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A new notosuchian from the Late Cretaceous Brazil and the phylogeny of advanced notosuchians.

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PHYLOGENETIC ANALYSIS

Tree search strategy

A heuristic tree search of 10000 replicates of Wagner trees with random addition sequences was performed followed by TBR branch-swapping, collapsing zero-length branches under the strictest criterion (Coddington and Scharff, 1994). All most parsimonious trees recovered in this search were subjected to a final round of TBR branch-swapping. This tree search strategy resulted in 38880 most parsimonious trees of 1598 steps (CI=0.309, RI=0.745).

Character list

Character list of the data matrix used in the phylogenetic analysis. The character list is extended from Pol et al. (2012). Character definitions 1–101 are from Clark (1994) and have the same numeration as in the original publication. Character 5 was excluded from the analysis (due to dependence with the modified definition of character 6). The characters are listed here and their respective sources are cited along with the character number of the original publication. Characters 1, 3, 6, 10, 23, 37, 43, 44, 45, 49, 65, 67, 69, 71, 73, 77, 79, 86, 90, 91, 96, 97, 105, 116, 126, 140, 142, 143, 149, 167, 182, 187, 193, 197, 226, 228, 279, 339, 356, 357, 364, 368 represent nested sets of homologies and/or entail present and absence information. These characters were set as additive (also marked with a “+” in this list).

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. pterygoideus 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 and by Brochu, 1997a: char. 7): + Hypapophyses in cervicodorsal vertebrae: absent (0), present only in cervical vertebrae (1), present in cervical and the first two dorsal vertebrae (2), present at least up to the third dorsal vertebra (3), or up to the fourth dorsal vertebrae (4).

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

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

Character 94 (Modified from Clark, 1994: char. 94): First caudal vertebrae: amphicoelous or amphiplatian (0), biconvex (1), or opisthocelous (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. iliobtibialis 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): Postorbital-ectopterygoid 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 (PIF1) 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), or 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 Apesteguía, 2005: char. 180): Splenial-dentary suture at symphysis on ventral surface: v-shaped (0), or transversal (1).

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

Character 187 (Pol and Apesteguía, 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 Apesteguía, 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 Apesteguía, 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 Apesteguía, 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 Apesteguía, 2005: char. 188): + Lateral surface of dentaries below alveolar margin, at mid to posterior region of tooth row: vertically oriented, continuous with rest of lateral surface of the dentaries (0), 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 (Wu et al., 1997: char. 127): Depression on posterolateral surface of maxilla: absent (0), or present (1).

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 quadrate-quadratojugal 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 Osmólska 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 Apesteguía, 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 Apesteguía, 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 Apesteguía, 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: 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 tooththrow (0) or maxilla broadly separates ectopterygoid from maxillary tooththrow (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 tooththrow, at the level of the second or third alveolus (0) or abuts premaxillary tooththrow (1).

Character 271 (modified from Turner, 2004: character 126): Ventral surface of choanal septum smooth to slightly depressed (0) or marked by an acute groove (1).

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 (Pol et al., 2009: char. 276): Transverse ridge crossing the frontal anteromedial to the orbits: absent (0) or present (1).

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 (Pol et al., 2012: char. 299). Dorsal migration of parapophysis on the neural arch on mid 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).

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 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).

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 PIF11 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 supracondylar ridge separating the anterior concave surface of femur from the lateral surface (0), or absence of well developed lateral supracondylar 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 astragalus (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 depression separated 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 than 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): Anterior margin of the suborbital fenestra: maxilla precludes the ectopterygoid-palatine contact at the anterior margin of the suborbital fenestra (0), or ectopterygoid projects 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): 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 (new character): 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).

Character 352 (new character): 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 (new character): 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 (new character): Temporo-orbital foramen: enclosed between the parietal and squamosal (0), or completely enclosed within squamosal (1).

Character 355 (new character): 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): + 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): + 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 (new character): 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 (new character): 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 (new character): 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 width of the maxillary palate (1).

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

Character 363 (new character): 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 (new character): + 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: Size of neurovascular foramina on mid to posterior region of alveolar edge of the dentary: small (0), or extremely large, being approximately as anteroposteriorly long as an alveolus (1).

Character 366 (new character): 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; Turner and Buckley, 2008: char 289): 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) +: Location of the anterior opening for the mandibular nerve (V_3): 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 (new character): 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 (new character): 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 (new character): 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 (new character): 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 (new character): 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 (new character): 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 (new character): Rounded bulge at the posterior end of the lateral flange of the retroarticular process: absent (0), or present (1).

Character 376 (new character): 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 (new character): 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 (new character): 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 (new character): 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 (new character): 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): 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 (new character): 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 (new character): 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): 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 (new character): 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): Apico-basal ridges on the enamel surface of posterior teeth: absent (0), or present (1).

Character 387 (new character): 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 (new character): 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 (new character): 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): Horizontal cingula along the buccal and/or lingual margin of the base of

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

Character 392 (modified from Turner and Sertich, 2010: char. 294): 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): 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): Tooth-tooth occlusion wear facets in posterior teeth: absent (0), present (1)

Character 395 (new character): 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): 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): 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): 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): + 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): 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): 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): 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): 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 (new character): 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): Suture between the postorbital and the squamosal in lateral view: straight or almost straight, vertical or oblique (0), or convex anteriorly (1).

Character 412 (new character): 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).

Taxon list

Collection numbers of the specimens that were first-hand revised by the authors are added after the bibliographic reference.

Adamantinasuchus navae (Nobre and Carvalho, 2006; UFRJ-DG 107-R)
Alligator mississippiensis (Clark, 1994; Brochu, 1999; FMNH 8201)
Alligatorium (Wellnhofer, 1971; Clark, 1986, 1994)
Anatosuchus minor (Sereno and Larsson, 2009; MNN GAD603, GAD17)
Araripesuchus buitreaensis (Pol and Apesteguia, 2005; MPCA-PV 235)
Araripesuchus gomesii (Price, 1959; AMNH 24450)
Araripesuchus patagonicus (Ortega et al., 2000; MUC-PV 269, MUC-PV 270, MUC-PV 283)
Araripesuchus tsangatsangana (Turner, 2006; UA 8720, FMNH PR 2297, FMNH PR 2298, FMNH PR 2299)
Araripesuchus wegeneri (Buffetaut, 1981; Sereno and Larsson, 2009; MNHN-GDF 700, MNN GAD19)
Argochampsia krebsi (Hua and Jouve, 2004)
Armadillosuchus (Marinho and Carvalho, 2009; UFRJ-DG 303-R)
Asiatosuchus germanicus (Brochu, 1999, 2003; SMF Me 1801, SMNK uncat.)
Ayllusuchus fernandezi (Gasparini, 1984; MLP 72-X-4-2)
Barinasuchus arveloi (Paolillo and Linares, 2007)
Baurusuchus albertoi (Nascimento and Zaher, 2010; MZSP-PV 140)
Baurusuchus pachecoi (Price, 1945; DGM 299-R)
Baurusuchus salgadoensis (Carvalho et al., 2005; MPMA 62-0001-02)
Bergisuchus dietrichbergi (Kuhn, 1968; Rossmann et al., 2000; HLMD-Me-7003)
Bernissartia fagesii (Buscalioni and Sanz, 1990; Norell and Clark, 1990; Brochu, 1999)
Borealosuchus formidabilis (Erickson, 1976; Brochu, 1997b, 1999)
Bretesuchus bonapartei (Gasparini et al., 1993; PVL 4735)
Caipirasuchus montealtensis (Andrade and Bertini, 2008a; MPMA 15-001/90)
Caipirasuchus paulistanus (Iori and Carvalho, 2011; MPMA 67-0001/00)
Caipirasuchus stenognathus (MZSP-PV 139)
Calsoyasuchus valliceps (Tykoski et al., 2002)
Campinasuchus dinizi (Carvalho et al., 2011)
Candidodon itapecurensis (Carvalho, 1994; Nobre and Carvalho, 2001; UFRJ 114R)
Caryonosuchus pricei (Kellner et al., 2011a)
Chimaeresuchus paradoxus (Wu and Sues, 1996; IVPP V8274)
Comahuesuchus brachybuccalis (Bonaparte, 1991; MUC-PV 202, MACN-N 30, MACN-N 31, MOZ 6131P)
Coringasuchus anisodontis (Kellner et al., 2009)
Cricosaurus araucanensis (Gasparini and Dellapé, 1976; MLP 72-IV-7-1, MLP 72-IV-7-2, MLP 72-IV-7-3, MLP 72-IV-7-4, MLP 72-IV-7-4, MLP 86-XI-5-7, MACN-N 95, MACN-N 64)
Cricosaurus suevicus (Fraas, 1902; SMNS [Fraas specimen])
Crocodylus niloticus (Clark, 1994; Brochu, 1999; FMNH 17157, FMNH 217153)
Cynodontosuchus rothi (Woodward, 1896; MLP 64-IV-16-25)
Dakosaurus andiniensis (Vignaud and Gasparini, 1996; MHNSR PV 344, MOZ 6146P)
Dakosaurus maximus (Fraas, 1902; SMNS 8203, BSP AS.VI.1, NHMUK R486)
Dibothrosuchus elpahros (Wu and Chatterjee, 1993; IVPP V 7907)
Diplocynodon hantoniensis (Brochu, 1999; NHMUK OR 30392, NHMUK OR 30393, NHMUK OR 30397, NHMUK OR 30394, NHMUK OR 25199, NHMUK OR 25178, NHMUK OR 30391, NHMUK OR 30250, NHMUK OR 30362, NHMUK OR 30289, NHMUK OR 30368, NHMUK OR 30414, NHMUK OR 30402, NHMUK OR 30219, NHMUK 30210,

