

Character 373 (Pol et al., 2014: char. 373): Dorsal surfaces of the lateral glenoid facet and the lateral flange of the retroarticular process: glenoid facet separated from the retroarticular surface by a ridge or a step (0), or continuous (1).

Character 374 (Pol et al., 2014: char. 374): Length of the lateral flange of the retroarticular process relative to the lateromedial width of the glenoid facets of the articular: shorter (0), or approximately the same length or longer (1).

Character 375 (Pol et al., 2014: char. 375): Rounded bulge at the posterior end of the lateral flange of the retroarticular process: absent (0), or present (1).

Character 376 (Pol et al., 2014: char. 376): Orientation of the ridge on the dorsal surface of retroarticular process that divides the of the lateral and medial flanges of the retroarticular process: directed posteriorly, parallel to the longitudinal axis of the mandibular ramus (0), or directed posterolaterally, approximately at 45 degrees with the longitudinal axis of the mandibular ramus (1).

Character 377 (Pol et al., 2014: char. 377): Small bulge located proximally on the medial flange of the retroarticular process, posteriorly to the medial glenoid facet of the articular and associated with the foramen aerum in some taxa: absent (0), or present (1).

Character 378 (Pol et al., 2014: char. 378): Anteromedial end of medial flange of the retroarticular process: connected to the posteromedial corner of the medial glenoid facet of the articular through a dorsally directed crest (0), or extending anteriorly as a distinct anterior process up to the level of the anteroposterior midpoint of the medial glenoid of the articular (1), or projecting anteroventrally as deep pendant process (2).

Character 379 (Pol et al., 2014: char. 379): Orientation of medial flange of the retroarticular process: facing dorsally or slightly dorsomedially, having a similar orientation to the lateral flange to the medial flange of the retroarticular process (0), or facing medially, strongly deflected and forming an angle of approximately 90 degrees with the dorsal surface of the lateral flange (1).

Character 380 (Pol et al., 2014: char. 380): Medial edge of the medial flange of the retroarticular process: straight or slightly convex (0), or strongly convex forming a paddle-shaped medial flange; its margin forms an extensive arch of approximately half circumference when viewed in dorsal view (1).

Character 381 (modified from Andrade and Bertini 2008a: char. 128; and Turner and Sertich, 2010: char. 296 by Pol et al., 2014: char. 381): Transitional tooth located at the contact between the premaxilla and maxilla, both of which contribute to the alveolar walls: absent (0), or present (1).

Character 382 (Pol et al., 2014: char. 382): Number of strongly procumbent teeth on the anterior region the mandibular symphysis: one tooth on each dentary (0), or two procumbent teeth on each dentary (1).

Character 383 (Pol et al., 2014: char. 383): Implantation of lower incisiviforms: in separate alveoli (0), or in a continuous alveolar groove (1).

Character 384 (modified from Andrade et al., 2011: char. 399 by Pol et al., 2014: char. 384): Left and right toothrow along mandibular symphysis: well separated from each other by a broad dorsal surface of the symphysis (0), or closely located to each other (forming a symphyseal tooth battery in most taxa) (1).

Character 385 (Pol et al., 2014: char. 385): Apico-basal ridges on the enamel surface of incisiviforms and caniniform: absent (0), or well-developed (1).

Character 386 (modified from Andrade and Bertini 2008a: char. 123 by Pol et al., 2014: char. 386): Apico-basal ridges on the enamel surface of posterior teeth: absent (0), or present (1).

Character 387 (Pol et al., 2014: char. 387): Separation of apico-basal ridges on the enamel surface of teeth: fine enamel ridges that are closely spaced to each other (flutting) (0), or ridges, usually with a broad base, well spaced from each other (1).

Character 388 (Pol et al., 2014: char. 388): Size variation of denticles along denticulated carinae: absent or minor variation (0), or variable, with denticles at the central region of the carinae being approximately twice the size (height and width) of both apical and basal denticles (1), or decreasing gradually along the carina from the apex to the base of the crown, apical denticles are more than three times the height of the basal denticles (2)

Character 389 (Pol et al., 2014: char. 389): Thin enamel ridge (loph) connecting adjacent denticles instead of presenting distinct interdenticular slits: absent (0), or present (1)

Character 390 (modified from Andrade and Bertini, 2008a: char. 149 and O´Connor et al., 2010: char. 233 by Pol et al., 2014: char. 390): Horizontal cingula along the buccal and/or lingual margin of the base of the crown of postincisiform teeth: absent (0), or present, with accessory cusps and styli (1).

Character 391 (modified from Riff and Kellner, 2011: char 264 by Pol et al., 2014: char. 391): Posterior teeth with accessory apicobasally oriented keels bearing cusps or tuberous denticles located lingually and buccally from the major central keel: absent (0), present (1)

Character 392 (modified from Turner and Sertich, 2010: char. 294 by Pol et al., 2014: char. 392): Outer enamel surface (between carinae, apicobasal ridges, or flutting, if present): smooth (0), rugose (1)

Character 393 (modified from Andrade et al. 2011: char. 374 by Pol et al., 2014: char. 393): Rugose texture on outer enamel surface: formed by anastomizing grooves and ridges (0), formed by small globular protuberances (“pebbled enamel” sensu Price, 1950) closely spaced to each other (1)

Character 394 (modified from Andrade and Bertini 2008a: char. 138 and O´Connor et al. 2010: char 235 by Pol et al., 2014: char. 394): Tooth-tooth occlusion wear facets in posterior teeth: absent (0), present (1)

Character 395 (Pol et al., 2014: char. 395): Location and orientation of tooth-tooth occlusion wear facets in posterior teeth: oriented horizontally on the occlusal surface of the crown, parallel to the longitudinal plane of the skull (0), or located mesiolingually from the apex of the crown in upper teeth and buccodistally from the apex in lower teeth (Pol, 2003: fig. 3; Lecuona and Pol, 2008: fig. 1), oriented along a plane that is oblique to the longitudinal and sagittal planes of the skull (1)

Character 396 (Turner and Buckley, 2008: char. 290): Prominent depression on palate near alveolar margin at level of sixth or seventh alveolus: absent (0), or present (1).

Character 397 (modified from Turner and Sertich, 2010: char. 293 by Pol et al., 2014: char. 397): Gap on line of large neurovascular foramina on lateral surface of maxilla, along alveolar margin: absent, foramina form single continuous row (0), or present with a gap between anterior series and posterior series of foramina (1).

Character 398 (modified from Sereno and Larsson, 2009: char. 46 by Pol et al., 2014: char. 398): Lateral surface of jugal-ectopterygoid contact: inset from lateral jugal margin (0), or confluent with lateral jugal margin (1).

Character 399 (modified from Montefeltro et al., 2011: char. 45 by Pol et al., 2014: char. 399): Ventral margin of jugal at posterior end of ectopterygoid contact: continuous with the infratemporal bar of jugal (0), or suborbital region of jugal separated by a notch from infratemporal bar of jugal (1).

Character 400 (Sereno and Larsson, 2009: char. 83): Single or paired large neurovascular foramina on lateral surface of premaxilla, at its posterolateral corner: absent (0), or present (1).

Character 401 (modified from Montefeltro et al., 2011: char. 5 by Pol et al., 2014: char. 401): + Prefrontal-prefrontal medial contact: absent (with a broad contact between nasal and frontal) (0) anterior region of prefrontals project a medial pointed process that almost touch the other prefrontal (with a tiny contact between nasal and frontal) or touch each other as a punctual contact (1), contact present along mostly of the dorsal medial edge (2).

Character 402 (Montefeltro et al., 2011: char. 23): Maxillary palatal sagittal contact: smooth (0), bearing a longitudinal series of foramina (1).

Character 403 (modified from Montefeltro et al., 2011: char. 33 by Pol et al., 2014: char. 403): Quadrate lateral depression: absent (0), present and elongated, reaching close to or extending into the quadratojugal-quadrate suture (1).

Character 404 (Montefeltro et al., 2011: char 34): Periotic quadrate fenestrae on lateral surface of quadrate: visible in lateral view (0), internalized in otic notch (1).

Character 405 (modified from Montefeltro et al., 2011: char. 42 by Pol et al., 2014: char. 405): Medial palatal contact between suborbital fenestra: (0), distinctly raised forming a ridged suture along its whole extension (1).

Character 406 (Montefeltro et al., 2011: char. 64): Posteroventral symphyseal depressions: absent (0), present (1).

Character 407 (modified from Montefeltro et al., 2011: char. 11 by Pol et al., 2014: char. 407): Extension of frontal sagittal ridge: extending along the entire frontal dorsal surface (0), failing to reach the anterior end of the frontal, extending up to 75% of its anteroposteriorlength (1).

Character 408 (modified from Montefeltro et al., 2011: char. 37 by Pol et al., 2014: char. 408): Supraoccipital dorsal exposure on skull roof: subtriangular or crescentic shaped with the maximum anteroposterior length located along the sagittal plane and lateral regions anteroposteriorly shorter (0), forming a anteroposteriorly short but lateromedially broad surface sutured to the posteriormost portion of parietal and squamosal, with the lateral ends as anteroposteriorly long as the central region (1).

Character 409 (Larsson and Sues, 2007: char. 71): Sagittal torus on maxillary palatal shelves: absent (0), or present (1).

Character 410 (Pol et al., 2014: char. 410): Groove located on premaxillary lateral surface, running anteroventrally from the dorsoventral midpoint of its posterior margin: absent (0), or present (1).

Character 411 (modified from Nascimento and Zaher, 2011: char. 258 and Montefeltro et al., 2011: char. 16 by Pol et al., 2014: char. 411): Suture between the postorbital and the squamosal in lateral view: straight or almost straight, vertical or oblique (0), or convex anteriorly (1).

Character 412 (Pol et al., 2014: char. 412): Anterolateral corner of supratemporal fossa: with a continuous rim formed by the postorbital dorsal surface (0), or with a transversely oriented groove on dorsal surface of postorbital interrupting the anterolateral rim of the supratemporal fossa (1).

Character 413 (Leardi et al., 2015a: char. 413): Acromial region of the scapula: not distinctively expanded, forming an angle of more than 120º with the major axis of the scapula (0); or, expanded, with a cuadrangular proximal end in lateral view and forming an angle of 105º or less with the major axis of the scapula (1).

Character 414 (Leardi et al., 2015a: char. 414): Glenoid facet on the scapula: Proximolaterally exposed (0); or, exposed proximally, being concave on lateral view, forming a dorsal roof to the glenoid facet of the coracoid (1).

Character 415 (Leardi et al., 2015a: char. 415): Bulge on the anterior margin of the glenoid facet on the scapula: absent (0); or, present (1).

Character 416 (Leardi et al., 2015a: char. 416): Posterior edge of the scapular blade: smooth (0); or, with a posterior flange that can be inferred as the insertion of the scapulosternal ligament (1).

Character 417 (Leardi et al., 2015a: char. 417): Anteroposterior development of the glenoid facet on the coracoid: short, well posterior to the level of the coracoid foramen (0); or, long, reaching or almost reaching the level of the coracoid foramen (1).

Character 418 (Leardi et al., 2015a: char. 418): Crest on the posterior surface of the proximal end of the humerus: passing just anteriorly to the scar of the common insertion of the M. teres major and M. latissimus dorsi (0); or, finishing dorsally to this scar (1).

Character 419 (Leardi et al., 2015a: char. 419): Anterolateral process of the ulna: displaced anteriorly, leaving the proximal surface of articulation with the radius exposed anteriorly (0); or, on the lateral surface of the proximal end, leaving the proximal surface of articulation with the radius exposed anterolaterally (1).

Character 420 (Leardi et al., 2015a: char. 420): Region between the anterolateral process of the ulna and the olecranon (or posterior process) in proximal view: convex (0); or, concave, bearing a well-developed furrow that extends onto the lateral surface of the ulna, that can be inferred as associated with the insertion of the M. flexor ulnaris (1).

Character 421 (Leardi et al., 2015a: char. 421): Proximal (proximodorsal) process of the radiale: absent (0); or, present (1)

Character 422 (Leardi et al., 2015a: char. 422): Ungual manual phalanges: lateromedially broad, with a convex and gently rounded ventral surface (0); or, lateromedially compressed, with a longitudinal crest along the whole ventral surface (1).

Character 423 (Leardi et al., 2015a: char. 423): Anteroproximal process of the ischium: anteroposteriorly long and dorsoventrally low, with the distal end being 3 times smaller than the whole length of the process (0); or, anteroposteriorly short and dorsoventrally tall, with the distal end equal or almost equal to the whole length of the process (1).

Character 424 (Leardi et al., 2015a: char. 424): Fibular facet on the fibular condyle of the femur: starting anteriorly to the level of the posterior end of the medial condyle (0); or, starting posteriorly to the level of the posterior end of the medial condyle (1).

Character 425 (Leardi et al., 2015a: char. 425): Distal end of the fibula in distal view: rounded (0); or, triangular (1).

Character 426 (Leardi et al., 2015a: char. 426): Strong dorsal crest separating the dorsal region of the anterior hollow of the astragalus from the astragalar-tarsale ligament pit: absent (0); or, present (1).

Character 427 (Leardi et al., 2015a: char. 427): Vascular foramen on the anterior hollow: absent (0); present (1).

Character 428 (Leardi et al., 2015a: char. 428): Strong median crest oriented proximodistally on the posterior surface of the astragalus connecting the distal roller with the posteromedial edge of the proximolateral process of the astragalus, closing posteriorly the proximal depression of the astragalus: absent or not continuous (0); or, present (1).

Character 429 (Leardi et al., 2015a: char. 429): Dorsal surface of the calcaneal tuber: lacks (0); or, has a small nutrient foramen around its mid length (1).

Character 430 (Leardi et al., 2015a: char. 430): Lateral bulge on the atlantal neural arch: absent (0); or, present (1).

Character 431 (Leardi et al., 2015a: char. 431): Hypapophysis on the axis: absent or poorly developed (0); or, present as a strong anteroventral process (1).

Character 432 (Leardi et al., 2015a: char. 432): Prespinal fossa on the cervical vertebrae: absent or shallow (0); or, deep, forming a strong depression on the dorsal surface of the neural arch (1).

Character 433 (Leardi et al., 2015a: char. 433): Neural spines of the anterior cervical vertebrae: vertical or posteriorly slanted (0); or, anteriorly slanted (1).

Character 434 (Leardi et al., 2015a: char. 434): Ventral keel on the ventral surface of the cervical vertebrae: absent or weak, not reaching the posterior margin of the centra (0); or, strongly developed, reaching the posterior margin of the centra (1).

Character 435 (Leardi et al., 2015a: char. 435): Ventral keel on the ventral surface of the anterior dorsal vertebrae: absent or weak, not reaching the posterior margin of the centra (0); or, strongly developed, reaching the posterior margin of the centra (1).

Character 436 (Leardi et al., 2015a: char. 436): Parapodiapophyseal laminae on the anterior dorsal vertebrae: absent or weakly developed (0); or, present as sharp laminae uniting the para and diapophyses, not leaving a concavity between both processes (1).

Character 437 (Leardi et al., 2015a: char. 437): Last dorsal vertebrae in which the parapophyses are in contact with the neurocentral suture: D2 or anteriorly (0); D3 (1); or, D4 or posteriorly (2).

Character 438 (Leardi et al., 2015b: char. 438): Sacral rib scars: contacting each other (0); or, separated each other by a non-articular surface (1).

Character 439 (modified from Sereno, 1991: char. 27 and Fiorelli and Calvo, 2007: char. 226 by Leardi et al., 2015: char. 439): Ratio of femoral length versus tibial length: greater than one (femur longer than the tibia) (0); or, equal or smaller than one (tibia as long as or longer than the femur).

Character 440 (Fiorelli et al., 2016: char. 440): Shape of the splenials at the symphysis in dorsal view: contacting each other obliquely, forming “V-shaped” anterior tapering process (0); or, contacting each other transversally, forming a broad anterior process (1).

Character 441: Maxillary contribution to the antorbital fossa: posteriorly tapering (0); or, as dorsoventrally high as the maxillary lateral surface between antorbital fossa and alveolar margin and extending posteriorly up to the posterior end of the antorbital fossa (1).

Character 442 (NEW): Length of parietal/squamosal suture (rostro caudal direction) with respect to the length of supratemporal fossa: can’t reach the half of the length of the supratemporal fenestrae (0); reach the half or surpass of the length of the supratemporal fenestrae (1); has the similar or surpass the length of the supratemporal fenestrae (2).

Character 443 (NEW): Convex outline of the lateral (distal) region of the supratemporal shelves: absent (0); present - convex (1); extremely convex (2).

Character 444 (NEW): Crests on the dorsal surface of the parietal: absent (0); present (1).

Character 445 (NEW): Lateral border of the supratemporal fenestrae without supratemporal fossa: present (0); absent (1).

Character 446 (NEW): Lateral skull table that overlaps the meatal chamber: a tall wall, with posterior portion of the postorbital subtriangular, and a highly posterior region of the squamosal, with a strong anteroventrally oriented anterior process (0); descending lamina of the squamosal possess a horizontal outline, forming a concave roof (1); laterally covered by descending lamina of the squamosal and posteroventrally oriented, but not closing the meatal chamber (2); laterally covered by descending lamina of the squamosal and posteroventrally, with the meatal chamber closed (3); boundary between postorbital and squamosal massive, with squamosal tapering posteriorly (4); the set postorbital posterior process and squamosal, making the dorsal rim of the infratemporal fenestra (5).

Character 447 (NEW): Boundary between periotic fossa and anterior dorsal process of the quadrate: smooth transition (0); a moderated division (1); well defined, laminar keel (2); well defined, columnar boundary (3).

Character 448 (NEW): Posterior extension of the dorsal portion of the postorbital bar: absent (0); present (1).

## *Ruiz et al. (2021):*

**The last 7 characters are newly proposed.**

Character 1: External surface of dorsal cranial bones: smooth (0), ornamented (1) (Clark 1994).

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

Character 3: Sculpture in external surface of rostrum: absent (0), present (1) (Gasparini *et al.* 2006).

Character 4: Rostrum dorsal projection: absent, rostrum straight or low (0), rostrum upturned (1) (Andrade *et al.* 2011).

Character 5: Skull expansion at orbits: gradual (0), abrupt (1) (Clark 1994).

Character 6: Lateral contour of snout in dorsal view: straight (0), sinusoidal (1) (Ortega *et al.* 2000).

Character 7: Snout length (anterior margin of orbits to rostrum) relative to remainder of skull: equal or longer (0), shorter (1) (Wu *et al.* 1997).

Character 8: Rostrum proportions: narrow oreinirostral (0), broad oreinirostral (1), nearly tubular (2), playtrostral (3) (Clark 1994).

Character 9: External nares orientation: facing anterolaterally (0), facing dorsally (1) (Clark 1994).

Character 10: External nares: divided by a septum (0), confluent (1) (Clark 1994).

Character 11: Major orbit orientation: dorsally or laterodorsally (0), fully laterally (1). (Wilkinson *et al.* 2008).

Character 12: External antorbital fenestrae: present (0), absent (1) (Andrade *et al.* 2011).

Character 13: External antorbital fenestra size: as large as orbit (0), about half the diameter of the orbit (1), much smaller than the orbit (2) (Clark 1994).

Character 14: Shape of antorbital fenestra: rounded or dorsoventrally high (0), low and elongated, slit-like (1), triangular shape with apex dorsally directed (2) (Gasparini *et al.* 2006).

Character 15: External supratemporal fenestra: present (0), absent (1) (Ortega *et al.* 2000).

Character 16: External supratemporal fenestrae shape: square-shaped to sub rectangular (0), circular to elliptical (1), triangle-shaped converging medially (2) (Andrade *et al.* 2011).

Character 17: Anteroposterior length of external supratemporal fenestrae: equal to or shorter than orbits (0), much longer than obits (1) (Clark 1994).

Character 18: Infratemporal fenestrae, size proportional to orbit: small to absent, no more than 20% the area of the orbit (0), large, area is usually no less than 50% of the area of the orbit (1) (Andrade *et al.* 2011).

Character 19: Infratemporal fenestra, orientation: faces laterally (0), faces laterodorsally (1) (Andrade *et al.* 2011).

Character 20: Infra temporal fenestrae shape: clearly triangular (0), elliptic to subpolygonal (1) (Ortega *et al.* 2000).

Character 21: Choanal opening, conformation in palate: continuous with pterygoid ventral surface except for anterior and anterolateral borders (0), or opens into palate through deep midline depression (choanal groove) (1) (Clark 1994).

Character 22: Choanae, shape in palatal view: subcircular, elliptic or lanceolated (0), triangle-like (1), rectangular (2) (Andrade & Bertini 2008).

Character 23: Choanal opening size: moderately broad or narrow, equal or less than 30% the width between the lateral margins of the pterygoid wings (0), or extremely broad approximately 50% the width between the lateral margins of the pterygoid wings (1) (Clack 1994).

Character 24: Choanal groove: undivided (0), partially septated (1), completely septated (2) (Clark 1994).

Character 25: Choanal opening: opened posteriorly and continuous with pterygoid surface (0), closed posteriorly by an elevated wall formed by the pterygoids (1) (Pol & Norell (2004a)).

Character 26: Suborbital fenestrae: small (0), present and subequal or larger than orbit (2) (Andrade *et al.* 2011).

Character 27: Suborbital fenestrae, shape of anterior border: rounded, smooth (0), in sharp angle, forming a notch, fissure-like (1) (Andrade & Bertini 2008).

Character 28: Post-temporal fenestrae: present (0), absent (1) (Montefeltro *et al.* 2011).

Character 29: Otic aperture (not including additional quadrate fenestrae): opened posteriorly (0), closed posteriorly by quadrate and otoccipital (1) (Clark 1994).

Character 30: General morphology of otic aperture (including otic aperture of cranio-quadrate passage but not preotic siphonal foramen nor quadrate fenestrae when present): closed posteriorly and subpolygonal to elliptic (0), closed posteriorly and triangle-shaped, with apex directed dorsally (1) (Andrade *et al.* 2011).

Character 31: External auditory meatus, size (including otic aprture of cranio-quadrate passage but not preotic siphonal foramen and quadrate fenestrae when present): very small, poorly visible (even in lateral view) (0), medium sized (1), conspicuously large (2) (Andrade *et al.* 2011).

Character 32: Cranio-quadrate canal: opened laterally (0), closed laterally (1) (Clark 1994).

Character 33: Cranio-quadrate canal occipital opening: distal portion near lateral edge of skull (0), distal portion located ventral to paraoccipital process (1) (Clark 1994).

Character 34: Dorsal surface of rostrum: curves smoothly (0), bears a median boss (1) (Brochu 1999).

Character 35: Maximal width of premaxillae and maximal width of the rostrum at the level of alveoli 4 or 5: premaxillae narrower (0), rostrum narrower (1) (Jouve 2009).

Character 36: Premaxillae anterior to nares, morphology: strongly sutured (0), loosely sutured, sometimes not in contact (1) (Andrade *et al.* 2011).

Character 37: Premaxilla anterior to nares: narrow (0), broad (1) (Clark 1994).

Character 38: Distance between the tip of the snout and the anteriomost position of the premaxilla-maxilla suture in dorsal view, and the distance between the anteriormost position of premaxilla-maxilla suture in dorsal view and the posterodorsal extremity of the premaxilla: distance between the tip of the snout and the anteriomost position of the premaxilla-maxilla suture larger (0), distance between the anteriormost position of premaxilla - maxilla suture in dorsal view and the posterodorsal extremity of the premaxilla larger (1) (Jouve 2004).

Character 39: Nares, projection of the internarial bar relative to the main body of premaxilla and narial opening: does not project anterior to the main body of premaxilla (0), strongly projected anteriorly from narial opening, anterior to main body of premaxilla (1) (Andrade *et al.* 2011).

Character 40: Premaxilla participation in internarial bar: forming at least the ventral half (0), with little participation (1) (Clark 1994).

Character 41: Premaxilla, foramen in perinarial depression: absent (0), present (1) (Gasparini *et al.* 2006).

Character 42: Perinarial crests: absent (0), present as well defined and distinct ridges, cornering the lateral to posterior borders of the naris (1) (Andrade *et al.* 2011).

Character 43: Postnarial fossa: absent (0), present (1) (Andrade *et al.* 2011).

Character 44: Premaxilla-maxilla suture ventrally: confluent (0), opened contact on ventral edge of rostrum (1) (Clark 1994).

Character 45: Opened contact on ventral edge of rostrum at premaxilla-maxilla contact: present ventrally as notch (0), present ventrally as large fenestrae encompassing at least partially the opposite dentary tooth (1), present as a narrow slit along the entire lateral portion of the suture (2) (Clark 1994).

Character 46: Nasal into external nares: absent, maxillae contact midline (0), absent, premaxillae contact midline (1), participate medially on dorsal/posterior margin of the nares (2), participate medially and laterally on dorsal/posterior margin of the nares (3) (Clark 1994).

Character 47: Posterodorsal process of premaxilla: absent (0), present extending posteriorly wedging between maxilla and nasals (1) (Pol 1999).

Character 48: Premaxilla-maxilla contact, nature of contact: premaxilla loosely overlies maxilla (i.e., posterodorsal process of the premaxilla overlaps the anterodorsal surface of the maxilla) (0), sutured together along a butt joint (1) (Clark 1994).

Character 49: Depression on posterolateral surface of maxilla: absent (0), or present (1) (Wu *et al.* 1997).

Character 50: Maxilla, extent of contact with nasal: extensive contact (0), small sutural contact (1) (Andrade *et al.* 2011).

Character 51: Maxillae, participation in the orbit: absent (0), present (1) (Andrade *et al.* 2011).

Character 52: Nasal bones: paired (0), or partially or completely fused (1) (Gasparini *et al.* 2006).

Character 53: Nasal elevated above dorsal surface of maxillae forming a sagittal bar: absent (0), present (1) (Montefeltro *et al.* 2011).

Character 54: Nasal lateral border posterior to external nares: laterally concave (0), straight (1) (Pol 1999).

Character 55: Nasal lateral edges: nearly parallel (0), oblique to each other converging anteriorly (1) (Pol 1999).

Character 56: Nasals, shape of posterolateral region: flat surface facing dorsally (0), lateral region deflected ventrally, forming part of the lateral surface of the snout (1) (Pol & Apesteguia 2005).

Character 57: Posterior portion of dorsal surface of the nasal: round or flat (0), or bearing a rugose broad depression (1) (Montefeltro *et al.* 2011).

Character 58: Nasal participation in antorbital fenestra: present (0), absent (1) (Ortega *et al.* 2000).

Character 59: Nasal-lacrimal contact: present (0), absent (1) (Clark 1994).

Character 60: Lacrimal contacts nasal along medial edge only (0), or medial and anterior edges (1) (Clark 1994).

Character 61: Caudal tip of nasals: converge at sagittal plane (0), or separated by anterior sagittal projection of frontals (1) (Ortega *et al.* 2000).

Character 62: Midline longitudinal depression on posterior portion of nasal and anterior portion of frontal: absent (0), present (1) (Montefeltro *et al.* 2011).

Character 63: Total lacrimal length relative to total prefrontal: longer (0), sub equal (1), shorter (2) (Brochu 1999).

Character 64: Lacrimal shape: longer than broad (0), as long as broad (1) (Sereno & Larsson 2009).

Character 65: Support for the anterior palpebral bone: marked depression forming an incipient lateral projection (0), marked depression forming a great lateral projection for the support of anterior palpebral (1) (Sereno & Larsson 2009).