NHMUK OR 30206, NHMUK OR 30236, NHMUK OR 25245, NHMUK R1046, NHMUK R1050, NHMUK R5230)
Dyrosaurus (Buffetaut, 1978; Clark, 1986, 1994; Jouve, 2005; BSP 1993.IX.400)
Edentosuchus tienshanensis (Young, 1973; IVPP V 3236; GMPKU-P 200101)
Eothoracosaurus mississippiensis (Brochu, 2004; MSU 3293, PPM p2000.1.60)
Eutretauranosuchus delfsi (Mook, 1967; Clark, 1986, 1994; CMNH 8028; AMNH 570)
Fruitachampsia callinsoni (Clark, 1985, 1994; LACM 120455a)
Gasparinisuchus peirosauroides (Gasparini et al., 1991; Martinelli et al., 2012; MOZ 1750 PV)
Gavialis gangeticus (Clark, 1994; Brochu, 1999; MLP s/n, FMNH 82681, FMNH 98864) Glen Rose Form (Brochu 1997a, 1999; USNM 22039, MCZ 4453)
Gobiosuchus kielanae (Osmólska, 1972; ZPAL MgR-II/67, ZPAL MgR-II/68, ZPAL MgR-II/69, ZPAL MgR-II/70, ZPAL MgR-II/71)
Goniopholis simus (Mook, 1942; Clark, 1986, 1994; Salisbury et al., 1999; NHMUK OR 41098)
Goniopholis stovalli (Mook, 1964; AMNH 5782)
Gracilisuchus stipanicorum (Romer, 1972; MCZ 4117, MCZ 4118, PVL 4597, PVL 4612)
Hamadasuchus reboulii (Buffetaut, 1994; Larsson and Sues, 2007; MDE C001)
Hemiprotosuchus leali (Bonaparte, 1971; PVL 3829)
Hsisosuchus chowi (Peng and Zhu, 2005; ZDM 0146)
Hsisosuchus chungkingensis (Young and Chow, 1953; Li et al., 1994; Wu et al., 1994a; cast of CNM V 1090)
Hylaeochampsia vectiana (Clark and Norell, 1992; NHMUK R177)
Hyposaurus rogersii (Troxell, 1925; Denton et al., 1997; YPM 985, YPM 764)
Iberosuchus macrodon (Antunes, 1975; Ortega et al., 2000; Ortega, 2004; STUS specimens)
Kaprosuchus saharicus (Serenó and Larsson, 2009; MNN IGU12) Kayenta Form (Clark, 1986; UCMP 97638, 125359, 125871)
Labidiosuchus amicum (Kellner et al., 2011b)
Leidyosuchus canadensis (Brochu, 1997b, 1999, 2003; Wu et al., 2001c; AMNH 5352, TMP 74.10.8, NMC 2279)
Libycosuchus brevirostris (Stromer, 1914; BSP 1912.VIII.574)
Lomasuchus palpebrosus (Gasparini et al., 1991; MOZ 4084 PV; MCF PVPH 160)
Lorosuchus nodosus (Pol and Powell, 2011; PVL 6219) Lumbraera form (unpublished sebecid, new taxon; PVL 6385)
Mahajangasuchus insignis (Buckley and Brochu, 1999; Turner and Buckley, 2008; UA 8654)
Malawisuchus mwakayasyunguti (Clark et al., 1989; Gomani, 1997; MAL 45, MAL 49)
Mariliasuchus amarali (Carvalho and Bertini, 1999; MZSP-PV 50, MZSP-PV 51, MNRJ 6298-V, MNRJ 6756-V, UFRJ-DG 105-R, UFRJ-DG 106-R, URC R67, URC R68)
Metriorhynchus casamiquelai (Gasparini and Diaz, 1977; cast of MGHF 1.08573)
Metriorhynchus superciliosus (de Blainville, 1853; Wenz, 1968; AMNH 997, SMNS 10116)
Montealtosuchus arrudacamposi (Carvalho et al., 2007; MPMA 16-0007-04)
Morrinhosuchus luziae (Iori and Carvalho, 2009)
Notosuchus terrestris (Gasparini, 1971; MLP 64-IV-16-1, MLP 64-IV-16-5, MLP 64-IV-16-6, MLP 64-IV-16-10, MLP 64-IV-16-11, MLP 64-IV-16-12, MLP 64-IV-16-13, MLP 64-IV-16-23, MACN-RN 1037, MACN-RN 1040, MACN-RN 1041, MACN-RN 1042, MACN-RN1043, MACN-RN 1044, MUC-PV 147, MUC-PV 209, MUC-PV 287, MUC-PV 900, MPCA-PV 249, MPCA-PV250)
Orthosuchus stormbergi (Nash, 1975; SAM-K 409)

Pabweshi pakistanus (Wilson et al., 2001; GSP-UM 2000, 2001)
Pakasuchus kapilimai (O'Connor et al. 2010)
Pehuenchesuchus enderi (Turner and Calvo, 2005)

Pelagosaurus typus (Eudes-Deslongchamps, 1864; NHMUK OR 32599, BSP 1925.I.34, BSP 1990.VIII.68, MB 1925.1, MB R.2883, SMNS 8666, SMNS 80066)
Pholidosaurus purbeckensis (Owen, 1878; Clark, 1986, 1994; Salisbury, 2002; NHMUK R3414)
Pissarrachampsa sera (Montefeltro et al., 2011)
Pristichampsus vorax (Brochu, 1999; UCMP 154329, FMNH PR 399, FMNH PR 479, FMNH PR 74)
Protosuchus haughtoni (Busbey and Gow, 1984; BPI/1/4746, BPI/1/4946, BPI/1/4770, BPI/1/5290)
Protosuchus richardsoni (Colbert and Mook, 1951; AMNH 3024, MCZ 6727, UCMP 34634, 130860, 131827)
Rhabdognathus (Brochu et al., 2002; CNRST-SUNY 190)
Rugosuchus nonganensis (Wu et al., 2001b)
Sarcosuchus imperator (de Broin and Taquet, 1966; Sereno et al., 2001; MNN 604, MNN 603)
Sebecus huilensis (Langston, 1965; Busbey, 1986; Langston and Gasparini, 1997; UCMP 37877)
Sebecus icaeorhinus (Colbert, 1946; AMNH 3159, 3160; MMP 235; MPEF-PV 1776)
Sebecus querejazus (Buffetaut and Marshall, 1991; MNHN cast of type specimen)
Shamosuchus djadochtaensis (Mook, 1924; AMNH 6412, IGM 100/1195)
Shantungosuchus hangjinensis (Wu et al., 1994b)
Sichuanosuchus huidongensis (Peng, 1995; ZDM 3403)
Sichuanosuchus shuhanensis (Wu et al., 1997; IVPP V 10594)
Simosuchus clarki (Buckley et al., 2000; Krause and Kely, 2010; UA 8679)
Sokotosuchus ianwilsoni (Halstead, 1975; Buffetaut, 1979; Clark, 1986, 1994)
Sphagesaurus huenei (Price, 1950; Pol, 2003; RCL 100)
Steneosaurus bollensis (Jaeger, 1828; Westphal, 1962; AMNH 5138, BSP 1890.I.510, BSP 1945.XV.1, BSP 1949.XV.1, BSP 1972.V.11, BSP 1973.VII.592, GPIT Re.1193-6, GPIT Re.1193-12, MB 1878.262, MB 1921.12, MB R.1953, SMNS 115, SMNS 4554, SMNS 9427, SMNS 9428, SMNS 15951, SMNS 16848, SMNS 17484, SMNS 18878, SMNS 20280, SMNS 20282, SMNS 20283, SMNS 53422)
Stolokrosuchus lapparenti (Larsson and Gado, 2000; MNN GDF600)
Stratiosuchus maxhechti (Campos et al., 2001; Riff, 2003; Pinheiro et al., 2007; DGM 1477-R; URC R73)
Sunosuchus junggarensis (Wu et al., 1996)
Terminonaris robusta (Mook, 1934; Wu et al., 2001a; AMNH 5850, AMNH 5849)
Terrestrisuchus gracilis (Crush, 1984)
Theriosuchus pusillus (Owen, 1879; Clark, 1986, 1994; Ortega et al., 2000; NHMUK OR 48328, NHMUK OR 48330)
Uberabasuchus terrificus (Carvalho et al., 2004)
Uruguaysuchus aznarezi (Rusconi, 1933; FC-DPV 2320)
Yacararani boliviensis (Novas et al., 2009; MNK PAL5063, MNK PAL5064)
Zaraasuchus shepardii (Pol and Norell, 2004b; IGM 100/1321)
Zosuchus davidsoni (Pol and Norell, 2004a; IGM 100/1304, IGM 100/1305, IGM 100/1306, IGM 100/1307, IGM 100/1308)