Character 66: Facet for palpebral articulation, general shape: borders not marked forming an anteroposterior elongated area (0), well-marked borders forming a shallow hemispherical surface (1) (Pol *et al.* 2009).

Character 67: Prefrontal lateral development: reduced (0), or enlarged, extending laterally over orbit (1) (Gasparini *et al.* 2006).

Character 68: Paired crests along the prefrontal-frontal sutures: absent (0), or present (1) (Pol & Powell 2011).

Character 69: Prefrontals anterior to orbits: elongated, oriented parallel to anteroposterior axis of the skull (0), short and broad, oriented posteromedially-anterolaterally (1). (Gomani 1997).

Character 70: Prefrontal-lacrimal crest dorsal to orbit: absent (0), present (1) (Andrade *et al.* 2011).

Character 71: Prefrontal and lacrimal around orbits: forming flat rims (0), or evaginated, forming elevated rims (1) (Gasparini *et al.* 2006).

Character 72: Prefrontals medial contact: absent (0), present (1) (Montefeltro *et al.* 2011).

Character 73: Prefrontals medial contact: present anteriorly (1), or present along mostly of dorsal medial edge (2) (Montefeltro *et al.* 2011).

Character 74: Frontals: paired (0), unpaired (1) (Clark 1994).

Character 75: Frontal width between orbits: narrow, as broad as nasals (0), broad, twice as broad as nasals (1) (Clark 1994).

Character 76: Frontal, morphology of anteriormost border of anterior process: truncated (0), wedge-like (1) (Andrade *et al.* 2011).

Character 77: Dorsal surface of frontal: flat (0), with a longitudinal ridge (1) (Clark 1994).

Character 78: Frontal dorsal longitudinal ridge: restricted to the posterior portion (0), restricted to median portion (1), restricted to anterior portion (2) (Montefeltro *et al.* 2011).

Character 79: Frontal, extension of anterior margin: long, progress anterior to the orbits (0), short, does not progress anterior to the orbits (1) (Andrade *et al.* 2011).

Character 80: Transverse ridge crossing the frontal anteromedial to the orbits: absent (0), or present (1) (Pol *et al.* 2009).

Character 81: Dorsal surface of frontal, posterior to orbits: flat or slightly concave (0) or markedly concave transversally (not considering the elevated orbital rim when it occurs) (1) (Riff & Kellner 2011).

Character 82: Prefrontal pillar: not contacting palate (0), contacting palate (1) (Clark 1994).

Character 83: Dorsal region of prefrontal pillars: transversely expanded (0), longitudinally expanded (1) (Ortega *et al.* 2000).

Character 84: Prefrontal pillar ventral portion, when integrated in palate: transversely expanded (0), columnar (1) (Ortega *et al.* 2000).

Character 85: Frontal, anterior ramus with respect to the tip of the prefrontal: ending posteriorly (0), ending anteriorly (1) (Sereno *et al.* 2001).

Character 86: Lateral margins of the frontal, relative to the skull surface: flush with skull surface (0), or elevated, forming ridged orbital margins (1) (Brochu 1999).

Character 87: Frontal, participation in the primary medial border of orbit, at dorsal skull roof, not considering palpebrals: extensive participation in the orbit (0), excluded from the orbit by prefrontal-postorbital contact, or participation is very reduced (1) (Andrade *et al.* 2011).

Character 88: Postorbital anterolateral process: absent or poorly developed (0), or well developed, long, and acute (1) (Clark 1994).

Character 89: Postorbital-jugal contact, configuration of contact: postorbital anterior to jugal (0), postorbital medial to jugal (1), postorbital lateral to jugal (2) (Clark 1994).

Character 90: Parieto-postorbital suture: absent from dorsal surface of skull roof and supratemporal fossa (0), absent from dorsal surface of skull roof but present at the ventral region of supratemporal fossa (1) absent from dorsal surface of skull roof but broadly present within supratemporal fossa (2), or present within supratemporal fossa and on dorsal surface of skull roof (3) (Clark 1994).

Character 91: Relative length between squamosal and postorbital: squamosal is longer (0), postorbital is longer (1) (Ortega *et al.* 2000).

Character 92: Supratemporal roof, conformation of dorsal surface: complex (0), dorsally flat "skull table" developed, with postorbital and squamosal with flat shelves extending laterally beyond quadrate contact (1) (Clark 1994).

Character 93: Medial borders of supratemporal fenestrae: flat sculptured region (0), forming a low sagittal crest (1) (Clark 1994).

Character 94: Dermal bone overhang about the supratemporal fenestrae: absent (0), present (1) (Norell 1988).

Character 95: Dermal bone overhang about the supratemporal fenestrae: present only medially and posteriorly (0), present about the entire edge (1) (Norell 1988).

Character 96: Supratemporal rims raised and hypertrophied: absent (0), present (1) (Montefeltro *et al.* 2011).

Character 97: Bar between orbit and supratemporal fossa, shape: broad and solid, with broadly sculpted dorsal surface if sculpture is present on skull (0), bar narrow, sculpting restricted to anterior surface (1) (Clark 1994).

Character 98: Angle between medial and anterior margins of supratemporal fossa: ~90 degrees or greater (0), or ~45 degrees (1) (Gasparini *et al.* 2006).

Character 99: Shallow fossa at anteromedial corner of supratemporal fenestra: present (0), or absent, corner smooth (1) (Brochu 1999).

Character 100: Parietal, dorsal surface: same level of squamosal (0), projected dorsally, relative to the skull roof (1), markedly depressed from skull roof (2) (Andrade *et al.* 2011).

Character 101: Cranial table width with respect to ventral portion of skull: as wide as ventral portion of skull (quadrates covered by squamosal) (0), narrower but still covering most of the lateromedial region of quadrates (1), narrower exposing lateromedial region of quadrate (2) (Wu *et al.* 1997).

Character 102: Upper temporal bars, outline of lateral margins in dorsal view: margin mostly straight or slightly convex (0), margin strongly sinusoidal (1) (Andrade *et al.* 2011).

Character 103: Lateral margins of squamosal and postorbital in dorsal view: parallel (0), or diverging posteriorly (1) (Ortega *et al.* 2000).

Character 104: Palpebrals: absent (0), present (1) (Clark 1994).

Character 105: Posterior palpebral: absent (0), present (1) (Clark 1994).

Character 106: Anterior palpebral shape: rounded (0), hook-shaped with a posterolateral process (1) (Clark 1994).

Character 107: Palpebrals: separated from (or weakly sutured to) lateral edge of frontals (0), extensively sutured to each other and to lateral margin of frontals (1) (Pol & Norell 2004b).

Character 108: Frontal-postorbital suture at anterior edge of external supratemporal fenestrae: level with the intertemporal bar (0), lower than the intertemporal bar (1) (Wilkinson *et al.* 2008).

Character 109: Longitudinal groove for attachment of the upper ear lid at squamosal lateral surface: absent (0), present (1) (Clark & Sues 2002).

Character 110: Dorsal and ventral edges of squamosal groove for upper ear lid: ventral edge is lateral to dorsal (0), ventral edge is directly beneath dorsal (1) (Clark & Sues 2002).

Character 111: Posteromedial branch of squamosal, orientation: transversely oriented (0), posterolaterally oriented (1) (Gasparini *et al.* 2006).

Character 112: Squamosal, dorsal margin of occipital flange: straight (0), or dorsally concave (1) (Gasparini *et al.* 2006).

Character 113: Anterior opening of temporo-orbital canal, in dorsal: present (0), absent (1) (Ortega *et al.* 2000).

Character 114: Squamosal posterolateral process: absent (0), present (1) (Clark 1994).

Character 115: Squamosal posterolateral process projection: parallel to skull roof (0), ventrally directed (1), upturned (2) (Ortega *et al.* 2000).

Character 116: Ventral projection of squamosal posterolateral process: does not closes the auditory meatus posteriorly (0), closes the auditory meatus posteriorly (1) (Ortega *et al.* 2000).

Character 117: Squamosal posterolateral process: in level with skull table (0), or depressed from skull table (1) (Sereno & Larsson 2009).

Character 118: Ornamentation on the posterolateral process of squamosal: absent (0), present (1) (Larsson & Sues 2007).

Character 119: Distal squamosal posterolateral process: tapered (0), broad (1) (Larsson & Sues 2007).

Character 120: Exposure of supraoccipital in skull roof: absent (0), present (1) (Ortega *et al.* 2000).

Character 121: Supraoccipital dorsal exposure: exposed in the midline portion of posterior region of skull table (0) restricted to a thin surface attached to posteriormost portion of parietal and squamosal (1) (Montefeltro *et al.* 2011).

Character 122: Parietal: with broad occipital portion (0), without broad occipital portion (1) (Clark 1994).

Character 123: Enclave at parietal-squamosal posterior margin in dorsal view: absent (0), present (1) (Wilkinson *et al.* 2008).

Character 124: Ventral curvature of temporal arch: absent (0), present (1) (Andrade *et al.* 2011).

Character 125: Ventral edge of premaxilla, location relative to maxilla: at same height as ventral edge of maxilla (0), or lower than ventral edge of maxilla, with dorsal contour of anterior part of dentary strongly concave (1) (Ortega *et al.* 2000).

Character 126: Notch in premaxilla on lateral edge of external nares: absent (0), present on the dorsal half of the external nares lateral margin (1) (Pol 1999).

Character 127: Perinarial fossa: absent (0), present (1) (Pol & Apesteguia 2005).

Character 128: Perinarial fossa: restricted extension (0), reaching the alveolar margin of premaxillae (1) (Pol & Apesteguia 2005).

Character 129: Perinarial fossa: posterior margin not reaching the level of posterior margin of external nares (0), posterior margin reaching beyond the level of posterior margin of external nares (1) (Pol & Apesteguia 2005).

Character 130: Neurovascular foramina (maxillae and premaxilla), overall distance to the alveolar margin and teeth ventralmost foramina clearly apart from the alveolar margin, distant to the teeth (0), ventralmost foramina reach area next to the alveolar margin, close to teeth (1) (Andrade & Bertini 2008).

Character 131: Neurovascular foramina (mid maxilla) forming a strongly arched line at mid-rostrum: absent, line of foramina follows the overall outline of the margin (0), present, ample area of smooth margin ventral to the arched line of foramina (1) (Andrade *et al.* 2011).

Character 132: Neurovascular foramina (posterior maxilla), distribution on the alveolar margin: ventralmost foramina not high on the maxillary margin, either close or next to the alveoli (0), ventralmost foramina high on the maxilla (up to twice the distance from other foramina), very distant to the alveoli (1) (Andrade & Bertini 2008).

Character 133: Ventral edge of maxilla in lateral view: straight or convex (0), or sinusoidal (1) (Ortega *et al.* 2000).

Character 134: Small foramen located in the premaxillo-maxillary suture in lateral surface (not for big mandibular teeth): absent (0), or present (1) (Pol 1999).

Character 135: Wedge-like process of the maxilla in lateral surface of premaxilla-maxilla: absent (0), or present (1) (Gasparini *et al.* 1993).

Character 136: External surface of maxilla and premaxilla, general shape: with single plane facing laterally (0), or with ventral region facing laterally and dorsal region facing dorsolaterally (1) (Pol 1999).

Chracter 137: Evaginated maxillary alveolar edges: absent (0), present (1) (Gasparini *et al.* 2006).

Character 138: Evaginated maxillary alveolar edges: as continuous sheet (0), as discrete evaginations at each alveolus (1) (Gasparini *et al.* 2006).

Character 139: Unsculptured region along alveolar margin on lateral surface of maxilla: absent (0), or present (1) (Wu & Sues 1996).

Character 140: Large and aligned neurovascular foramina on lateral maxillary surface: forming a continuous row (0), forming anterior and posterior series separated by a gap (1) (Pol 1999).

Character 141: Posterior extent of maxilla in lateral surface of rostrum: posterior to anterior margin of orbit (0) anterior to anterior margin of orbit (1) (Wu & Chatterjee 1993).

Character 142: Lacrimal, posterior extent and relationship with jugal: extending posteroventrally, widely contacting jugal (0), or tapering posteroventrally, does not contact jugal or contacts the jugal only slightly (1) (Zaher *et al.* 2006).

Character 143: Anterior margins of lacrimal and jugal: confluent with no notch at anterior contact (0), jugal edge convex producing an anterior notch at contact (filled by maxilla) (1) (Larsson & Sues 2007).

Character 144: Jugal, extension below the orbit: does not exceed anterior margin of orbit (0), or exceeds margin (1) (Pol 1999).

Character 145: Posterior extent of orbital edge of jugal: confluent with postorbital bar (0), displaced laterally and ends anterior to postorbital bar (forming posteroventral notch in orbit) (1) (Brochu 1999).

Character 146: Jugal outer surface: confluent along the entire length (0), infratemporal portion of jugal laterally displaced anteriorly (1) (Pol 1999).

Character 147: Infratemporal portion of jugal laterally displaced: does not extend beyond the anterior orbital margin (0), extends beyond the anterior orbital margin (1) (Pol 1999).

Character 148: Dorsoventral height of jugal antorbital region with respect to infraorbital region: equal or lower (0), or antorbital region more expanded than infraorbital region (1) (Pol 1999).

Character 149: Dorsoventral depth of the jugal orbital portion in relation to infratemporal portion: almost the same depth (0), orbital portion twice the depth of the infratemporal portion (1) (Clark 1994).

Character 150: Jugal, large foramen on the lateral surface near the anterior margin: absent (0), or present (1) (Zaher *et al.* 2006).

Character 151: Anterior process of jugal relative to infratemporal fenestrae anteroposterior length: smaller to sub equal (0), much longer (1) (Larsson & Sues 2007).

Character 152: Ectopterygoid-jugal suture ridge: absent (0), present (1) (Montefeltro *et al.* 2011).

Character 153: Ectopterygoid-jugal suture ridge: continuous with ventral ridge of the infratemporal portion of jugal (0), ridges separated by a notch at the posterior region of the ectopterygoid-jugal suture (1) (Montefeltro *et al.* 2011).

Character 154: Posterior portion of lateral surface of jugal and ectopterygoid: not confluent (0), confluent with lateral jugal margin forming a depression (1) (Sereno & Larsson 2009).

Character 155: Ventral lamina of jugal: extends far anterior to ectopterygoid (0), or ends at level of ectopterygoid (1) (Jouve 2004).

Character 156: Base of postorbital process of jugal, orientation: directed posterodorsally (0), dorsally (1), or anterodorsally (2) (Pol 1999).

Character 157: Postorbital process of jugal, location on jugal: anteriorly placed (0), in middle (1), or posteriorly positioned (2) (Pol 1999).

Character 158: Jugal portion of postorbital bar, relative to lateral surface of jugal: flush with lateral surface of jugal (0), inset (1) (Ortega *et al.* 2000).

Character 159: Inset jugal portion of postorbital bar: anteriorly continuous but posteriorly inset (1), or medially displaced along the whole extent (2) (Ortega *et al.* 2000).

Character 160: Jugal infratemporal bar: laterally flat (0), rod-shaped (1) (Clark 1994).

Character 161: Postorbital bar, external texture: sculpted (0), or unsculpted (1) (Clark 1994).

Character 162: Postorbital bar, lateral surface formed by: formed by postorbital and jugal (0), or only by postorbital (1) (Gasparini *et al.* 2006).

Character 163: Ventral margin of infratemporal bar of jugal: straight or gentle dorsally arched (0), or strongly arched (1) (Pol *et al.* 2004).

Character 164: Longitudinal ridge on lateral surface of jugal below infratemporal fenestrae: absent (0), present (1) (Pol & Norell 2004b).

Character 165: Jugal, relationship with antorbital fossa: participating in margin of antorbital fossa (0), or separated from it (1) (Wu & Sues 1996).

Character 166: Jugal posterior process, extent of process: exceeding posteriorly the infratemporal fenestrae (0), or not (1) (Pol 1999).

Character 167: Posteroventral corner of quadratojugal: not reaching quadrate condyles (0), reaching quadrate condyles (1) (Pol 1999).

Character 168: Quadratojugal: reaches but does not participate in quadrate condyles (0), forms lateral extension to the quadrate condyles and participates in mandibular joint (1) (Pol 1999).

Character 169: Postorbital bar, shape: transversely flattened (0), massive and elliptical cross section (1), slender and cylindrical (2) (Clark 1994).

Character 170: Dorsal part of postorbital, shape in dorsal view: with anterior and lateral edges only (0), or with anterolaterally facing edge (1) (Clark 1994).

Character 171: Dorsal end of the postorbital bar, shape nearing skull table: continuous with dorsal part of postorbital (0), or dorsal part of postorbital bar constricted, distinct from the dorsal part of the postorbital (1) (Clark 1994).

Character 172: Vascular opening in dorsal surface of postorbital bar: absent (0), or present (1) (Clark 1994).

Character 173: Postorbital posteroventral process: absent or extremely reduced (tip of laterotemporal fenestrae close to dorsal edge of skull) (0), present (tip of laterotemporal fenestrae separated from the dorsal edge of skull) (1) (Larsson & Sues 2007).

Character 174: Postorbital participation in infratemporal fenestra: almost or entirely excluded (0), or bordering infratemporal fenestra (1) (Buscalioni *et al.* 1992).

Character 175: Postorbital descending flange lateral surface: flat (0), or concave (1) (Montefeltro *et al.* 2011).

Character 176: Quadratojugal, ornamentation at base: absent (0), or present (1) (Pol 1999).

Character 177: Length of anterior process of quadratojugal: either short or absent (0), from long (less than half length of lower temporal bar) to moderate (one third of lower temporal bar) (1), long (greater than half of lower temporal bar) (2) (Larsson & Sues 2007).

Character 178: Posterolateral end of quadratojugal, shape and relationship with quadrate: acute or rounded, tightly overlapping quadrate (0), or with sinusoidal ventral edge and wide and rounded posterior edge slightly overhanging lateral surface of quadrate (1) (Pol & Norell (2004a).

Character 179: Postorbital-quadratojugal contact in lateral view: restricted (0), broad contact between quadratojugal and the posterior portion of the postorbital descending flange (1) (Clark 1994).

Character 180: Ridge along dorsal section of quadrate-quadratojugal contact: absent (0), or present (1) (Pol & Norell 2004b).

Character 181: Posterior margin of infratemporal fenestrae: straight (0), with an anterior projection (1) (Ortega *et al.* 2000).

Character 182: Anterior projection of posterior margin of infratemporal fenestrae: crest shaped (0), prominent spina quadratojugalis (1) (Ortega *et al.* 2000).

Character 183: In lateral view, anterior process of the squamosal extending to the orbital margin, overlapping the postorbital: absent (0), present (1) (Turner & Buckley 2008).

Character 184: In lateral view, anterior process of the squamosal extending to the orbital margin, overlapping the postorbital: reaching the level of dorsal tip of lateral temporal fenestrae (0), reaching the orbital margin (1) (Turner & Buckley 2008).

Character 185: Quadrate major axis, direction of orientation: directed posteroventrally (0), directed mostly ventrally, or anteroventrally (1) (Pol 1999).

Character 186: Dorsal, primary head of quadrate articulates with: squamosal, otoccipital, and prootic (0), or prootic and laterosphenoid (1) (Clark 1994).

Character 187: Quadrate lateral depression: absent (0), present (1) (Montefeltro *et al.* 2011).

Character 188: Cranioquadrate otic aperture: not marking a notch at otic aperture (0), or marking a notch at otic aperture (1), marking a posteroventral sulcus (2) (Brochu 1999).

Character 189: Posterior edge of quadrate: broad medial to tympanum, gently concave (0), or posterior edge narrow dorsal to otoccipital contact, strongly concave (1) (Clark 1994).

Character 190: External auditory meatus: continuous (0), separated in two regions by a ridged-on quadrate-quadratojugal (1) (Larsson & Sues 2007).

Character 191: Quadrate fenestration: absent (0), present (1) (Clark 1994).

Character 192: Quadrate fenestration: preotic siphonal foramen present anterior to otic aperture (0), quadrate with many additional fenestrations (1) (Clark 1994).

Character 193: Quadrate fenestrae: visible in lateral view (0), or internalized in otic notch (1) (Montefeltro *et al.* 2011).

Character 194: Squamosal-quadrate contact within the otic aperture: dorsally to cranioquadrate otic aperture (0), within cranioquadrate otic aperture (1) (Brochu 1999).

Character 195: Distal quadrate body: anterior margin oriented in a right angle in relation to quadratojugal (0), anterior margin gentle slopes to quadratojugal (1) (Montefeltro *et al.* 2011).

Character 196: Quadrate distal end in posterior view: with only one plane facing posteriorly (0), or with two distinct faces, a posterior one and a medial one bearing foramen aëreum (1) (Pol 1999).

Character 197: Incisive foramen size: present (0), absent (1) (Larsson & Sues 2007).

Character 198: Palatal parts of premaxillae, extent of contact: do not meet posterior to incisive foramen (0), meet posteriorly along contact with maxillae (1) (Clark 1994).

Character 199: Incisive foramen, location relative to premaxillary toothrow: completely situated far from alveolar processes at level of second or third alveolus (0), close to alveolar process (1) (Brochu 1999).

Character 200: Premaxilla, anterior alveolar margin orientation: vertical (0), or inturned (1) (Sereno *et al.* 2001).

Character 201: Posterior palatal branches of maxillae anterior to palatines: do not meet (0), meet (1) (Clark 1994).

Character 202: Premaxillary palate, circular paramedian depressions: absent (0), present (1) (Sereno *et al.* 2001).

Character 203: Prominent depression on the palate near alveolar margin at the level of the 6th or 7th alveoulus: absent (0), or present (1) (Turner & Buckley 2008).

Character 204: Premaxilla-maxilla suture in palatal view, medial to alveolar region: anteromedially directed (0), sinusoidal, posteromedially directed on lateral half and anteromedially directed along medial region (1), or posteromedially directed (2), premaxillae-maxillae suture U-shaped (3) (Pol 1999).

Character 205: Premaxilla-maxilla lateral fossa excavating alveolous of last premaxillary tooth: no (0), or yes (1) (Larsson & Sues 2007).

Character 206: Large nutrient foramen on palatal surface of premaxilla-maxilla contact: small or absent (0), or present (1) (Larsson & Sues 2007).

Character 207: Rugose surface on palatal surface of maxilla posterior to last tooth: absent (0), or present (1) (Pol & Powell 2011).

Character 208: Longitudinal depressisons on palatal surface of maxillae and palatines: absent (0), or present (1) (Gasparini *et al.* 2006).

Character 209: Sculpturing, palatal surface of maxilla: absent, palatal surface smooth (0), present, palatal surface ornamented with ridges (1) (Ortega *et al.* 2000).

Character 210: Maxillae saggital contact: smooth (0), bearing a longitudianal series of foramina (1) (Montefeltro *et al.* 2011).

Character 211: Participation of maxilla at anterior edge of suborbital fenestrae: great participation (0), reduced or absent (1) (Andrade & Bertini 2008).

Character 212: Sagittal torus on maxillary palatal shelves: absent (0), present (1) (Larsson & Sues 2007).

Character 213: Ectopterygoid - maxilla contact: ectopterygoid only abuts maxilla (0), present and broad and maxilla broadly separetes ectopterygoid from maxillary tooth row (1) (Brochu 1999).

Character 214: Quadratojugal dorsal extent in medial surface: ending ventrally to the dorsal tip of laterotemporal fenestra (0), ending at the same level, or overcoming the dorsal tip of laterotemporal fenestrae (1) (Montefeltro *et al.* 2011).

Character 215: Palatines, palatal process: absent (0), present (1) (Clark 1994).

Character 216: Palatines, palatal process: do not meet on palate below narial passage (0), meet ventral to narial passage, forming part of secondary palate (1) (Clark 1994).

Character 217: Maxilla-palatine suture (when fused at midline): palatine anteriorly rounded (0), palatine anteriorly pointed (1), palatine invaginated (2), suture transverse to midline axis (3) (Brochu 1999).

Character 218: Maxillary process to palatine, next to the anterior border of suborbital fenestrae: absent (0), present (1) (Andrade & Bertini 2008).

Character 219: Nasopharyngeal duct, width at its narrowest section relative to the skull width: narrow in proportion to skull width, no more than 25% (0), wide in proportion to skull width, no less than 30% (1) (Andrade *et al.* 2011).

Character 220: Palatines anterior extension: overcoming the anterior margin of suborbital fenestrae (0), do not reaching the level of the anterior margin of suborbital fenestrae (1) (Pol 1999).

Character 221: Paired anterior palatal fenestrae: absent (0), or present (1) (Wu *et al.* 1997).

Character 222: Medial palatal contact: smooth (0), rougouse (1) (Montefeltro *et al.* 2011).

Character 223: Row of foramina flanking the medial contact of palatines: absent (0), present (1) (Montefeltro *et al.* 2011).

Character 224: Anterior half of interfenestral bar between suborbital fenestrae: parallel to subparallel (0), or flared anteriorly (1) (Pol *et al.* 2009).

Character 225: Posterior half of interfenestral bar between suborbital fenestrae: parallel to subparallel (0), or flared posteriorly (1) (Pol *et al.* 2009).

Character 226: Ventral face of palatine bar: flat and wide (0), ventral surface restricted and dorsal portion cylindrical (1) (Montefeltro *et al.* 2011).

Character 227: Cylindrical dorsal portion of palatine bar: with the same wideness through (0) constricted in the posterior portion (1) (Montefeltro *et al.* 2011).

Character 228: Palatines (anteroposterior axis): run parasagittally along midline (0), diverge laterally, becoming rod-like and forming palatine bars posteriorly (1) (Martinelli 2003).

Character 229: Palatine-pterygoid contact on palate: palatines overlie pterygoids (0), or palatines firmly sutured to pterygoids (1) (Pol & Norell 2004a).

Character 230: Vomer, exposure on palate: exposed (0), or not exposed (1) (Buckley *et al.* 2000).

Character 231: Pterygoid, location: restricted to palate and suspensorium, joints with quadrate and basisphenoid overlapping (0), or extends dorsally to contact laterosphenoid and form ventrolateral edge of trigeminal foramen, strongly sutured to quadrate and laterosphenoid (1) (Clark 1994).

Character 232: Pterygoids, contact on palate: not in contact anterior to basisphenoid on palate (0), or pterygoids in contact (1) (Wu *et al.* 1997).

Character 233: Primary pterygoidean palate, role in forming choanal opening: forms posterior half of choanal opening (0), forms posterior, lateral, and part of anterior margin of choana (1), or completely encloses choana (2) (Clark 1994).

Character 234: Pterygoid, ventral surface of pterygoid flanges, parachoanal fossae: absent (0), or present (1) (Andrade & Bertini 2008).

Character 235: Pterygoid parachoanal fenestra: absent (0), present (1) (Montefeltro *et al.* 2011).

Character 236: Pterygoid parachoanal fenestra: open dorsally (0), closed dorsally (1) (Montefeltro *et al.* 2011).

Character 237: Pterygoid, in ventral view, participation in the suborbital fenestra: pterygoid forms margin of suborbital fenestra (0), or excluded from suborbital fenestra by ectopterygoid-palatine contact (1) (Turner & Sertich 2010).

Character 238: Anterior edge of choanae, location: situated between suborbital fenestra (or anteriorly) (0), near posterior edge of suborbital fenestra (1), or near posterior edge of pterygoid flange (2) (Clark 1994).

Character 239: Pterygoid ventral rami, ventral surface at proximal end: smooth (0), evident transverse ridge on ventral surface (1) (Andrade *et al.* 2011).