Institutional Abbreviations—**AMNH**, American Museum of Natural History, New York, USA; **DGM**, Departamento de Produção Mineral, Rio de Janeiro, Brazil; **BPI**, Bernard Price Institute, Johannesburg, South Africa; **BSP**, Bayerische Staatssammlung für Paläontologie und Geologie, München, Germany; **CMNH**, Cleveland Museum of Natural History, Cleveland, USA; **CNM**, Chongqing Natural Museum, Sichuan, People's Republic of China; **CNRST-SUNY**, Centre National de la Recherche Scientifique et Technologique, Mali - Stony Brook University, New York, USA; **DGM**, Departamento de Produção Mineral, Rio de Janeiro, Brazil; **FC-DPV**, Colección de Vertebrados Fósiles, Facultad de Ciencias, Montevideo, Uruguay; **FMNH**, Field Museum of Natural History, Chicago, Illinois, USA; **GMPKU-P**, School of Earth and Space Sciences, Peking University, Beijing, People's Republic of China; **GPIT**, Institut und Museum für Geologie und Paläontologie, Universität Tübingen, Tübingen, Germany; **GSP-UM**, Geological Survey of Pakistan-University of Michigan collection, Quetta, Pakistan; **HLMD**, Hessisches Landesmuseum, Darmstadt, Germany; **IGM**, Mongolian Institute of Geology, Ulaan Bataar, Mongolia; **IVPP**, Institute of Vertebrate Paleontology and Paleoanthropology, Beijing, China; **LACM**, Natural History Museum of Los Angeles County, Los Angeles, California, USA; **MACN**, Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina; **MAL**, Malawi Department of Antiquities, Malawi; **MB**, Institut für Palaontologie, Museum für Naturkunde, Humboldt-Universität, Berlin, Germany; **MCF**, Museo Carmen Funes, Plaza Huincul, Argentina; **MCZ**, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA; **MDE**, Musée des Dinosauriens D'Espérasa, France; **MGHF**, Museo Geológico H. Fuenzalida, Universidad Católica del Norte, Antofagasta, Chile; **MHNSR**, Museo de Historia Natural de San Rafael, San Rafael, Argentina; **MLP**, Museo de La Plata, La Plata, Argentina; **MMP**, Museo de Historia Natural —Galileo Scaglia||, Mar del Plata, Argentina; **MNHN**, Museum National d'Histoire Naturelle, Paris, France; **MNK**, Museo Noel Kempff Mercado, Santa Cruz de la Sierra, Bolivia; **MNN**, Musée National du Niger; **MNRJ**, Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil; **MPCA-PV**, Museo Carlos Ameghino, Cipoletti, Argentina; **MPEF**, Museo Paleontológico Egidio Feruglio, Trelew, Argentina; **MPMA**, Museu de Paleontologia de Monte Alto, Brazil; **MSU**, Dunn-Seiler Museum, Mississippi State University, Starkville, USA; **MUC-PV**, Museo de Geología y Paleontología, Universidad Nacional del Comahue, Neuquén, Argentina; **MOZ**, Museo Profesor J. Olsacher, Zapala, Argentina; **MZSP**, Museu Zoologia, Universidade de São Paulo, São Paulo, Brazil; **NHMUK**, Natural History Museum, London, United Kingdom; **NMC**, Canadian Museum of Nature, Ottawa, Ontario, Canada; **PPM**, Pink Palace Museum, Memphis, Tennessee, USA; **PVL**, Instituto Miguel Lillo, Tucumán, Argentina; **RCL**, Museo de Ciencias Naturales, Pontificia Universidade Católica de Minas Gerais, Brazil; **SAM**, Iziko-South African Museum, Cape Town, South Africa; **UA**, University of Antananarivo, Madagascar; **SMF**, Senckenberg Museum, Frankfurt, Germany; **SMNK**, Staatliches Museum für Naturkunde, Karlsruhe, Germany; **SMNS**, Staatliches Museum für Naturkunde, Stuttgart, Germany; **STUS**, Sala de las Tortugas, Universidad de Salamanca, Salamanca, Spain; **TMP**, Royal Tyrrell Museum of Palaeontology, Drumheller, Alberta, Canada; **UAM**, Universidad Autónoma de Madrid, Spain; **UCMP**, University of California Museum of Paleontology, Berkeley, California, USA; **UFRJ**, Universidade Federal do Rio de Janeiro, Departamento de Geologia, Brazil; **URC**, Museu de Paleontologia e Estratigrafia Prof. Dr. Paulo Milton Barbosa Landim, Universidade Estadual Paulista, Rio Claro, Brazil; **USNM**, United States National Museum, Smithsonian Institution, Washington, DC; **YPM**, Peabody Museum of Natural History, Yale University, New Haven, Connecticut, USA; **ZDM**, Zigong Dinosaur Museum, Zigong, China; **ZPAL**, Instytut Paleobiologii PAN, Warszawa, Poland.

Consensus trees

FIGURE 1S. Strict consensus tree of the 38880 MPTs retrieved in the parsimony analysis.

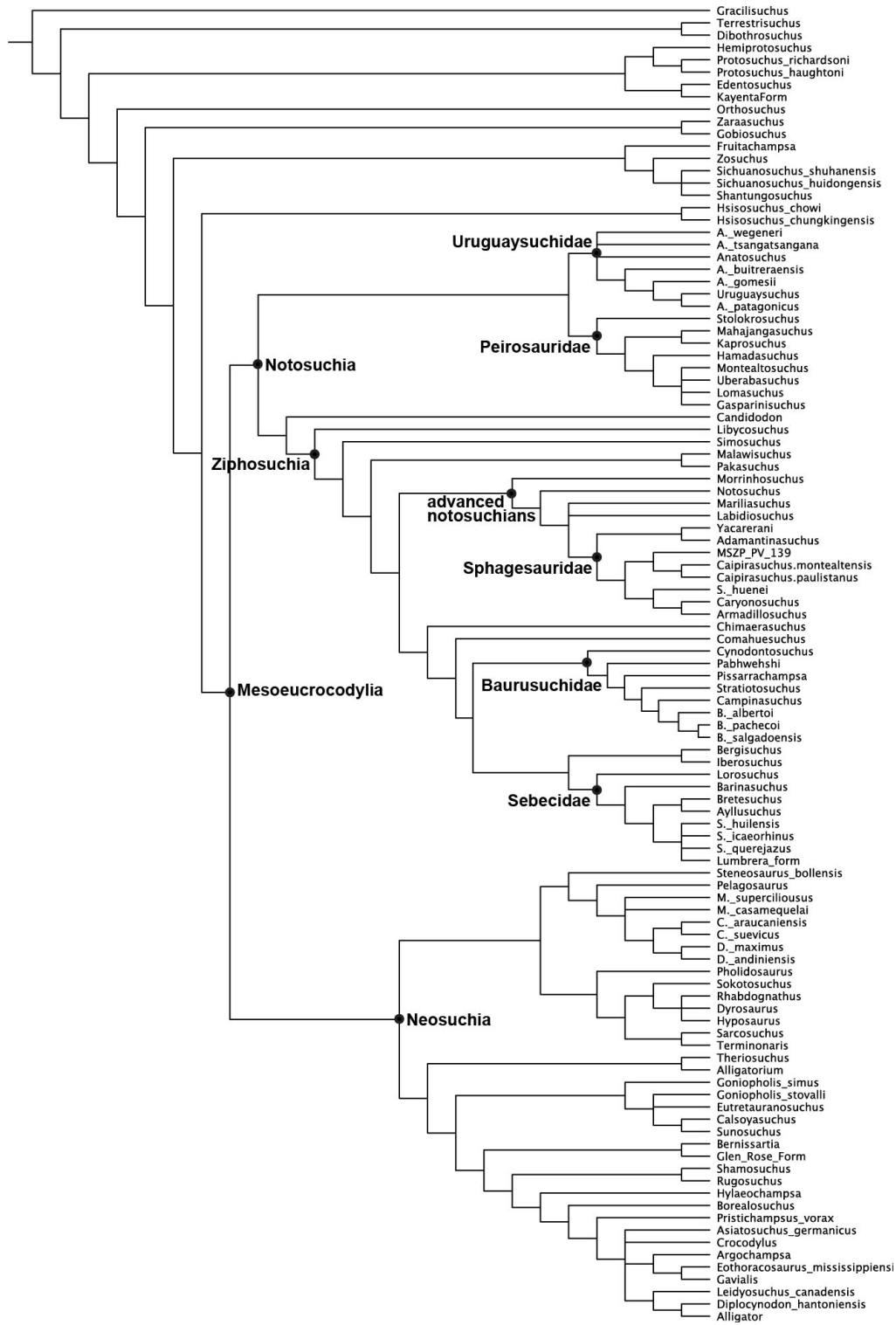


FIGURE 2S. Reduced strict consensus tree of the 38880 MPTs retrieved in the parsimony analysis, pruning the unstable taxa *Pehuenchesuchus*, *Pabwehshi*, and *Coringasuchus* identified through IterPCR (Pol and Escapa, 2009). The tree is labeled with node numbers for reference to the synapomorphy list.



Nodal Support

The nodal support (Figs. 3S-7S) was evaluated using Bremer support (Bremer, 1994) and two measures based on resampling of characters, bootstrap (Felsenstein, 1985) and jackknife (Farris et al., 1996). The Bremer analysis was conducted using the BREMER.RUN script distributed with TNT (Goloboff et al., 2008a, b). The bootstrap and jackknife analysis was conducted performing 1000 pseudoreplicates and a heuristic tree search similar to the one described for the parsimony analysis. Trees obtained during this procedure were summarized with absolute and GC frequencies (Goloboff et al., 2003). All branch support analyses (i.e., tree searches) included the unstable *Pehuenchesuchus*, *Pabwehshi*, and *Coringasuchus* but these taxa were pruned from the resulting trees to summarize the results.

FIGURE 38. Reduced strict consensus tree with Bremer support values obtained ignoring the alternative positions of Pehuenchesuchus, Fabwehshi, and Coringasuchus from the resulting trees.