Character 240: Transverse ridge on ventral surface of pterygoid: thin (0), robust (1) (Andrade *et al.* 2011).

Character 241: Quadrate process of pterygoids: well developed (0), or poorly developed (1) (Pol 1999).

Character 242: Quadrate ramus of pterygoid in ventral view: narrow (0), or broad (1) (Wu *et al.* 1997).

Character 243: Palatal surface of pterygoids: smooth (0), or sculpted (1) (Clark 1994).

Character 244: Pterygoidean flanges: laminar and expanded (0), bar-like (1) (Ortega *et al.* 2000).

Character 245: Bar-like pterygoidean flanges: elongate (0), short and poor developed (1) (Ortega *et al.* 2000).

Character 246: Pterygoid flanges, size: thin and laminar (0), or dorsoventrally thick, with pneumatic spaces (1) (Wu *et al.* 1997).

Character 247: Pterygoid flanges: mediolaterally expanded surpassing laterally the quadrate medial condyle (0), or relatively short, and do not reach laterally to the level of quadrate medial condyle (1) (Ösi *et al.* 2007).

Character 248: Posterior pterygoid processes: absent or reduced (0), well developed projecting posteriorly (1) (Larsson & Sues 2007).

Character 249: Choanal septum shape: narrow vertical bony sheet (0), T-shaped bar expanded ventrally (1), or massive and blocky (2) (Pol & Apesteguia 2005).

Character 250: Ventral surface of choanal septum: smooth to slightly depressed (0), marked by an acute groove (1), ridged (2) (Turner 2006).

Character 251: Postorbital-ectopterygoid contact: present (0), or absent (1) (Pol 1999).

Character 252: Ectopterygoid, relation to postorbital bar: absent, bar does not receive contribution from ectopterygoid (0), present, bar receives contribution from ectopterygoid (1) (Sereno & Larsson 2009).

Character 253: Ectopterygoid main axis orientation: laterally or slightly anterolaterally (0), or anteriorly, subparallel to longitudinal axis of skull (1) (Pol *et al.* 2004).

Character 254: Ectopterygoid, extent of medial projection on the ventral surface of pterygoid flanges: barely extended (0), or widely extended, covering approximately lateral half of ventral surface of pterygoid flanges (1) (Zaher *et al.* 2006).

Character 255: Ectopterygoid, extent along lateral pterygoid flange, at maturity: extends to posterior tip (0), or does not extend to posterior tip (1) (Norell 1988).

Character 256: Ectopterygoid, participation in the palatine bar: absent (0), or present (1) (Zaher *et al.* 2006).

Character 257: Anterior process of ectopterygoid: developed (0), or reduced or absent (1) (Pol 1999).

Character 258: Ectopterygoid medial process, shape: single (0), or forked (1) (Ortega *et al.* 2000).

Character 259: Posterior process of ectopterygoid: developed (0), or reduced or absent (1) (Pol 1999).

Character 260: Ectopterygoid-palatine contact posterior to the suborbital fenestra: not contacting (0), or contacting (1) (Pol & Powell 2011).

Character 261: Ectopterygoid, morphology of the distal ramus: laminar, extending as a flattened sheet over the pterygoid wing (0), robust, extending as a rod over most of the pterygoid wing, with subcircular crosssection through most of its length (1) (Andrade *et al.* 2011).

Character 262: Basipterygoid process, shape: prominent, forming movable joint with pterygoid (0), or small or absent, with basisphenoid joint suturally closed (1) (Clark 1994).

Character 263: Basisphenoid, exposure on braincase: exposed on ventral surface of braincase (0), or virtually excluded from ventral surface by pterygoid and basioccipital (1) (Clark 1994).

Character 264: Basispenoid, lateral exposure on braincase: absent (0), or present (1) (Pol 1999).

Character 265: Basisphenoid: ventral surface continuous to surrounding bones (0), body ventrally developed and separated from the remaining elements by a posteroventrally step forming by a sulcus separating it from the main occipital plane, forming a postchoanal pterygoid-basisphenoid tuberosity (1) (Montefeltro *et al.* 2011).

Character 266: Pterygoid ramus of quadrate: with flat ventral edge (0), or with deep groove (1) (Clark 1994).

Character 267: Paired ridges located medially on the ventral surface of the basisphenoid (originating at the anterior margins of lateral Eustachian foramina): absent (0), present (1) (Pol & Norell 2004a).

Character 268: Quadrate-basisphenoid contact: dorsolateral contact (0), dorsolateral and anterolateral contact (1) (Wu *et al.* 1997).

Character 269: Basisphenoid ventral surface, size relative to basioccipital: shorter than basioccipital (0), or wide and similar to, or longer, in length than basioccipital (1) (Clark 1994).

Character 270: Basioccipital: without well-developed bilateral tuberosities (0), or with large pendulous tubera (1) (Clark 1994).

Character 271: Basioccipital, midline crest on basioccipital plate below occipital condyle: absent (0), or present (1) (Turner & Sertich 2010).

Character 272: Eustachian tubes, relationship with basioccipital and basisphenoid: not enclosed between basioccipital and basisphenoid (0), or entirely enclosed (1) (Clark 1994).

Character 273: Lateral eustachian tube openings, location: located posterior to medial opening (0), or aligned anteroposteriorly and dorsoventrally (1) (Pol 1999).

Character 274: Lateral Eustachian foramina anterior wall: present and separating the foramen from the sulcus (0), absent, foramen opens into the sulcus (1) (Montefeltro *et al.* 2011).

Character 275: Lateral Eustachian foramina: smaller than medial one (0), as larger or larger than medial one (1) (Montefeltro *et al.* 2011).

Character 276: Anterodorsal ramus of quadrate in ventral view: developed, forming more than 50% of the lateral edge of internal supratemporal fenestra (0), restricted, forming less than 50% of the lateral edge of internal supratemporal fenestra (1) (Montefeltro *et al.* 2011).

Character 277: Muscle scar in the medial surface of quadrate (ridge A Iordasky 1968): almost straight to curved (0), or sigmoidal (1) (Montefeltro *et al.* 2011).

Character 278: Ventral surface of the quadrate: smooth or with simple muscle scars (0), with developed multiples ridges (1) (Ösi *et al.* 2007).

Character 279: Cross section of distal end of quadrate: mediolaterally wide and anteroposteriorly thin (0), or subquadrangular (1) (Pol & Norell 2004a).

Character 280: Quadrate condyles: Quadrate condyles with poorly developed intercondylar groove (0), or medial condyle expands ventrally, being separated from lateral condyle by deep intercondylar groove (1) (Ortega *et al.* 2000).

Character 281: Lateral quadrate condyle: almost at the same anteroposterior extention than medial one (0), or lateral quadrate hemispherical (1) (Montefeltro *et al.* 2011).

Character 282: Laterosphenoid bridge: absent (0), at least partially complete (1) (Brochu 1999).

Character 283: Laterosphenoid, orientation of capitate process: oriented laterally (0), or anteroposteriorly toward midline (1) (Brochu 1999).

Character 284: Squamosal posterolateral region, lateral to paroccipital process: narrow (0), or bearing subrounded flat surface (1) (Gasparini *et al.* 2006).

Character 285: Supraoccipital: forms dorsal edge of foramen magnum (0), otoccipitals broadly meet dorsal to foramen magnum, separating supraoccipital from foramen magnum (1) (Clark 1994).

Character 286: Posterior surface of supraoccipital: nearly flat (0), or with bilateral posterior prominences (1) (Clark 1994).

Character 287: Exoccipitals participate in the occipital condyle: no (0), yes (1) (Jouve *et al.* 2005).

Character 288: Basioccipital and ventral part of otoccipital, orientation: facing posteriorly (0), or posteroventrally (1) (Gomani 1997).

Character 289: Ventrolateral contact of otoccipital with quadrate: very narrow (0), or broad (1) (Clark 1994).

Character 290: Orientation of paraocciptial process in occipital view: horizontal (0), dorsal-laterally directed at a 45° angle (1), or medial edge horizontal, then terminal third sharply inclined dorsal-laterally at a 45° angle (2) or curve downwards strongly (3) (Young & Andrade 2009).

Character 291: Otoccipital: without laterally concave descending flange ventral to subcapsular process (0), or with flange (1) (Clark 1994).

Character 292: Ventromedial part of quadrate, contact with otoccipital: does not contact otoccipital (0), or contacts otoccipital to enclose carotid artery and form passage for cranial nerves IX-XI (1) (Clark 1994).

Character 293: Cranial nerves IX-XI, passage through braincase: all pass through common large foramen vagi in otoccipital (0), or cranial nerve IX passes medial to nerves X and XI in separate passage (1) (Clark 1994).

Character 294: Development of distal quadrate body ventral to otoccipital-quadrate contact: distinct (0), indistinct (1) (Wu *et al.* 1997).

Character 295: Otoccipital, ventral to paroccipital process: without large ventrolateral part ventral to paroccipital process (0), or with large ventrolateral part (1) (Clark 1994).

Character 296: Crista interfenestralis between fenestrae pseudorotunda and ovalis, orientation: nearly vertical (0), or horizontal (1) (Clark 1994).

Character 297: Mastoid antrum, location: does not extend into supraoccipital (0), or extends through transverse canal in supraoccipital to connect middle ear regions (1) (Clark (1994).

Character 298: Quadrate body distal to otoccipital-quadrate, orientation of contact in posterior view: ventrally (0), or ventrolaterally (1) (Pol & Norell 2004a).

Character 299: Foramen for the internal carotid artery: reduced, similar in size to openings for cranial nerves IX-XI (0), or extremely enlarged (1). (Gasparini *et al.* 2006).

Character 300: Mandibular outer surface sculpture: absent (0), present (1) (Montefeltro *et al.* 2011).

Character 301: Mandibular outer surface sculpture: present on dentary (0), present on dentary and splenial (1) (Montefeltro *et al.* 2011).

Character 302: Strong pitted pattern on angular and posterior surangular: absent (0), present (1) (Andrade *et al.* 2011).

Character 303: Mandibular fenestra: absent (0), present (1) (Clark 1994).

Character 304: Mandibular fenestrae size: present as a diminutive passage (0), present as an evident fenestra (1) (Clark 1994).

Character 305: External mandibular fenestra, orientation of main axis: horizontal (0), main axis inclined, directed anteroventrally-posterodorsally (1) (Andrade *et al.* 2011).

Character 306: External mandibular fenestra, shape: subcircular to poorly elliptic (0), highly elliptic, anteroposterior axis much longer than dorso-ventral axis, three time or more, but both ends rounded (1), slit-like, proportionally very long and both ends acute (2). teardrop-like (3), triangle (4) (Andrade *et al.* 2011).

Character 307: Mandible, morphology of distal rami in dorsal/ventral views: distal rami mostly straight or poorly curved (0), distal rami strongly curved medially at mid-mandible, giving the mandible a broad-Y shape (1) (Andrade *et al.* 2011).

Character 308: Posteroventral edge of mandibular ramus, shape: straight or convex (0), or markedly deflected (1) (Wu *et al.* 1997).

Character 309: Jaw joint, location: placed level with occipital condyle (0), below occipital condyle (1) (Wu & Sues 1996).

Character 310: Anterior foramen intramandibularis oralis: small or absent (0), or large and slotlike (1) (Ortega *et al.* 2000).

Character 311: Foramen intramandibularis caudalis: absent (0), present (1) (Larsson & Sues 2007).

Character 312: Dentary, lateral surface: smooth lateral to seventh alveolus (0), or with lateral concavity for reception of enlarged maxillary tooth (1) (Buckley & Brochu 1999).

Character 313: Lateral surface of dentaries below alveolar margin, at mid to posterior region of tooth row: vertically oriented, continuous with rest of lateral surface of dentaries (0), or flat surface exposed dorsolaterally, divided by ridge from rest of lateral surface of dentaries (1) (Pol & Apesteguia 2005).

Character 314: Dentary, relative to mandibular fenestra: extends posteriorly beneath mandibular fenestra (0), or does not extend beneath fenestra (1) (Clark 1994).

Character 315: Dentary compression and lateroventral surface anterior to mandibular fenestra: compressed and vertical (0), or not compressed and convex (1) (Ortega *et al.* 1996).

Character 316: Unsculpted region in the dentary below the tooth row: absent (0), present (1) (Pol 1999).

Character 317: Dorsal edge of dentary: slightly concave or straight and subparallel to longitudinal axis of skull (0), straight with abrupt dorsal expansion, being straight posteriorly (1), with single dorsal expansion and concave posteriorly (2), or sinusoidal, with two concave waves (3) (Ortega *et al.* 1996).

Character 318: In lateral view, surangular and dentary suture: simple, with no interdigitation or with little interdigitation (0), or complex, with interlocking well developed prongs from both surangular and dentary, three posterior prongs from dentary and two from surangular (1) (Brochu 1999).

Character 319: Dentary, projection of anterior alveoli: project anterodorsally (0), procumbent (1) (Brochu 1999).

Character 320: Coronoid size: short, located below dorsal edge of mandibular ramus (0), or anteriorly extended with posterior region elevated at dorsal margin of mandibular ramus (1) (Ortega *et al.* 2000).

Character 321: Coronoid participation on the external face of the mandible: no (0), or yes (1) (Young & Andrade 2009).

Character 322: Posterior peg at symphysis: absent (0), or present (1) (Pol & Apesteguia 2005).

Character 323: Posteroventral symphyseal depressions: absent (0), present (1) (Montefeltro *et al.* 2011).

Character 324: Posteroventral symphyseal depressions: facing ventrally (0), facing posteriorly (1) (Montefeltro *et al.* 2011).

Character 325: Symphysis, length relative to width: short, length and width subequal or shorter than wide (0), proportionally long, longer than wide (1), extremely long, length at least five times its width (2) (Andrade *et al.* 2011).

Character 326: Splenial involvement in symphysis in ventral view: not involved (0), involved (1) (Clark 1994).