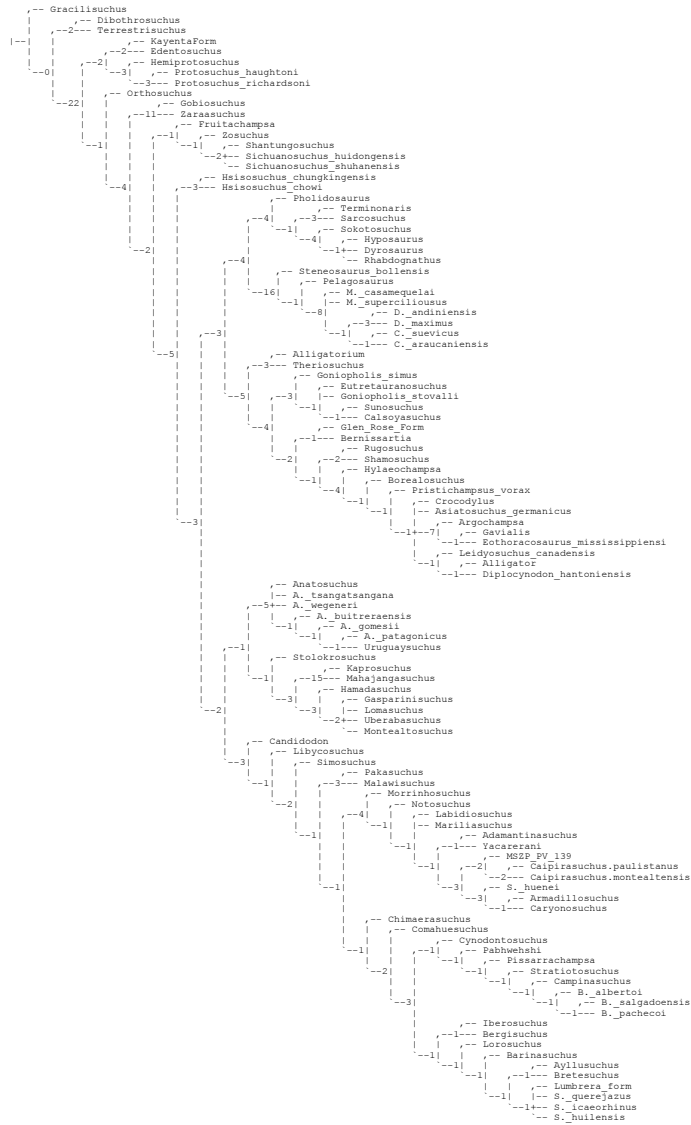


FIGURE 48. Reduced strict consensus tree with Bootstrap absolute frequencies on a majority rule consensus tree. Support values obtained ignoring the alternative positions of *Fehuenchesuchus*, *Fabwhehi*, and *Coringasuchus* from the trees obtained in the bootstrap pseudoreplicates.

```

,-- Gracilisuchus
|
| ,-- Dibothrosuchus
| | ,--82--- Terrestriisuchus
| | |
| | | ,-- Fruilichampsia
| | |
| | | ,-- Zosuchus
| | |
| | | ,-- Orthosuchus
| | |
| | | ,--98--- Zeraasuchus
| | |
| | | ,-- KayentaForm
| | |
| | | ,--74--- Edentosuchus
| | |
| | | ,-- Shantungosuchus
| | |
| | | ,--78--- Sichuanosuchus_huldongensis
| | |
| | | ,-- Sichuanosuchus_shuanensis
| | |
| | | ,-- Hemiprotosuchus
| | |
| | | ,--88| ,-- Protosuchus_haughtoni
| | |
| | | ,--92--- Protosuchus_richardsoni
| | |
| | | ,-- Hsiosuchus_chungkingensis
| | |
| | | ,--91--- Hsiosuchus_chowi
| | |
| | | ,-- Stelokrosuchus
| | |
| | | ,--96| |
| | | | ,-- Anatosuchus
| | | |
| | | | ,-- A_tanqatsangana
| | | |
| | | | ,-- A_wegeneri
| | | |
| | | | ,-- A_buitrerensis
| | | |
| | | | ,-- A_patagonicus
| | | |
| | | | ,-- A_gomeaii
| | | |
| | | | ,-- Fabwhehi
| | | |
| | | | ,-- Lumberea_form
| | | |
| | | | ,-- Lorosuchus
| | | |
| | | | ,-- Aylisuchus
| | | |
| | | | ,-- S_querejatus
| | | |
| | | | ,-- S_iceorhinus
| | | |
| | | | ,-- S_hullemsi
| | | |
| | | | ,-- Betinasuchus
| | | |
| | | | ,-- Bretesuchus
| | | |
| | | | ,--71| |
| | | | | ,-- Cynodontosuchus
| | | | |
| | | | | ,-- Stratiototusuchus
| | | | |
| | | | | ,-- Pissarrachampsia
| | | | |
| | | | | ,-- Campinasuchus
| | | | |
| | | | | ,-- Comahuesuchus
| | | | |
| | | | | ,-- Chimaerasuchus
| | | | |
| | | | | ,-- Simosuchus
| | | | |
| | | | | ,-- Libycosuchus
| | | | |
| | | | | ,-- Candidodon
| | | | |
| | | | | ,-- Uruguayosuchus
| | | | |
| | | | | ,-- Kaprosuchus
| | | | |
| | | | | ,--98--- Mahajangasuchus
| | | | |
| | | | | ,-- Iberosuchus
| | | | |
| | | | | ,--60--- Bergisuchus
| | | | |
| | | | | ,-- Pakasuchus
| | | | |
| | | | | ,--78--- Malaisuchus
| | | | |
| | | | | ,-- B_albertoi
| | | | |
| | | | | ,--63---56| ,-- B_salgadoensis
| | | | |
| | | | | ,--58--- B_pachecoi
| | | | |
| | | | | ,-- Hamadasuchus
| | | | |
| | | | | ,-- Gasparinisuchus
| | | | |
| | | | | ,--53| |
| | | | | | ,-- Lomasuchus
| | | | | |
| | | | | | ,--84--- Uberabasuchus
| | | | | |
| | | | | | ,-- Montealtosuchus
| | | | | |
| | | | | | ,-- Morrisosuchus
| | | | | |
| | | | | | ,-- Notosuchus
| | | | | |
| | | | | | ,-- Labidiosuchus
| | | | | |
| | | | | | ,--75| |
| | | | | | | ,-- Merillasuchus
| | | | | | |
| | | | | | | ,-- Adamantinasuchus
| | | | | | |
| | | | | | | ,--51--- Yacarezani
| | | | | | |
| | | | | | | ,--83| |
| | | | | | | | ,-- M28_FV_139
| | | | | | | |
| | | | | | | | ,--71| ,-- Caipirasuchus_paulistanus
| | | | | | | |
| | | | | | | | ,--72--- Caipirasuchus_montealtensis
| | | | | | | |
| | | | | | | | ,--67| ,-- S_huenei
| | | | | | | |
| | | | | | | | ,--91| ,-- Armadillosuchus
| | | | | | | |
| | | | | | | | ,--64--- Caryonosuchus
| | | | | | | |
| | | | | | | | ,-- Rugosuchus
| | | | | | | |
| | | | | | | | ,-- Glen_Rose_Form
| | | | | | | |
| | | | | | | | ,-- Bernissartia
| | | | | | | |
| | | | | | | | ,-- Shamosuchus
| | | | | | | |
| | | | | | | | ,-- Sunosuchus
| | | | | | | |
| | | | | | | | ,-- Calsoyasuchus
| | | | | | | |
| | | | | | | | ,-- Eutretauranosuchus
| | | | | | | |
| | | | | | | | ,-- Goniopholis_stovalli
| | | | | | | |
| | | | | | | | ,-- Goniopholis_simus
| | | | | | | |
| | | | | | | | ,-- Alligatorium
| | | | | | | |
| | | | | | | | ,--81--- Theriosuchus
| | | | | | | |
| | | | | | | | ,-- Alligator
| | | | | | | |
| | | | | | | | ,-- Diplocynodon_hantoniensis
| | | | | | | |
| | | | | | | | ,-- Crocodylus
| | | | | | | |
| | | | | | | | ,--67| ,-- Axiotosuchus_germanicus
| | | | | | | |
| | | | | | | | ,-- Leidyosuchus_canadensis
| | | | | | | |
| | | | | | | | ,--56--- Frlstichampsia_vorax
| | | | | | | |
| | | | | | | | ,-- Borealosuchus
| | | | | | | |
| | | | | | | | ,-- Hylaeochampsia
| | | | | | | |
| | | | | | | | ,--90| |
| | | | | | | | | ,-- Gavialis
| | | | | | | | |
| | | | | | | | | ,--76--- Eothenacosaurus_mississippiensis
| | | | | | | | |
| | | | | | | | | ,-- Pholidosaurus
| | | | | | | | |
| | | | | | | | | ,-- Terminonaris
| | | | | | | | |
| | | | | | | | | ,--74| ,--93--- Sarcosuchus
| | | | | | | | |
| | | | | | | | | ,--50| ,-- Sokotosuchus
| | | | | | | | |
| | | | | | | | | ,--91| ,-- Hyposaurus
| | | | | | | | |
| | | | | | | | | ,--56--- Dyrosaurus
| | | | | | | | |
| | | | | | | | | ,--67| ,-- Rhabdogonathus
| | | | | | | | |
| | | | | | | | | ,-- Stenosaurus_bollensis
| | | | | | | | |
| | | | | | | | | ,-- Pelagosaurus
| | | | | | | | |
| | | | | | | | | ,--100| ,-- M_casamequelai
| | | | | | | | |
| | | | | | | | | | ,-- M_supercilliosus
| | | | | | | | | |
| | | | | | | | | | ,--99| ,-- D_andiniensis
| | | | | | | | | |
| | | | | | | | | | ,--93--- D_maximus
| | | | | | | | | |
| | | | | | | | | | ,--65| ,-- C_suevicus
| | | | | | | | | |
| | | | | | | | | | ,--62--- C_araucaniensis

```

FIGURE 58. Reduced strict consensus tree with Bootstrap GC frequencies (Goloboff et al. 2003). Support values obtained ignoring the alternative positions of *Fehuenchesuchus*, *Fabwhehi*, and *Coringasuchus* from the trees obtained in the bootstrap pseudoreplicates.

```

,-- Gracilisuchus
|
| ,-- Dibothrosuchus
| | ,--80--- Terrestriisuchus
| | |
| | | ,-- Orthosuchus
| | |
| | | ,-- KayentaForm
| | |
| | | ,--81| ,--53--- Edentosuchus
| | |
| | | ,--23| ,-- Hemiprotosuchus
| | |
| | | ,--97| |
| | | | ,--84| ,-- Protosuchus_haughtoni

```



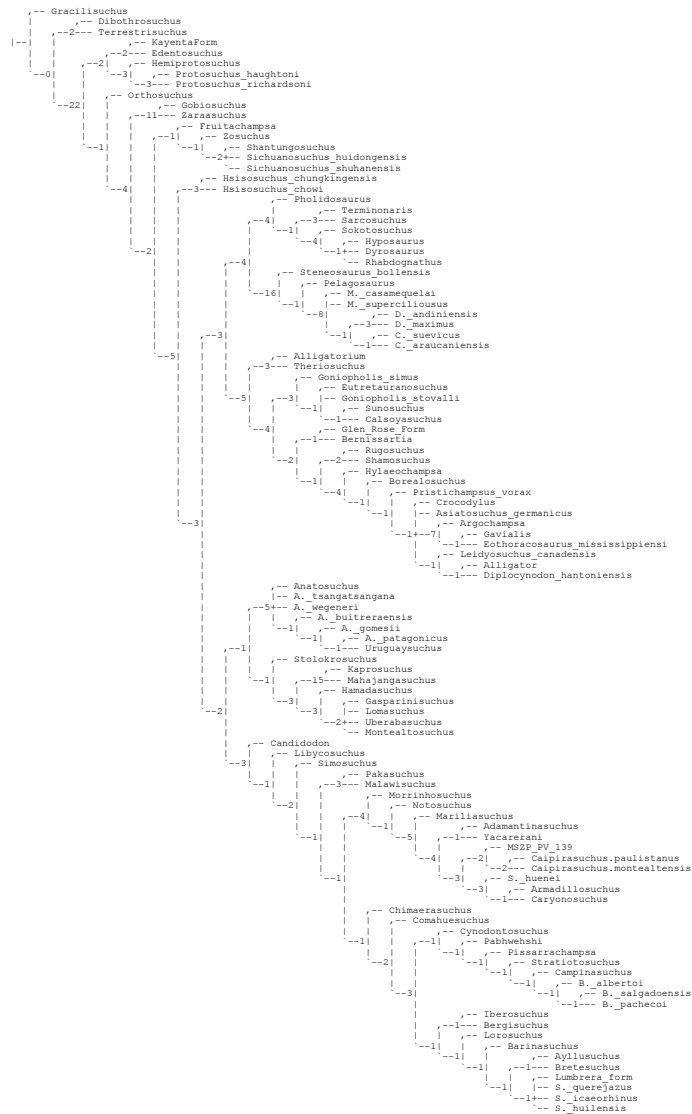
```

|--12| |--60--- Edentosuchus
|--32| |-- Hemiprotosuchus
|--97| |--91--- Protosuchus_haughtoni
|--91--- Protosuchus_richardsoni
|-- Gobiosuchus
|--99--- Zarasuchus
|--98| |--99--- Fruitachampsia
|--11| |-- Zosuchus
|--18| |-- Shantungosuchus
|--77| |-- Sichuanosuchus_huidongensis
|--7--- Sichuanosuchus_shuhanensis
|--32| |-- Hsiaoosuchus_chungkingensis
|--93--- Hsiaoosuchus_chow
|-- Pholidosaurus
|-- Temimonaris
|--73| |--92--- Sarcosuchus
|--40| |-- Sokotosuchus
|--33| |-- Hyposaurus
|--83| |-- Dyrosaurus
|--574--- Rhabdognathus
|--59| |-- Stenosauros_bollensis
|-- Pelagosaurus
|--100| |-- M_superciliosus
|--19| |-- M_canaqueualai
|--99| |-- D_andiniensis
|--10| |--95--- D_maximus
|--5| |-- C_suevicus
|--56--- C_araucaniensis
|--75| |--74| |-- Alligatorium
|--79--- Theriosuchus
|-- Goniopholis_simus
|--41| |--57| |-- Sinosuchus
|--27--- Calsosuchus
|--32| |-- Eutretraurosus
|--18--- Goniopholis_stovalli
|--16| |-- Glen Rose Form
|-- Bernissartia
|-- Rugosuchus
|--454---30--- Shamosuchus
|-- Hylaeochampsia
|--57| |-- Pristichampsus_vorax
|-- Asiatosuchus_germanicus
|-- Leidysuchus_canadensis
|--26| |-- Bozelesuchus
|--64---91| |-- Argochampsia
|--77--- Gavia
|-- Eochoirosaurus_mississippiensis
|-- Crocodylus
|--5| |-- Alligator
|--42--- Diplocynodon_hantoniensis
|-- Stolokrosuchus
|-- Kaprosuchus
|--59--- Mahajangasuchus
|--51| |-- Hamadasuchus
|--41| |-- Montevaltosuchus
|--86| |-- Gasparsiusuchus
|--14--- Lomasuchus
|--34| |--12| |-- Uberabasuchus
|-- A_wegeneri
|-- Anatosuchus
|--564---1--- A_tsangatsangana
|-- A_bultresensis
|--31| |-- A_gomeali
|--35| |-- A_patagonicus
|--13| |--30--- Triguaysuchus
|-- Libycosuchus
|-- Candidodon
|-- Simosuchus
|-- Pakasuchus
|--83--- Malawisuchus
|--17| |-- Chimeraosuchus
|-- Comahuosuchus
|-- Morrhosuchus
|--30| |--7--- Notosuchus
|--2| |-- Marillasuchus
|--70| |-- Labidosuchus
|--88| |-- Adamantinaosuchus
|--15| |--39--- Yacarezani
|--44| |-- MSP_PV_139
|--4| |--69| |-- Calpirasuchus_paulistanus
|--70--- Calpirasuchus_montealtensis
|--72| |-- S_huenei
|--92| |-- Armadillosuchus
|--59--- Caryonosuchus
|-- Pabwheishi
|-- Cynodontosuchus
|--25| |-- Pissarochampsia
|--26| |-- Campinosuchus
|--19| |-- Stratiotosuchus
|--17| |-- B_albertoi
|--25| |--52| |-- B_salgadoensis
|--61--- B_pachecoi
|-- Lorosuchus
|-- Iberosuchus
|--12| |--60--- Bergisuchus
|-- Barinasuchus
|--6| |-- Ayllusuchus
|--11| |--43--- Bretesuchus
|--3| |-- S_lacepedinus
|--36| |-- S_huellensis
|--10--- S_querejarus

```

Given that the analysis included highly fragmentary taxa that can affect support values, several exploratory analyses were performed in order to identify taxa that, although placed in a fixed position in the MPTs, can be positioned in multiple positions in marginally suboptimal trees. This type of unstable taxon can decrease the support values of a large number of clades that are otherwise well supported (Wilkinson et al., 2000). These taxa were identified through the use of the iterPCR script developed for TNT (Pol and Escapa, 2009) through the analysis of suboptimal topologies. This procedure identified *Labidiosuchus* as the taxon that most drastically affects the support values within the clade of advanced notosuchians. Nodal support measures were re-evaluated using Bremer support, bootstrap (Figs. 8S-12S), and jackknife but ignoring the alternative positions of *Pehuenchesuchus*, *Pabwehshi*, *Coringasuchus*, and *Labidiosuchus* in the suboptimal trees (for the case of the Bremer support) or in the trees obtained in each of the bootstrap/jackknife pseudoreplicates in TNT (Goloboff et al., 2008a, b). These taxa were not deleted from the matrix, but instead their position was ignored in the trees obtained during the support analyses. This procedure resulted in the discovery of relatively high support values for some nodes of interest in comparison with the support analysis shown above.