Character 327: Splenial, participation in the medial wall of the posterior mandibular alveoli: does not take part, splenial may reach the alveolar margin, but alveoli are delimited solely by the dentary (0), participates in the distalmost alveoli, supporting teeth (1) (Andrade *et al.* 2011).

Character 328: Dorsal surface of mandibular symphysis: flat or slightly concave (0), or strongly concave and narrow, trough shaped (1) (Pol & Apesteguia 2005).

Character 329: Medial surface of splenials posterior to symphysis: flat or slightly convex (0), markedly concave (1) (Pol & Apesteguia 2005).

Character 330: 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) (Wu & Sues 1996).

Character 331: Mandibular symphysis, orientation of anterior part: horizontal or slightly dorsally directed (0), forming an angle of approximately 45 degrees to the main axis of the jaw (1) (Sereno & Larsson 2009).

Character 332: Shape of dentary symphysis in ventral view: tapering anteriorly forming an angle (0), U-shaped, smoothly curving anteriorly (1), or lateral edges longitudinally oriented with convex anterolateral corner and extensive, transversely oriented anterior edge (2) (Pol 1999).

Character 333: Splenial-dentary suture at symphysis on ventral surface: V-shaped (0), or transversely oriented (1) (Pol & Apesteguia 2005).

Character 334: Splenial posterior to symphysis: thin (0), or robust dorsally (1) (Ortega *et al.* 1996).

Character 335: Surangular groove, enlarged foramen at anterior end: absent (0), present (1) (Gasparini *et al.* 2006).

Character 336: Lateral surface of the anterior region of surangular and posterior region of dentary: without longitudinal depression (0), or with longitudinal depression (1) (Ortega *et al.* 1996).

Character 337: Surangular ventral face in lateral view: angular doesn't extend beyond orbits (0), angular extends beyond the orbits (1) (Wilkinson *et al.* 2008).

Character 338: Dorsal edge of surangular: mostly straight (0), arched dorsally (1) (Clark 1994).

Character 339: Longitudinal ridge along the dorsolateral surface of surangular: absent (0), or present (1) (Pol & Norell 2004b).

Character 340: Lateral expansion of posterodorsal edge of surangular anterior to glenoid fossa: absent (0), or present (1) (Turner & Buckley 2008).

Character 341: Surangular, contribution to the glenoid fossa: forms only lateral wall of glenoid fossa (0), or forms approximately one-third of glenoid fossa (1) (Buckley & Brochu 1999).

Character 342: Insertion area for M. pterygoideous posterior: does not extend onto lateral surface of angular (0), or extends onto lateral surface of angular (1) (Clark 1994).

Character 343: Surangular extension toward posterior end of retroarticular process: along entire length (0), or pinched off anterior to posterior tip (1) (Norell 1988).

Character 344: Angular, shape of posteroventral margin: straight or gently arched dorsally (0), or strongly arched dorsally (1) (Pol *et al.* 2009).

Character 345: Angular posterior to mandibular fenestra, location on mandible: widely exposed on lateral surface of mandible (0), or shifted to ventral surface of mandible (1) (Wu *et al.* 1997).

Character 346: Sharp ridge on the surface of the angular: absent (0), present (1) (Pol & Norell 2004b).

Character 347: Sharp ridge on the surface of the angular: at ventral-most margin (0), or along lateral surface (1) (Pol & Norell 2004b).

Character 348: Prearticular: present (0), or absent (1) (Clark 1994).

Character 349: Articular facet for quadrate condyle, size: equal in length to quadrate condyles (0), slightly longer (1), or close to three times length of quadrate condyles (2) (Wu & Sues 1996).

Character 350: Posterior ridge on glenoid fossa of articular: posterior margin well developed, evidently high (0), posterior margin poorly delimited, crest absent (1) (Pol & Apesteguia 2005).

Character 351: Articular, medial process articulating with otoccipital and basisphenoid: absent (0), present (1) (Clark 1994).

Character 352: Retroarticular process: absent or extremely reduced (0), with an extensive rounded, wide, and flat (or slightly concave) surface projected posteroventrally and facing dorsomedially (1), posteriorly elongated, triangular, and facing dorsally (2), or posteroventrally projecting and paddle-shaped (3) (Clark 1994).

Character 353: Position of distalmost tip of retroarticular process relative to the mandibular glenoid: tip at the same level or below (0), tip clearly in a more dorsal plane than the glenoid fossa (1) (Andrade *et al.* 2011).

Character 354: Tooth margin carinae: without carinae or with smooth or crenulated carinae (0), with denticulate carinae (1), with tubercular heterogenic denticles (2) (Ortega *et al.* 1996).

Character 355: Mid to posterior elements of the toothrows: crowns not compressed laterally, subcircular in cross section (0), or crowns symmetrically slightly compressed laterally (1), or crowns symmetrically highly compressed laterally (2) (Pol 1999).

Character 356: Compressed crown of maxillary and dentary teeth, orientation: oriented parallel to longitudinal axis of skull (0), only maxillary teeth obliquely disposed (1), both maxillary and dentary obliquely disposed (2) (Pol 1999).

Character 357: Asymmetric compression of Mid to posterior tooth rows elements: absent (0), present, occurring only along distal margin giving teeth a teardrop shape (1) (Andrade & Bertini 2008).

Character 358: Tooth accessory cusps: absent (0), present (1) (Gomani 1997).

Character 359: Tooth accessory cusps: accessory cusps arranged in one row (0), accessory cusps arranged in more than one row (1) (Gomani 1997).

Character 360: Posterior teeth with rings of undulated enamel: absent (0), or present (1) (Gasparini *et al.* 2006).

Character 361: Presence of ridged ornamentation on enamel surface of mid to posterior teeth: absent (0), present (1) (Andrade *et al.* 2011).

Character 362: Surface of tooth enamel: smooth or slightly crenulated (0), or with ridges at base of crown (often extending apically) (1) (Turner & Sertich 2010).

Character 363: Accessory ridges on labial-lingual surfaces of mid to posterior teeth: absent (0), present (1) (Andrade *et al.* 2011).

Character 364: Premaxillary tooth number: six (0), five (1), four (2), three (3), two (4) (Wu & Sues 1996).

Character 365: Number of maxillary teeth: eight or more (0), seven (1), six (2), five (3), or four (4) (Wu & Sues 1996).

Character 366: Premaxillary tooth row orientation: arched posteriorly from midline (0), angled posterolaterally, at 120 angle (1), transverse (2), set in a relatively straight posterolateral orientation (3) (Sereno *et al.* 2001).

Character 367: Procumbent premaxillary alveoli: absent (0), or present (1) (Zaher *et al.* 2006).

Character 368: Premaxillary teeth 1 and 2, position: separated like adjacent teeth (0), or nearly confluent (1) (Larsson & Gado 2000).

Character 366: Posterior premaxillary teeth, size: similar in size to anterior teeth (0), or much longer than anterior teeth (1) (Clark 1994).

Character 370: Last premaxillary tooth position relative to tooth row: anterior or anteromedial (0), or anterolateral (1) (Sereno *et al.* 2001).

Character 371: Maxillary teeth waves: absent, no tooth size variation (0), one wave of teeth enlarged (1), or enlarged maxillary teeth occur in two waves (festooned) (2) (Clark 1994).

Character 372: Maxillary tooth row posterior extension: does not extends posteriorly to the anteriormost border of the suborbital fenestra (0), extends posteriorly to the anteriormost border of the suborbital fenestra (1) (Ortega *et al.* 2000).

Character 373: Maxillary tooth, size relative to maxillary palatal surface in palatal view: proportionally small teeth, occupying only marginal portion of ventral surface of maxilla (0), or proportionally well developed teeth, occupying large area of maxillary palatal surface (1) (Andrade & Bertini 2008).

Character 374: Size of the 7th and 8th dentary tooth crowns: about the same size (0), 7th much smaller than 8th (1) (Andrade *et al.* 2011).

Character 375: Maxillary dental implantation: teeth in isolated alveoli (0), or located in dental groove (1) (Ortega *et al.* 2000).

Character 376: Tooth (with transitional morphology) present at premax-max contact: absent (0), or present (1) (Turner & Sertich 2010).

Character 377: Cheek teeth base: not constricted (0), or constricted (1) (Ortega *et al.* 1996).

Character 378: Posterior (molariform) teeth, wear facets: absent (0), or present (1) (Turner & Sertich 2010).

Character 39: Width of root of teeth with respect to crown: narrower or equal (0), or wider (1) (Ortega *et al.* 2000).

Character 380: Enlarged maxillary teeth: absent (0), present at second or third alveolus (1), or fourth or fifth (2) (Ortega *et al.* 2000).

Character 381: Anterior dentary teeth opposite premaxilla-maxilla contact: no more than twice length (0), more than twice the length (1) (Clark 1994).

Character 382: Vertebral centra, shape: cylindrical (0), or spool-shaped (1) (Buscallioni & Sanz 1988).

Character 383: Atlas intercentrum, size: broader than long (0), or as long as broad (1) (Clark 1994).

Character 384: Axial neural spine height: high, subequal to centrum height (0), low, less than half centrum height and nearly horizontal (1) (Larsson & Sues 2007).

Character 385: Anteroposterior development of neural spine in axis: well developed, covering all of neural arch length (0), or poorly developed, located over the posterior half of the neural arch (1) (Pol 1999).

Character 386: Axial neural spines, width of posterior half: wide (0), or narrow (1) (Brochu 1999).

Character 387: Prezygapophyses of axis, development relative to neural arch: not exceeding anterior edge of neural arch (0), or exceeding anterior margin of neural arch (1) (Pol 1999).

Character 388: Postzygapophyses of axis: well developed, curved laterally (0), or poorly developed (1) (Pol 1999).

Character 389: Axial hyapophysis, deep fork: present (0), or absent (1) (Brochu 1999).

Character 390: Cervical rod-like neural spines: absent (0), present (1) (Clark 1994).

Character 391: Cervical vertebrae: amphicoelous or amphyplatyan (0), or procoelous (1) (Clark 1994).

Character 392: Anterior cervical vertebrae base of neural spine: gracile base, with neural spine clearly distinct from the neural arch (0), robust base, with the development of spinozygapophyseal ridges (1) (Andrade & Bertini 2008).

Character 393: Prezygapophyseal process of anterior cervical vertebrae: anterodorsally projected and straight or slightly recurved (0), or dorsally projected and strongly recurved (1) (Pol *et al.* 2012).

Character 394: Prezygapophyseal process of anterior to middle cervical vertebrae in lateral view: anterior margin straight or evenly convex (0), or anterior margin bearing a distinct bulge at the midpoint of the prezygapophyseal process (1) (Pol *et al.* 2012).

Character 395: Shape of the articular surface of the parapophysis in the posterior cervicals and anterior dorsals: subcircular/ovoid with the major axis oriented anteroposteriorly (0), or subtriangular/ovoid with major axis oriented dorsoventrally (1) (Pol *et al.* 2012).

Character 396: Posterior cervical vertebrae base of neural spine: gracile base, with neural spine clearly distinct from the neural arch (0), robust base, with the development of spinozygapophyseal ridges (1) (Andrade & Bertini 2008).

Character 397: Third cervical vertebra (CIII) prezygapophysis: poorly developed, slightly projecting anterior to the vertebral centrum (0), well developed, clearly projecting anteriorly, beyond the vertebral centrum (1) (Andrade *et al.* 2011).

Character 398: Hypapophyses in cervicodrsal vertebrae: absent (0), present (1) (Buscallioni & Sanz 1988).

Character 399: Hypapophyses in cervicodrsal vertebrae: present only in cervical vertebrae (0), present in cervical and dorsal vertebrae (1) (Buscallioni & Sanz 1988).

Character 400: Trunk vertebrae: amphicoelous or amphyplatyan (0), or procoelous (1) (Clark 1994).

Character 401: Transverse process of posterior dorsal vertebrae, shape: dorsoventrally low and laminar (0), or dorsoventrally high (1) (Buscalioni & Sanz 1988).

Character 402: Dorsal migration of parapophysis on the neural arch on middle dorsals: dorsal vertebrae 4 to 9 showing a gradual dorsal migration of parapophysis, with at least two vertebrae bearing the parapophysis on the neural arch pedicles, well below the diapophysis (0), or abrupt change in position of parapophysis, with dorsal 4 bearing the parapophysis at the neurocentral suture and dorsal 5 with parapophysis leveled with diapophysis forming a transverse process (1) (Pol *et al.* 2012).

Character 403: Medial surface of prezygapophyseal process of anterior to middle cervical vertebrae: flat or slightly convex (0), or with an ovoid or triangular depression close to the neural canal (1) (Pol *et al.* 2012).

Character 404: Spinopostzygapophyseal lamina in dorsal vertebrae: absent (0), or present as a high and sharp lamina (1) (Pol *et al.* 2012).

Character 405: Distinct rounded depression on the dorsal surface of the neural arches of the anterior to middle dorsal vertebrae, located between the base of the neural spine and the postzygapophyseal process: absent (0), or present (1) (Pol *et al.* 2012).

Character 406: Relative position of the transverse process and the postzygapophysis in middle dorsal vertebrae: postzygapophysis located dorsal to the transverse process (0), or postzygapophysis level with the transverse process (1) (Pol *et al.* 2012).

Character 407: Number of sacral vertebrae: two (0), or more than two (1) (Buscalioni & Sanz 1988).

Character 408: Sacral vertebrae, direction of transverse processes: laterally (0), or markedly deflected ventrally (1) (Gasparini *et al.* 2006).

Character 409: Dorsolateral end of first sacral rib: located at the level of the neural canal (0), or dorsoventrally expanded, projecting dorsally above the level of the neural canal (1) (Pol *et al.* 2012).

Character 410: Biconvex first caudal vertebra: absent (0), present (1) (Clark 1994).

Character 411: Caudal vertebrae downwards deflection: absent (0), present (1) (Young & Andrade 2009).

Character 412: Cervical rib shaft, posterior process, posterodorsally projecting spine at the junction with the tubercular process: absent (0), or present (1) (Turner 2006).

Character 413: Anterior scapular edge: strongly concave (0), posterior edge relatively straight (1) (Clark 1994).

Character 414: Scapular blade width: no more than twice length of scapulocoracoid articulation (0), or very broad, greater than twice length of scapulocoracoid articulation (1) (Buckley & Brochu 1999).

Character 415: M. teres major and M. dorsalis scapulae insert separately on humerus: yes (0), no (1) (Brochu 1999).

Character 416: Insertion mark dorsal to the glenoid facet of the scapula for the attachment of the M. triceps: present as a well-developed ridge or tubercle (0), or absent (1) (Pol *et al.* 2012).

Character 417: Coracoid, medial process: elongate posteromedial process (0), with distally expanded ventromedial process (1) (Wu & Sues 1996).

Character 418: Coracoid length: up to two-thirds of scapular length (0), or subequal in length to scapula (1) (Clark 1994).

Character 419: Distal expansion of the coracoid: larger or equal to the proximal expansion (0), or less expanded than the proximal region (1) (Pol *et al.* 2012).

Character 420: Recess ventral to the glenoid facet of the coracoid: shallow and smoothly concave surface (0), or deep recess strongly concave in lateral view, overhung by a large ventral projection of the glenoid facet (1) (Pol *et al.* 2012).

Character 421: Orientation of the area of insertion of M. subscapularis above the internal tuberosity of the humerus: obliquely oriented in anterior view, with the area of insertion facing proximomedially (0), or vertically oriented in anterior view, with the area of insertion facing medially (1) (Pol *et al.* 2012).

Character 422: Anterior projection and profile of deltopectoral crest in humerus: Well-developed crest bearing a pointed tubercle for the insertion of the supracoracoideus complex (sensu Meers, 2003) (0), or low and anteriorly convex in lateral view, lacking a well-developed tubercle (1) (Pol *et al.* 2012).

Character 423: Proximal one-third of the deltopectoral crest: originating at the proximolateral corner of the humerus and running distally along the proximal region of the lateral margin of the humerus (0), or proximal origin medially displaced from the proximolateral corner of the humerus and running distally, leaving an anteriorly facing concave surface between the crest and the lateral margin of the anterior surface of the humerus (which probably corresponds to the insertion area of the M. coracobrachialis brevis dorsalis) (1) (Pol *et al.* 2012).

Character 424: Orientation and extension of the distal half of the deltopectoral crest: running along the lateral edge of the humerus or slightly deflected medially reaching, at the most, the lateromedial midpoint of the humeral shaft (0), or strongly deflected medially, surpassing the lateromedial midpoint of the anterior surface of the humeral shaft (1) (Pol *et al.* 2012).

Character 425: Circular depression on the posterior surface of the proximal end of the humerus, related to the insertion of the M. scapulohumeralis caudalis: absent (0), or present (1) (Pol *et al.* 2012).

Character 426: Lateral and medial surface of distal end of humerus: flat and anteroposteriorly broad, similar in anteroposterior length to the lateromedial width of the distal end of humerus (0), or convex and reduced in comparison with the lateromedial width of the distal humerus (1) (Pol *et al.* 2012).

Character 427: Ulna, width of olecranon process: narrow and subangular (0), or wide and rounded (1) (Brochu 1999).

Character 428: Articular surface for the ulna on the radiale: facing posterolaterally (0), or facing posteriorly, not visible in lateral view (1) (Pol *et al.* 2012).

Character 429: Proximodistal development of articular surface for the ulna on the radiale: short and wide, being up to than 30% of the total length of the radiale (0), or proximodistally elongated, being more than 40% of the total length of the radiale (1) (Pol *et al.* 2012).

Character 430: Proximal end of radiale, shape: expanded symmetrically, similarly to distal end (0), or more expanded proximolaterally than proximomedially (1) (Buscallioni & Sanz 1988).

Character 431: Proximal carpals, relative proportions of radiale: slender, much longer than wide (0), broad, proximal width subequal to length (1) (Ortega *et al.* 2000).

Character 432: Distal region of articular surface for the ulnare on the radiale: merging gradually with the posterolateral surface of the radiale shaft (0), or usually triangular, and separated from the shaft of the radiale by a distinct step (1) (Pol *et al.* 2012).

Character 433: Proximal region of articular surface for the ulnare in the radiale: divided from the articular surface for the ulna by a crest, creating a distinct articular surface for the ulnare (0), or continuous with the articular surface for the ulna (1) (Pol *et al.* 2012).

Character 434: Anterior surface of radiale: smoothly convex (0), or bearing a proximodistal crest that extends along the shaft dividing the anterior surface of the radiale (1) (Pol *et al.* 2012).

Character 435: Distolateral expansion of the ulnare: absent, as (or less) expanded as the distomedial corner of the ulnare (0), or distinctly expanded and projecting more distally than the distomedial corner of the ulnare, forming a distinct process (ulnar anterior projection sensu Nascimento & Zaher, 2010) (1) (Pol *et al.* 2012).

Character 436: Lateromedial width of shaft of metacarpal I: as broad as the shaft of other metacarpals (0), or broader than other metacarpals, being the digit I the most robust element of the metacarpus (1) (Pol *et al.* 2012).

Character 437: Anterior process of ilium, length relative to posterior process: similar in length to posterior process (0), or one-quarter or less length of posterior process (1) (Clark 1994).

Character 438: Development of the rugose surface for the insertion of the M. iliotibialis that forms the supracetabular crest: lateromedially narrow (0), lateromedially broad (1) (Buscallioni & Sanz 1988).

Character 439: Development of the postacetabular process of the ilium: well developed as a distinct process that extends anteroposteriorly at least 60% of the acetabular length (0), or extremely reduced or absent, extending anteroposteriorly not more than 50% of the acetabular length (1) (Pol *et al.* 2012).

Character 440: Posterior end of the postacetabular process: tapering posteriorly and ending in an acute tip (0), or subrectangular shaped with the posterior end vertically oriented, with its dorsoventral height being at least 60% of the height at the origin of the postacetabular process (1) (Pol *et al.* 2012).

Character 441: Orientation of the ventral margin of the postacetabular process: posterodorsally directed (0), or horizontally or slightly posteroventrally deflected (1) (Pol *et al.* 2012).

Character 442: Dorsoventral position of the ventral margin of the postacetabular process (along its posterior-most third): located at the same height or dorsally than the acetabular roof (0), or located at or ventrally than the dorsoventral midpoint of the acetabular height (1) (Pol *et al.* 2012).

Character 443: Orientation of the rugose surface for the insertion of the M. iliotibialis that forms the supracetabular crest: dorsal or dorsolateral (0), lateral (1) (Buscallioni & Sanz 1988).

Character 444: Pubis, shape: rod-like without expanded distal end (0), or with expanded distal end (1) (Clark 1994).

Character 445: Pubis anterior process: absent (0), present (1) (Clark 1994).

Character 446: Ischium anterior process: does not excludes pubis from acetabulum margin (0), excludes pubis from acetabulum margin (1) (Clark 1994).

Character 447: Femur, anterior margin: linear (0), or bears flange for PIFI 1 musculature and a marked concavity above this region (1) (Buckley & Brochu 1999).

Character 448: Development of greater trochanter on proximal femur: prominent, ridge-like lateral border that separates lateral surface of proximal femur from a flat posterior surface of proximal femur reaching down to the level of the fourth trochanter (0), or proximodistally short trochanteric surface lacking a distinct ridge that separates the lateral and posterior surfaces of the proximal femur and ending well above the fourth trochanter (1) (Pol *et al.* 2012).

Character 449: Lateral supracondylar ridge on anterior surface of distal femur: prominent and broad lateral suprancondylar ridge separating the anterior concave surface of femur from the lateral surface (0), or absence of well-developed lateral suprancondylar ridge, anterior surface of femur flat or slightly concave and continuous with the lateral surface of the distal femur (1). (Pol *et al.* 2012).

Character 450: Proximal-most portion of fibular head: straightsided to weakly developed posteriorly (0), or very sharply projecting posteriorly, forming distinct extension (1) (Turner 2006).

Character 451: Tibial shaft in anterior or posterior view: straight or only slightly bowed (0), or markedly bowed laterally (1) (Pol *et al.* 2012).

Character 452: Distal projection of tibial articular surfaces: medial region of distal articular surface of distal tibia extends further distally than the lateral region, forming a strongly oblique distal margin of the tibia (0), or medial and lateral regions subequally extended, with distal margin subhorizontally oriented (1) (Pol *et al.* 2012).

Character 453: Anterior margin of the tibial facet on the astragalus: forming a well-defined ridge that reaches medially the ball-shaped region for the articulation of metatarsal I-II and closes the proximomedial corner of the anterior hollow of the astragalus (0), or forming a low ridge that is medially separated by a notch from the ball-shaped region for the articulation of the metatarsals I-II, failing to close the proximomedial corner of the anterior hollow (1) (Pol *et al.* 2012).

Character 454: Planar and proximal calcaneal surfaces on the astragalus: connected to each other forming a continuous articular surface that articulates with the calcaneal condyle, the margin of which forms the distolateral ridge-like margin of the anterior hollow of the astragalus (0), or separated from each other forming two distinct articular surfaces for the planar and proximal articular surfaces of the calcaneum (1) (Pol *et al.* 2012).

Character 455: Astragalar-tarsal ligament pit on astragalus (sensu Sertich & Groenke, 2010) at the distal end of the anterior hollow: not differentiated from the rest of the anterior hollow of the astragalus (0), or distinct depression separated from the anterior hollow by an obliquely oriented ridge running along the proximolateral margin of the astragalar-tarsal ligament pit (1) (Pol *et al.* 2012).

Character 456: Development of proximal astragalar depression, located posteriorly to the tibial facet of the astragalus: shallow concave depression (0), or deep depression with sharply delimited medial and anterior margins, forming a true astragalar fossa (1) (Pol *et al.* 2012).

Character 457: Shape of the fibular facet on the astragalus: subrectangular with subequal anterior and posterior margins (0), or trapezoidal with the proximodistal height of its anterior margin lower that the posterior margin (1) (Pol *et al.* 2012).

Character 458: Calcaneum with posterior astragalar facet: subtriangular with proximal and lateral margins forming a right-angle and an oblique medioplantar edge (0), or proximal and plantar edges subparallel to each other connected through a broad and rounded medial margin (1) (Pol *et al.* 2012).

Character 459: Dorsal osteoderms shape: rounded or ovate (0), rectangular, much broader than long (3X, or more) (1), rectangular, broader than long (less than 3X), (2), or square (3) (Clark 1994).

Character 460: Dorsal osteoderms articular anterior process: absent (0), present (1) (Clark 1994).

Character 461: Dorsal osteoderms articular anterior process: with discrete convexity on anterior margin (0), or with well-developed process located anterolaterally (1) (Clark 1994).

Character 462: Longitudinal keels on dorsal surface of osteoderms: absent (0), present (1) (Clark 1994).

Character 463: Longitudinal keels on dorsal surface of osteoderms: extending to anterior half (0), or restricted to posterior edge of osteoderm (1) (Pol *et al.* 2009).

Character 464: Osteoderms: some or all imbricated (0), or sutured to one another (1), or not in contact (2) (Clark 1994).

Character 465: Gap in cervico-thoracic dorsal armor: absent (0), or present (1) (Ortega *et al.* 2000).

Character 466: Presacral nuchal armor: nuchal and dorsal trunk shields undifferentiated, morphology grading continuously (0), nuchal shields clearly differentiated from dorsal trunk shields by size and general morphology (regardless of contact between nuchal and trunk series) (1) (Andrade *et al.* 2011).

Character 467: Rows of dorsal primary osteoderms (sensu Frey, 1988): present (1), absent (1) (Clark 1994).

Character 468: Rows of dorsal primary osteoderms (sensu Frey, 1988): two parallel rows (0), four rows (1), or more than four rows (2) (Clark 1994).

Character 469: Dorsal osteoderms, accessory ranges of osteoderms (sensu Frey, 1988): absent (0), or present (1) (Turner & Sertich 2010).

Character 470: Osteoderms on ventral part of trunk: absent (0), or present (1) (Clark 1994).

Character 471: Tail osteoderms: dorsal surface only has osteoderms (0), completely surrounding tails (1), or lacks any osteoderms (2) (Clark 1994).

Character 472: Appendicular osteoderms: absent (0), or present (1) (Pol & Norell 2004b).

Character 473: Constriction at frontal anterior process: absent (0), present, anterior portion of anterior process of frontal constricted (1) (Montefeltro *et al.* 2013).

Character 474: Dorsal edge of squamosal sulcus for dorsal ear lid: parallel to ventral edge (0), dorsal margin with a medial curvature (1) (Montefeltro *et al.* 2013).

Character 475: Size of the dorsal aperture of orbitotemporal channel: small, are of foramen less than 30% of internal supratemporal fenestrae area (0), big, larger than 30% of internal supratemporal fenestrae area (1) (Montefeltro *et al*. 2013).

Character 476: Ornamentation at squamosal postero lateral corner close to external supratemporal fenestrae: non sculpted or with same pattern of skull roof (0), with a peculiar pebbled surface (1) (Montefeltro *et al.* 2011).

Character 477: Frontal participation in primary orbit border: restricted to the posterior region (0), or forming great part of median and anterior region (1) (Montefeltro *et al.* 2013).

Character 478: Parietal posterior region dorsal surface: smooth (0), presenting a dorsal ridge (1) (Montefeltro *et al.* 2013).

Character 479: Paired foramen located ant anterior region of palatal ventral surface (not homologous to maxillo-palatine fenestrae and palate canals): absent (0), preset (1) (Montefeltro *et al.* 2013).