FIGURE 88. Reduced strict consensus tree with Bremer support values obtained ignoring the alternative positions of *Pehuenchesuchus*, *Fabwhehi*, *Coringasuchus*, and *Labidiosuchus* from the resulting trees.




```

|--92--- Protosuchus richardsoni
|
|--98--- Gobiosuchus
|
|--95| |--98--- Zerasuchus
| |
| | |--95| |--98--- Fritschampsia
| | |
| | | |--6| |--92--- Zosuchus
| | | |
| | | | |--17| |--92--- Shantungosuchus
| | | | |
| | | | | |--70| |--92--- Sichuanosuchus huldongensis
| | | | | |
| | | | | |--10--- Sichuanosuchus shuhanensis
| | | | | |
| | | | | |--22| |--92--- Naisosuchus chungkingensis
| | | | | |
| | | | | | |--88--- Naisosuchus chowi
| | | | | | |
| | | | | | | |--63| |--92--- Terminosaris
| | | | | | | |
| | | | | | | |--34| |--92--- Sarcosuchus
| | | | | | | |
| | | | | | | |--88| |--92--- Sokotosuchus
| | | | | | | |
| | | | | | | |--55| |--92--- Hyposaurus
| | | | | | | |
| | | | | | | |--54| |--92--- Dyrosaurus
| | | | | | | |
| | | | | | | | |--54| |--92--- Rhabdognathus
| | | | | | | | |
| | | | | | | | | |--100| |--92--- Pelagosaurus
| | | | | | | | | |
| | | | | | | | | | |--8| |--92--- M. supercilliosus
| | | | | | | | | | |
| | | | | | | | | | | |--99| |--92--- M. casamiquelii
| | | | | | | | | | | |
| | | | | | | | | | | |--16| |--92--- D. andiniensis
| | | | | | | | | | | |
| | | | | | | | | | | |--46| |--92--- D. maximus
| | | | | | | | | | | |
| | | | | | | | | | | |--58--- C. tucucicus
| | | | | | | | | | | |
| | | | | | | | | | | |--58--- C. araucaniensis
| | | | | | | | | | | |
| | | | | | | | | | | |--72--- Alligatorium
| | | | | | | | | | | |
| | | | | | | | | | | |--26| |--92--- Therapsuchus
| | | | | | | | | | | |
| | | | | | | | | | | |--43| |--92--- Goniopholis simus
| | | | | | | | | | | |
| | | | | | | | | | | |--22| |--92--- Sunosuchus
| | | | | | | | | | | |
| | | | | | | | | | | |--27--- Calsosuchus
| | | | | | | | | | | |
| | | | | | | | | | | |--11| |--92--- Eutretraurososuchus
| | | | | | | | | | | |
| | | | | | | | | | | | |--11| |--92--- Goniopholis stovalli
| | | | | | | | | | | | |
| | | | | | | | | | | | |--11| |--92--- Glen Rose Form
| | | | | | | | | | | | |
| | | | | | | | | | | | |--11| |--92--- Bernissartia
| | | | | | | | | | | | |
| | | | | | | | | | | | |--29--- Rugosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--29--- Shamosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--45| |--92--- Hylaeochampsia
| | | | | | | | | | | | |
| | | | | | | | | | | | |--53| |--92--- Pristichampsus vorax
| | | | | | | | | | | | |
| | | | | | | | | | | | |--13| |--92--- Borealisuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--0| |--92--- Crocodylus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--1+--88| |--92--- Asiatosuchus germanicus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--1+--88| |--92--- Argochampsia
| | | | | | | | | | | | |
| | | | | | | | | | | | |--74--- Gaviolis
| | | | | | | | | | | | |
| | | | | | | | | | | | |--74--- Eothorosacosaurus mississippiensis
| | | | | | | | | | | | |
| | | | | | | | | | | | |--0| |--92--- Leidyosuchus canadensis
| | | | | | | | | | | | |
| | | | | | | | | | | | |--0| |--92--- Alligator
| | | | | | | | | | | | |
| | | | | | | | | | | | |--34--- Diplocynodon hantoniensis
| | | | | | | | | | | | |
| | | | | | | | | | | | |--98--- Stalokrososuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--36| |--92--- Kaprosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--36| |--92--- Mahajangosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--35| |--92--- Hamadasuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--83| |--92--- Montcaltosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--34--- Gasparsiusuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--34--- Lomasuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--8| |--92--- Uberasuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--29| |--92--- A. tsangatsangana
| | | | | | | | | | | | |
| | | | | | | | | | | | |--40+--1--- A. wagneri
| | | | | | | | | | | | |
| | | | | | | | | | | | |--24| |--92--- A. buirensensis
| | | | | | | | | | | | |
| | | | | | | | | | | | |--30| |--92--- A. gomesii
| | | | | | | | | | | | |
| | | | | | | | | | | | |--23--- A. patagonicus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--11| |--92--- Uruguaysuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--11| |--92--- Simosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--2| |--92--- Libycosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--2| |--92--- Candidodon
| | | | | | | | | | | | |
| | | | | | | | | | | | |--74--- Pakasuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--74--- Malaisuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--8| |--92--- Chimaerasuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--8| |--92--- Comahuesuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--32| |--92--- Morrhinosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--6--- Notosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--66| |--92--- Marillasuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--92| |--92--- Adamantinaosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--59| |--92--- Yacarerani
| | | | | | | | | | | | |
| | | | | | | | | | | | |--59| |--92--- MSZP_FV_139
| | | | | | | | | | | | |
| | | | | | | | | | | | |--57| |--92--- Calpirasuchus.paulitanus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--57| |--92--- Calpirasuchus.montealtensis
| | | | | | | | | | | | |
| | | | | | | | | | | | |--92| |--92--- S. huenei
| | | | | | | | | | | | |
| | | | | | | | | | | | |--92| |--92--- Armadillosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--62--- Caryonosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--23| |--92--- Pabwwehshli
| | | | | | | | | | | | |
| | | | | | | | | | | | |--23| |--92--- Cynodontosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--29| |--92--- Pissarrachampsia
| | | | | | | | | | | | |
| | | | | | | | | | | | |--22| |--92--- Campinasuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--12| |--92--- Stratiotosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--12| |--92--- B. albertoi
| | | | | | | | | | | | |
| | | | | | | | | | | | |--51| |--92--- B. saigodoensis
| | | | | | | | | | | | |
| | | | | | | | | | | | |--58--- B. pectecoi
| | | | | | | | | | | | |
| | | | | | | | | | | | |--6| |--92--- Lorosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--6| |--92--- Iberosuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--12| |--92--- Bergisuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--12| |--92--- Barinasuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--12| |--92--- Aylusuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--12| |--92--- Breteusuchus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--3| |--92--- S. icacerhinus
| | | | | | | | | | | | |
| | | | | | | | | | | | |--34| |--92--- S. huilensis
| | | | | | | | | | | | |
| | | | | | | | | | | | |--34| |--92--- Lumbrera_form
| | | | | | | | | | | | |
| | | | | | | | | | | | |--9--- S. querejazus

```

FIGURE 118. Reduced strict consensus tree with Jackknife GC frequencies (Goloboff et al. 2003) on a majority rule consensus tree. Support values obtained ignoring the alternative positions of Pehuenchesuchus, Fakhwehshi, Coringsuchus, and Labidiosuchus from the trees obtained in the jackknife pseudoreplicates.

```

|-- Gracilisuchus
|
|-- DIBOTHROSUCHUS
|
|--84--- Terrestriusuchus
|
|-- Fruitchampsia
|
|-- Zosuchus
|
|-- Orthosuchus
|--|
|--|   |-- Gebiosuchus
|--|   |--99--- Zarasuchus
|--|   |-- KayentaForm
|--|   |--77--- Edentosuchus
|--|   |-- Shantungosuchus
|--97---|   |-- Sichuanosuchus_buidongensis
|--|   |-- Sichuanosuchus_shuhanensis
|
|--93---|   |-- Hemiprotochus
|--|   |-- Protosuchus_haughtoni
|--|   |--91--- Protosuchus_richardsoni
|--|   |-- Hisosuchus_chungkingensis
|--|   |--94--- Hisosuchus_chowi
|
|--|   |--|   |-- Pholidosaurus
|--|   |--|   |-- Terminonaris
|--98---|   |--|   |--80--- Sarcosuchus
|--|   |--|   |--54--- Sokotosuchus
|--|   |--|   |--95--- Hyposaurus
|--|   |--|   |--57--- Dyrosaurus
|--|   |--|   |-- Rhabdognathus
|--|   |--|   |--73--- Stenosauros_bollensis
|--|   |--|   |-- Pelagosaurus
|--|   |--|   |--100--- M_casamequiel
|--|   |--|   |-- M_superciliosus
|--|   |--|   |--99--- D_andiniensis
|--|   |--|   |--96--- D_maximus
|--|   |--|   |--68--- C_suevicus
|--|   |--|   |--77--- C_atracaniensis
|
|--|   |--|   |--85--- Therapsuchus
|--78---|   |--|   |-- Sunosuchus
|--|   |--|   |-- Calsoyasuchus
|--|   |--|   |--61--- Eutretauranosuchus
|--|   |--|   |-- Goniopholis_stovalli
|--|   |--|   |-- Goniopholis_simus
|--|   |--|   |--55--- Glen_Rose_Form
|--|   |--|   |-- Bernissartia
|--|   |--|   |-- Rugosuchus
|--|   |--|   |--54--- Shamosuchus
|--|   |--|   |-- Crocodylus
|--|   |--|   |--54--- Asiatosuchus_germanicus
|--|   |--|   |-- Leidyosuchus_canadensis
|--|   |--|   |-- Pristichampsus_vorax
|--|   |--|   |-- Borealosuchus
|--|   |--|   |--67--- Hylaeochampsia
|--|   |--|   |-- Alligator
|--|   |--|   |--57--- Diplocynodon_hantoniensis
|--|   |--|   |-- Argosuchus
|--|   |--|   |--92--- Gavisalis
|--68---|   |--78--- Eothoracosaurus_mississippiensis
|
|-- Stelokrosuchus
|-- Fakhwehshi
|-- Lumbrea_Form
|-- Lotosuchus
|-- Ayllusuchus
|-- S_quezelsanus
|-- S_lcaeorhinus
|-- S_hullensis
|-- Batinasuchus
|-- Bretesuchus
|-- Cynodontosuchus
|-- Stratiotosuchus
|-- Pissarrachampsia
|-- Campinasuchus
|-- Comahuesuchus
|-- Chimeraosuchus
|-- Simosuchus
|-- Libyosuchus
|-- Candidodon
|-- Iberosuchus
|--64--- Bergisuchus
|--53---|   |-- Pakasuchus
|--|   |--83--- Malawisuchus
|--|   |-- B_albertoi
|--56---|   |-- B_salgadoensis
|--|   |--62--- B_pachecoi
|--|   |-- Kaprosuchus
|--|   |--99--- Mahajangasuchus
|--|   |-- Hamadasuchus
|--57---|   |-- Gasparinisuchus
|--|   |--59--- Lomasuchus
|--|   |--87--- Uberabassuchus
|--|   |-- Montealtosuchus
|--|   |-- Anatosuchus
|--|   |-- A_langatangana
|--|   |-- A_wegeneri
|--61---|   |-- A_buitrerensis
|--|   |-- A_patagonicus
|--|   |--51--- A_gomesii
|--|   |-- Ucuguayasuchus
|--|   |-- Morrinosuchus
|--|   |-- Notosuchus
|--80---|   |-- Marllisuchus
|--|   |--|   |-- Xdamantinasuchus
|--97---|   |--64--- Yacarerani
|--|   |--|   |-- MSZP_PV_139
|--81---|   |--77--- Calpirasuchus_paulistanus
|--|   |--|   |--75--- Calpirasuchus_montealtensis
|--78---|   |-- S_huenei
|--93---|   |-- Armadillosuchus
|--62---|   |-- Caryonosuchus

```

FIGURE 128. Reduced strict consensus tree with Jackknife GC frequencies (Goloboff et al. 2003). Support values obtained ignoring the alternative positions of Pehuenchesuchus, Fakhwehshi, Coringsuchus, and Labidiosuchus from the trees obtained in the jackknife pseudoreplicates.

```

|-- Gracilisuchus
|
|-- DIBOTHROSUCHUS
|
|--83--- Terrestriusuchus
|
|-- Orthosuchus
|--|
|--|   |-- KayentaForm