Character 480: Median pharyngeal tube main orientation: ventral (0), lateral (1), posterior (2) (Montefeltro *et* *al*. 2013).

Character 481: Median pharyngeal tube, posterior wall: present (0), absent (1) (Montefeltro *et al*. 2013).

Character 482: Dorsoventral height of the proximal region of the quadrate body: less than 50% of the skull roof total width (0), more than 50% of the skull roof total width (1) (Montefeltro *et al.* 2013).

Character 483: Occipital condyle proximal surface: condyle surface gradually slopes onto occipital surface (0), present clearing marking a neck separating occipital condyle and surrounding occipital surface (1) (Montefeltro *et al.* 2013).

Character 484: Diastema at 7th and 8th teeth positions: absent, 7th and 8th teeth regularly spaced (0), present, 7th and 8th teeth apart from each other and closer to 6th and 9th (1) (Montefeltro *et al.* 2013).

Character 485: Bony otic aperture: Formed by external auditory meatus (EAM) (0), formed by EAM, dorsal otic incisure (DOI), and incisure of the otic aperture of the cranioquadrate passage (IOC) (1) (sensu Montefeltro et al. 2016) (Ruiz et al. 2021).

Character 486: Otic buttress: Absent (0), present (1) (sensu Montefeltro et al. 2016) (Ruiz et al. 2021).

Character 487: Otic buttress: Slender (0), Robust (1) (sensu Montefeltro et al. 2016) (Ruiz et al. 2021).

Character 488: Coronoid process on the medial surface of the anterior surangular: Absent or poorly developed (0), well developed, forming prominent elongated crests (1) (adapted from Pol et al. 2014).

Character 489: Longitudinal sulcus between the coronoids process of surangular: Shallow (0), deep (1) (Ruiz et al. 2021).

Character 490: Ventral coronoid process: reduced, less developed than ascending medial process of angular (0), well developed ventral extension similar to ascending medial process of angular (1) (Ruiz et al. 2021).

Character 491: Bar between the paracoanal fenestrae, shape: same width along the entire extension (0), tappers in the posterior third (1) (Ruiz et al. 2021).

Character 492: Flat ventral surface of ventral nares septum: Parallel sided (0), tapering anteriorly (1), tapering posteriorly (2) (sensu Pol et al. 2014: char. 225 – modified from Pol and Apesteguía, 2005: char. 220).

Character 493: Pterygoid flanges, length of the base between the posterior edge of parachoanal fenestra and anterior portion of quadrate process of pterygoid: More than half of the dorsoventral length of the posterior edge of the pterygoid flanges (0), less than half of the dorsoventral length of the posterior edge of the pterygoid flanges (1) (Ruiz et al. 2021).

Character 494: Ectoperygoid-palatine contact posterior to the suborbital fenestra: equally formed by ectopterygoid and palatine (0), formed only by the ectopterygoid (1) (Ruiz et al. 2021).

Character 495: Medial pharyngean tube in relationship with the pterygoids: bounded by pterygoid wall anteriorly (0), enlarged and anteriorly continued by the choana (1) (Ruiz et al. 2021).

Character 496: Basisphenoid posterior edge: straight or curved (0), with an anterior reentrance (1) (Ruiz et al. 2021).

Character 497: Outer enamel surface: Smooth (0), rugose (1): char.392 – modified from Turner and Sertich, 2010: char. 294 (sensu Pol et al. 2014).

Character 498: Size of neurovascular foramina on mind to posterior region of aveolar edge of the dentary: Small (0), extremely large, being approximately as anteroposteirorly long as an alveolus (1) (sensu Pol et al. 2014: char.365).

Character 499: Thin enamel ridge (loph) connecting adjacent denticles instead of presenting distinct interdenticular slits: absent (0), present (1) (sensu Pol et al. 2014: char.389).

Character 500: Suture between the postorbital and the squamosal in lateral view: straight or almost straight, vertical or oblique (0), convex anteriorly (1) (sensu Pol et al. 2014: char.411 – modified from Nascimento and Zaher, 2010: char. 258 and Montefeltro et al. 2011: char.16).

Character 501: Quadrate contact with basioccipital: absent (0), located on the ventral surface of the braincase (1), well developed medial crest of quadrate meets the basioccipital surface of the skull, excluding the exoccipital from the margin of the occipital surface (2) (Pol et al. 2014, modified from Andrade and Bertini, 2008a: char. 70).

Character 502: Jugal anteroventral process between maxilla and ectopterygoid: Absent (0), present, jugal extending anteriorly a short triangular process that wedges between the ectopterygoid and maxilla on the lateroventral surface of the skull at the level of the orbits (sickle-like medial process present on the ventral surface of the anterior jugal ramus, sensu Andrade and Bertini, 2008a) (1) (sensu Pol et al. 2014: char. 351).

Character 503: Frontal shape along its suture with the prefrontal: relatively broad and tapering gradually anteriorly (0), broad tabular-shaped with lateral sutures with prefrontals parallel to each other (1) (sensu Pol et al. 2014: char. 353).

Character 504: Quadrate mesoventral crest ventral to occipital contact: absent (0), incipient (1), well developed (2) (Ruiz et al. 2021).

Character 505: Small pedicel of pterygoid supporting the palatine-ectopterygoid contact posterior to the suborbital fenestra: Absent (0), present (1) (Ruiz et al. 2021).

Character 506: Diastema between D5 and D6: Absent or regularly arranged teeth (0), present, clearly separating the alveoli (1) (Ruiz et al. 2021).

Character 507: Maxillopalatal fenestrae: enclosed mostly by the maxilla (0), enclosed by the palatine (1) (Ruiz et al. 2021).

Character 508 (NEW): Length of parietal/squamosal suture (rostro caudal direction) with respect to the length of supratemporal fossa: can’t reach the half of the length of the supratemporal fenestrae (0); reach the half or surpass of the length of the supratemporal fenestrae (1); has the similar or surpass the length of the supratemporal fenestrae (2).

Character 509 (NEW): Convex outline of the lateral (distal) region of the supratemporal shelves: absent (0); present - convex (1); extremely convex (2).

Character 510 (NEW): Crests on the dorsal surface of the parietal: absent (0); present (1).

Character 511 (NEW): Lateral border of the supratemporal fenestrae without supratemporal fossa: present (0); absent (1).

Character 512 (NEW): Lateral skull table that overlaps the meatal chamber: a tall wall, with posterior portion of the postorbital subtriangular, and a highly posterior region of the squamosal, with a strong anteroventrally oriented anterior process (0); descending lamina of the squamosal possess a horizontal outline, forming a concave roof (1); laterally covered by descending lamina of the squamosal and posteroventrally oriented, but not closing the meatal chamber (2); laterally covered by descending lamina of the squamosal and posteroventrally, with the meatal chamber closed (3); boundary between postorbital and squamosal massive, with squamosal tapering posteriorly (4); the set postorbital posterior process and squamosal, making the dorsal rim of the infratemporal fenestra (5).

Character 513 (NEW): Boundary between periotic fossa and anterior dorsal process of the quadrate: smooth transition (0); a moderated division (1); well defined, laminar keel (2); well defined, columnar boundary (3).

Character 514 (NEW): Posterior extension of the dorsal portion of the postorbital bar: absent (0); present (1).

# **TABLE OF TAXA USED FOR MORPHOLOGICAL COMPARISON**

|  |  |  |
| --- | --- | --- |
| Taxa | First Hand | Literature |
| *Hamadasuchus rebouli* | ROM 52620, 52059, 54511 |  |
| *Pepesuchus deiseae* | MN 7005-V |  |
| *Stolokrosuchus lapparenti* | MNN GDF 600 |  |
| *Rukwasuchus yajabalijekundu* | RRBP 08630 |  |
| *Gavialis gangeticus* |  | Gold, 2011 |
| *Hylaeochampsa vectiana* | BMNH R 117 |  |
| *Allodaposuchus precedens* | HUE-02502 |  |
| *Crocodylus* |  | Brochu, 2000 |
| *Alligator mississippiensis* |  | Brochu, 1999 |
| *Susisuchus anatoceps* |  | Salisbury et al., 2003 |
| *Isisfordia duncani* |  | Salisbury et al., 2006 |
| *Lohuecosuchus megadontos* | HUE-04498 |  |
| *Agaresuchus fontisensis* | HUE-02702 |  |
| *Pietraroiasuchus ormezzanoi* |  | Buscalioni et al., 2011 |
| *Iharkutosuchus makadii* |  | Ösi, 2008 |
| *Baurusuchus salgadoensis* | MPMA 04-0012/00 |  |
| *Armadillosuchus arrudai* | URFJ DG 303-R |  |
| *Crocodylus porosus* |  | Brochu, 2000 |
| *Montealtosuchus arrudacamposi* | MPMA 16-0007-04 |  |
| *Barreirosuchus franciscoi* | MPMA 04-0012/00 |  |
| *Crocodylus niloticus* |  | Brochu, 2000 |
| *Uberabasuchus terrificus* | CPPLIP 630 |  |
| *Osteolaemus tetraspis* |  | Brochu, 2003 |
| *Dakosaurus andiniensis* |  | Vignaud and Gasparini, 1996 |
| *Dakosaurus maximus* |  | Plieninger, 1846 |
| *Cricosaurus suevicus* |  | Fraas, 1901 |
| *Crocodylus acutus* |  | Brochu, 2000 |
| *Mahajangasuchus insignis* |  | Buckley and Brochu, 1999 |
| *Araripesuchus gomesii* | AMNH 24450 |  |
| *Lomasuchus palpebrosus* | MOZ 4084 |  |
| *Tomistoma schlegelii* |  | Brochu, 2003 |
| *Caiman latirostris* |  |  |
| *Shamosuchus djadochtaensis* | IGM 100/1195, AMNH FARB 6412 |  |
| *Paleosuchus palpebrosus* |  | ROM R6692 |
| *Mariliasuchus amarali* | IGEO 50-R, IGEO 105-R, IGEO 106-R |  |
| *Kaprosuchus saharicus* | MNN IGU12 |  |
| *Argochampsa krebsi* |  | Hua and Jouve, 2004 |
| *Eothoracosaurus mississippiensis* |  | Brochu, 2004 |
| *Asiatosuchus germanicus* |  | Berg, 1966 |
| *Leidyosuchus canadensis* |  | Lambe, 1907 |
| *Diplocynodon hantoniensis* |  | Wood, 1846 |

# **BODY SIZE ESTIMATION**

We coarsely estimated the dorsal cranial length (DCL) of *Titanochampsa iorii* by comparing its skull roof width with that of other mesoeucrocodylians with preserved cranial material and relatively similar skull width size (see table below). The skull roof width of these taxa was obtained by measuring the distance between the lateral border of each squamosal, whereas that of *Titanochampsa iorii* was obtained by measuring from the lateral border of the squamosal until the midpoint of the dorsal anterior surface of the parietal and then multiplying the measurement by two. We used photographs of specimens and the software ImageJ to collect the measurements.

**Table of measurements**

|  |  |  |  |
| --- | --- | --- | --- |
| **Taxa** | **Specimen number** | **Skull roof width** | **DCL** |
| *Titanochampsa iorii* | MPMA 02-0005/87 | 18.6 cm | – |
| *Stratiotosuchus maxhechti* | DGM 1477-R | 26.66 cm | 54.43 cm |
| *Crocodylus acutus* | DGM 127-R | 9.99 cm | 36.62 cm |
| *Eosuchus lerichei* | IRSNB R 48 | 11.29 cm | 45.18 cm |
| *Uberabasuchus terrificus* | CPPLIP 630 | 16.65 cm | 33.13 cm |
| *Alligator mississippiensis* | DGM 25-R | 12.35 cm | 35.41 cm |

The comparison resulted in an estimated DCL ranging from 37.01 to 74.43 cm for *Titanochampsa iorii*.Subsequently, we used the equation presented by Hurlburt et al. (2003), which can be found below, to estimate the total body length (TL) of *Titanochampsa iorii* from the range of estimated DCL values:

Log TL = (log DCL \* 0.970) + 0.954 (Hurlburt *et al*. 2003)

The results indicate that *Titanochampsa iorii* total body length ranged between 2.98 and 5.88 meters.

# **INSTITUTIONAL ABBREVIATIONS**

**AMNH** – American Museum of Natural History, New York, USA.

**AMNH FARB** – American Museum of Natural Hystory, Collection of Fossil Reptiles, Amphibians, and Birds, New York, USA.

**BMNH** – British Museum of Natural Hystory, London, England.

**CPPLIP** – Centro de Pesquisas Paleontológicas “Llewellyn Ivor Price”, Peirópolis, Minas Gerais, Brazil.

**DGM** – Divisão de Geologia e Mineralogia, Rio de Janeiro, Brazil.

**HUE** – Lo Hueco Collection, Museo de las Ciencias de Castilla-La Mancha, Cuenca, Spain

**IGM** – Mongolian Institute of Geology, Mongolia.

**IRSNB** – Institute Royal des Sciences Naturelles de Belgique/ Koninklijk  
Belgisch Instituut voor Natuurwetenschappen, Brussels.

**MOZ** – Museo Profesor J. Olsacher, Zapala, Neuquén Province, Argentina.

**MPMA** – Museu de Paleontologia de Monte Alto “Professor Antonio Celso de Arruda-Campos”, Monte Alto, São Paulo, Brazil.

**MN** – Museu Nacional, Rio de Janeiro, Brazil.

**MNN** – Musée National du Niger, Niamey, Republic of Niger.

**ROM** – Royal Ontario Museum, Toronto, Canada.

**RRBP** – Rukwa Rift Basin Project, Tanzanian Antiquities Unit, Dar es Salaam, Tanzania.

**UFRJ/DG** – Universidade Federal do Rio de Janeiro, Departamento de Geologia, Rio de Janeiro, Brazil.

**UFRJ/IGEO** – Universidade Federal do Rio de Janeiro, Instituto de Geociências, Rio de Janeiro, Brasil.