```

```

|--12| |--60--- Edentosuchus
|--32| |-- Hemiprotosuchus
|--97| |--91--- Protosuchus_haughtoni
|--91--- Protosuchus_richardsoni
|-- Gobiosuchus
|--99--- Zarasuchus
|--98| |-- Fruitachampsia
|--11| |-- Zosuchus
|--18| |-- Shantungosuchus
|--77| |-- Sichuanosuchus_huidongensis
|--7--- Sichuanosuchus_shuhanensis
|--32| |-- Hsiaoosuchus_chungkingensis
|--93--- Hsiaoosuchus_chow
|-- Pholidosaurus
|-- Terminusaris
|--73| |--92--- Sarcosuchus
|--40| |-- Sokotosuchus
|--33| |-- Hyposaurus
|--83| |-- Dyrosaurus
|--57--- Dyrosaurus
|--59| |-- Stenosaurs_rhobdogmathus
|-- Pelagosaurus
|--100| |-- M_superciliosus
|--19| |-- M_canaqueualai
|--99| |-- D_andiniensis
|--10| |-- D_maximus
|--55| |-- C_suevicus
|--56--- C_araucaniensis
|--75| |--74| |-- Alligatorium
|--79--- Theriosuchus
|-- Goniopholis_simus
|--57| |-- Sinosuchus
|--41| |--57| |-- Caisoyasuchus
|--32| |-- Eutretraurososuchus
|--18--- Goniopholis_stovalli
|--16| |-- Glen Rose Form
|-- Bernissartia
|--45---30--- Rugosuchus
|--45---30--- Shamosuchus
|-- Hylaeochampsia
|--57| |-- Pristichampsia_vorax
|--57| |-- Asiatosuchus_germanicus
|-- Leidyosuchus_canadensis
|--26| |-- Borealosuchus
|--64---91| |-- Argochampsia
|--77--- Eochoacrossaurus_mississippiensis
|-- Crocodylus
|--5| |-- Alligator
|--42--- Diplocynodon_hantoniensis
|-- Stolokrosuchus
|-- Kaptrosuchus
|--59--- Mahajangasuchus
|--51| |-- Hamadasuchus
|--41| |-- Montealtosuchus
|--86| |-- Gasparsinosuchus
|--14--- Lomasuchus
|--34| |--12| |-- Uberabasuchus
|-- A_wegeneri
|-- Anatosuchus
|--56---1--- A_tsangatsangana
|-- A_bultresensis
|--31| |-- A_gomeali
|--35| |-- A_patagonicus
|--13| |--30--- Triguaysuchus
|-- Libycosuchus
|-- Candidodon
|-- Simosuchus
|-- Pakasuchus
|--83--- Malawisuchus
|--17| |-- Chimaerasuchus
|-- Comahuasuchus
|-- Morrhosuchus
|--30| |--8--- Notosuchus
|--2| |-- Marillasuchus
|--70| |-- Adamantinaosuchus
|--96| |--49--- Yacarerani
|--72| |--69| |-- M22_PV_139
|--70--- Caipirasuchus_paulistanus
|--4| |--72| |-- S_huenei
|--93| |-- Amadilloosuchus
|--59--- Caryonosuchus
|-- Pabhehahi
|-- Oydontosuchus
|--25| |-- Pissarrachampsia
|--26| |-- Campinasuchus
|--19| |-- Strotiosuchus
|--17| |-- B_albertoi
|--25| |-- B_salgadoensis
|--61--- B_pachecoi
|-- Lorosuchus
|-- Iberosuchus
|--12| |--60--- Bergisuchus
|-- Barinasuchus
|--6| |-- Ayllusuchus
|--11| |--43--- Bretesuchus
|-- S_icaeorhinus
|--3| |-- S_huilensis
|--36| |-- Lumbraera_form
|--10--- S_querejazus

```

List of synapomorphies

The following list is the complete set of unambiguous synapomorphies of the 38880 MPTs obtained in the phylogenetic analysis conducted in TNT. Node numbers refer to the enumeration of nodes of the strict consensus shown above (Fig. 2S).

Gracilisuchus :

All trees:

No autapomorphies:

Terrestrisuchus :

All trees:

No autapomorphies:

Dibothrosuchus :

All trees:

Char. 15: 0 --> 1

Char. 79: 0 --> 1

Char. 90: 0 --> 2

Protosuchus_richardsoni :

All trees:

Char. 165: 1 --> 0

Protosuchus_haughtoni :

All trees:

Char. 206: 1 --> 0

Char. 280: 0 --> 1

Hemiprotosuchus :

All trees:

Char. 33: 0 --> 1

Orthosuchus :

All trees:

Char. 2: 0 --> 1

Char. 11: 0 --> 1

Char. 105: 1 --> 2

Char. 108: 0 --> 4

Char. 131: 0 --> 1

Char. 142: 1 --> 0

Char. 153: 0 --> 1

Char. 163: 0 --> 1

Char. 212: 0 --> 1

Char. 285: 1 --> 0

Edentosuchus :

All trees:

Char. 67: 1 --> 2

Char. 121: 0 --> 1

Char. 125: 0 --> 1
Char. 130: 0 --> 1
Char. 139: 0 --> 1

KayentaForm :

All trees:
Char. 119: 0 --> 1

Zaraasuchus :

All trees:
Char. 199: 0 --> 1

Gobiosuchus :

All trees:
No autapomorphies:

Sichuanosuchus_shuhanensis :

Some trees:
Char. 22: 0 --> 1
Char. 145: 1 --> 0

Sichuanosuchus_huidongensis :

Some trees:
Char. 263: 0 --> 1

Shantungosuchus :

All trees:
No autapomorphies:

Zosuchus :

All trees:
Char. 32: 0 --> 1
Char. 44: 01 --> 2
Char. 81: 0 --> 1
Char. 106: 1 --> 2
Char. 108: 0 --> 3
Char. 140: 1 --> 0
Char. 160: 0 --> 1
Char. 165: 1 --> 0
Char. 173: 0 --> 1
Char. 193: 1 --> 0
Char. 262: 0 --> 1

Hsisosuchus_chowi :

All trees:
Char. 184: 0 --> 1

Hsisosuchus_chungkingensis :

All trees:
Char. 207: 0 --> 1

Fruitachampsia :

All trees:

Char. 12: 0 --> 1
 Char. 19: 1 --> 0
 Char. 40: 0 --> 1
 Char. 67: 1 --> 2
 Char. 92: 0 --> 1
 Char. 93: 0 --> 1
 Char. 127: 1 --> 0
 Char. 135: 0 --> 1
 Char. 142: 1 --> 0
 Char. 266: 0 --> 1
 Char. 366: 1 --> 0

Uruguaysuchus :

All trees:

Char. 176: 1 --> 0
 Char. 273: 1 --> 0
 Char. 278: 0 --> 1
 Char. 279: 0 --> 1

Some trees:

Char. 56: 0 --> 1
 Char. 167: 1 --> 0

Candidodon :

All trees:

Char. 108: 0 --> 1
 Char. 120: 1 --> 0
 Char. 128: 1 --> 0
 Char. 140: 1 --> 0
 Char. 149: 0 --> 1
 Char. 390: 0 --> 1
 Char. 400: 0 --> 1

Libycosuchus :

All trees:

Char. 76: 0 --> 1
 Char. 192: 1 --> 0
 Char. 212: 0 --> 1

Simosuchus :

All trees:

Char. 3: 1 --> 3
 Char. 5: 0 --> 1
 Char. 10: 2 --> 0
 Char. 16: 1 --> 0
 Char. 17: 1 --> 0
 Char. 19: 0 --> 1
 Char. 37: 2 --> 1
 Char. 78: 1 --> 0
 Char. 95: 1 --> 2

Char. 97: 0 --> 1
 Char. 102: 1 --> 0
 Char. 103: 1 --> 2
 Char. 126: 0 --> 2
 Char. 128: 1 --> 2
 Char. 133: 0 --> 1
 Char. 143: 1 --> 2
 Char. 149: 0 --> 2
 Char. 150: 1 --> 0
 Char. 154: 0 --> 2
 Char. 176: 1 --> 0
 Char. 191: 0 --> 1
 Char. 202: 0 --> 1
 Char. 210: 0 --> 1
 Char. 219: 0 --> 1
 Char. 240: 0 --> 1
 Char. 258: 0 --> 1
 Char. 342: 0 --> 1
 Char. 353: 0 --> 1
 Char. 354: 0 --> 1
 Char. 365: 0 --> 1
 Char. 383: 0 --> 1
 Char. 411: 0 --> 1

Malawisuchus :

All trees:

Char. 108: 3 --> 1
 Char. 140: 1 --> 0
 Char. 278: 0 --> 1

Pakasuchus :

All trees:

Char. 11: 0 --> 1
 Char. 67: 1 --> 2
 Char. 80: 0 --> 1
 Char. 90: 2 --> 1
 Char. 105: 2 --> 1
 Char. 167: 0 --> 1

Chimaerasuchus :

All trees:

Char. 11: 0 --> 1
 Char. 70: 1 --> 0
 Char. 84: 1 --> 0
 Char. 101: 0 --> 1
 Char. 106: 1 --> 3
 Char. 108: 3 --> 4
 Char. 124: 0 --> 1
 Char. 140: 1 --> 0
 Char. 152: 1 --> 0
 Char. 219: 0 --> 12

Char. 305: 1 --> 0
 Char. 385: 0 --> 1
 Char. 388: 0 --> 2
 Char. 391: 0 --> 1

Notosuchus :

All trees:

Char. 12: 0 --> 1
 Char. 106: 1 --> 0
 Char. 136: 0 --> 1
 Char. 142: 0 --> 1
 Char. 180: 0 --> 1

Comahuesuchus :

All trees:

Char. 119: 1 --> 0
 Char. 126: 0 --> 2
 Char. 127: 1 --> 0
 Char. 167: 0 --> 2
 Char. 183: 0 --> 1
 Char. 230: 0 --> 1
 Char. 231: 0 --> 1
 Char. 262: 0 --> 1

Mariliasuchus :

All trees:

Char. 29: 1 --> 0
 Char. 98: 0 --> 2
 Char. 108: 2 --> 3
 Char. 167: 0 --> 12
 Char. 229: 0 --> 1
 Char. 293: 0 --> 1

Labidiosuchus :

All trees:

No autapomorphies:

Caryonosuchus :

All trees:

No autapomorphies:

S. _huenei :

All trees:

No autapomorphies:

Armadillosuchus :

All trees:

No autapomorphies:

Caipirasuchus.stenognathus :

All trees:

Char. 229: 0 --> 1

Char. 400: 0 --> 1

Caipirasuchus.montealtensis :

All trees:

Char. 293: 0 --> 1

Caipirasuchus.paulistanus :

All trees:

Char. 278: 0 --> 1

Char. 407: 1 --> 0

Yacarerani :

All trees:

Char. 22: 1 --> 0

Char. 29: 1 --> 0

Adamantinasuchus :

All trees:

Char. 122: 1 --> 0

Char. 216: 0 --> 1

Char. 229: 0 --> 1

Char. 366: 0 --> 1

Morrinhosuchus :

All trees:

No autapomorphies:

Campinasuchus :

All trees:

Char. 66: 1 --> 0

Char. 155: 0 --> 1

Char. 185: 0 --> 1

Char. 193: 0 --> 1

Char. 257: 1 --> 0

Char. 284: 1 --> 0

Pissarrachampsa :

All trees:

Char. 108: 3 --> 4

Char. 165: 1 --> 0

Char. 193: 0 --> 1

Char. 237: 0 --> 1

B._albertoi :

All trees:

No autapomorphies:

B._pachecoi :

All trees:

Char. 74: 0 --> 1

B._salgadoensis :

All trees:

No autapomorphies:

Stratiotosuchus :

All trees:

Char. 145: 0 --> 1

Char. 214: 0 --> 1

Char. 357: 1 --> 0

Cynodontosuchus :

All trees:

No autapomorphies:

Bergisuchus :

All trees:

No autapomorphies:

Iberosuchus :

All trees:

No autapomorphies:

Bretesuchus :

All trees:

Char. 227: 0 --> 1

Barinasuchus :

All trees:

No autapomorphies:

S._huilensis :

All trees:

No autapomorphies:

S._icaeorhinus :

Some trees:

Char. 396: 0 --> 1

Char. 407: 0 --> 1

S._querejazus :

Some trees:

Char. 42: 1 --> 0

Char. 69: 0 --> 1

Char. 179: 1 --> 0

Ayllusuchus :

All trees:

No autapomorphies:

Lorosuchus :

All trees:

Char. 3: 0 --> 3
 Char. 5: 0 --> 1
 Char. 6: 0 --> 2
 Char. 9: 2 --> 1
 Char. 25: 1 --> 0
 Char. 42: 1 --> 0
 Char. 66: 1 --> 0
 Char. 77: 1 --> 2
 Char. 103: 2 --> 3
 Char. 120: 0 --> 1
 Char. 160: 0 --> 1
 Char. 266: 0 --> 1
 Char. 368: 1 --> 2
 Char. 399: 1 --> 0

Lumbrera_form :

Some trees:

Char. 121: 0 --> 1

A._gomesii :

All trees:

Char. 186: 1 --> 0

Some trees:

Char. 123: 1 --> 0
 Char. 167: 1 --> 2

A._patagonicus :

All trees:

No autapomorphies:

A._buitreraensis :

All trees:

Char. 23: 1 --> 0
 Char. 165: 0 --> 1
 Char. 198: 0 --> 1
 Char. 293: 0 --> 1

A._wegeneri :

All trees:

Char. 212: 0 --> 1
 Char. 226: 0 --> 1
 Char. 265: 1 --> 0

Some trees:

Char. 22: 0 --> 1
 Char. 120: 1 --> 0

A._tsangatsangana :

All trees:

Char. 141: 0 --> 1
 Char. 198: 0 --> 1

Char. 368: 1 --> 2
 Some trees:
 Char. 65: 3 --> 2
 Char. 174: 0 --> 1

Anatosuchus :

All trees:
 Char. 3: 1 --> 3
 Char. 128: 1 --> 0
 Char. 140: 1 --> 0
 Char. 185: 0 --> 1
 Char. 235: 0 --> 1
 Char. 240: 0 --> 1
 Some trees:
 Char. 22: 0 --> 1
 Char. 171: 1 --> 0
 Char. 186: 1 --> 0
 Char. 407: 0 --> 1

Montealtosuchus :

Some trees:
 Char. 23: 1 --> 0
 Char. 31: 0 --> 1
 Char. 135: 0 --> 1
 Char. 155: 0 --> 1

Uberabasuchus :

Some trees:
 Char. 74: 0 --> 1
 Char. 102: 1 --> 0
 Char. 105: 1 --> 2

Lomasuchus :

All trees:
 No autapomorphies:

Gasparinisuchus :

Some trees:
 Char. 73: 0 --> 1

Hamadasuchus :

All trees:
 Char. 36: 2 --> 1
 Char. 78: 0 --> 1
 Char. 79: 1 --> 2
 Char. 106: 0 --> 1
 Char. 126: 0 --> 1
 Char. 130: 0 --> 1
 Char. 348: 0 --> 1
 Char. 400: 0 --> 1
 Char. 409: 0 --> 1

Mahajangasuchus :

All trees:

Char. 9: 12 --> 0
 Char. 18: 0 --> 1
 Char. 74: 0 --> 1
 Char. 141: 0 --> 1
 Char. 181: 0 --> 1
 Char. 266: 0 --> 1
 Char. 286: 1 --> 0
 Char. 377: 1 --> 0
 Char. 401: 0 --> 1

Some trees:

Char. 155: 1 --> 0

Kapatosuchus :

All trees:

Char. 22: 0 --> 1
 Char. 70: 1 --> 0
 Char. 78: 0 --> 1
 Char. 79: 1 --> 2
 Char. 200: 0 --> 1
 Char. 209: 0 --> 1
 Char. 271: 0 --> 1

Stolokrosuchus :

All trees:

Char. 7: 1 --> 0
 Char. 29: 1 --> 0
 Char. 36: 2 --> 1
 Char. 105: 1 --> 0
 Char. 124: 0 --> 1
 Char. 130: 0 --> 1
 Char. 147: 0 --> 1
 Char. 148: 0 --> 1
 Char. 160: 0 --> 1
 Char. 161: 0 --> 1
 Char. 170: 0 --> 1
 Char. 184: 0 --> 1
 Char. 186: 1 --> 0
 Char. 246: 0 --> 1
 Char. 283: 0 --> 1
 Char. 285: 1 --> 0
 Char. 295: 1 --> 2
 Char. 369: 1 --> 0
 Char. 386: 0 --> 1
 Char. 409: 0 --> 1

Theriosuchus :

All trees:

Char. 12: 0 --> 1

Char. 22: 0 --> 1

Alligatorium :

All trees:

No autapomorphies:

Goniopholis_simus :

All trees:

Char. 385: 0 --> 1

Char. 386: 0 --> 1

Goniopholis_stovalli :

All trees:

Char. 106: 0 --> 1

Eutretauranosuchus :

Some trees:

Char. 295: 0 --> 1

Calsoyasuchus :

All trees:

Char. 23: 0 --> 2

Char. 67: 2 --> 1

Sunosuchus :

All trees:

Char. 11: 0 --> 1

Char. 268: 0 --> 1

Some trees:

Char. 37: 1 --> 2

Shamosuchus :

All trees:

Char. 11: 0 --> 1

Char. 79: 2 --> 1

Char. 122: 1 --> 0

Char. 184: 1 --> 0

Char. 220: 0 --> 1

Char. 277: 0 --> 1

Bernissartia :

All trees:

Char. 264: 0 --> 1

Char. 280: 0 --> 1

Hylaeochampsa :

All trees:

Char. 1: 2 --> 0

Char. 11: 0 --> 1

Char. 184: 1 --> 2

Glen_Rose_Form :

All trees:

Char. 6: 2 --> 0
 Char. 31: 0 --> 1
 Char. 66: 1 --> 0
 Char. 80: 0 --> 1
 Char. 184: 1 --> 0
 Char. 219: 0 --> 2
 Char. 262: 0 --> 2
 Char. 276: 0 --> 1
 Char. 396: 0 --> 1

Borealosuchus :

All trees:

Char. 13: 0 --> 1
 Char. 50: 0 --> 1
 Char. 89: 0 --> 1

Pristichampsus_vorax :

All trees:

Char. 3: 3 --> 0
 Char. 64: 0 --> 1
 Char. 120: 1 --> 0
 Char. 140: 0 --> 1
 Char. 147: 1 --> 0
 Char. 160: 1 --> 0
 Char. 181: 0 --> 1

Eothoracosaurus_mississippiensi :

All trees:

Char. 23: 1 --> 0

Some trees:

Char. 101: 0 --> 1

Gavialis :

All trees:

Char. 2: 0 --> 1
 Char. 9: 1 --> 0
 Char. 14: 0 --> 1
 Char. 256: 0 --> 1
 Char. 266: 0 --> 1
 Char. 280: 0 --> 1

Leidyosuchus_canadensis :

All trees:

Char. 23: 1 --> 0
 Char. 50: 0 --> 1

Asiatosuchus_germanicus :

Some trees:

Char. 117: 0 --> 1

Crocodylus :

Some trees:

- Char. 23: 1 --> 2
- Char. 77: 2 --> 0
- Char. 126: 1 --> 2
- Char. 379: 0 --> 1

Diplocynodon_hantoniensis :

Some trees:

- Char. 13: 0 --> 1
- Char. 82: 2 --> 1

Alligator :

All trees:

- Char. 9: 1 --> 0
- Char. 66: 1 --> 0
- Char. 69: 0 --> 2
- Char. 89: 0 --> 1
- Char. 144: 0 --> 1
- Char. 266: 0 --> 1

Some trees:

- Char. 23: 1 --> 2
- Char. 100: 1 --> 0

Pelagosaurus :

All trees:

- Char. 20: 0 --> 1
- Char. 25: 1 --> 0
- Char. 59: 1 --> 0

Steneosaurus_bollensis :

All trees:

- Char. 209: 0 --> 1

M._superciliosus :

All trees:

- Char. 362: 0 --> 1

Some trees:

- Char. 244: 1 --> 0

M._casamequelai :

All trees:

- Char. 44: 0 --> 1

Some trees:

- Char. 242: 0 --> 1

C._araucaniensis :

All trees:

No autapomorphies:

C._suevicus :

All trees:

No autapomorphies:

D._maximus :

All trees:

No autapomorphies:

D._andiniensis :

All trees:

No autapomorphies:

Rhabdognathus :

Some trees:

Char. 264: 1 --> 0

Sokotosuchus :

All trees:

Char. 9: 0 --> 1

Char. 79: 0 --> 1

Char. 178: 0 --> 1

Dyrosaurus :

Some trees:

Char. 167: 2 --> 0

Hyposaurus :

All trees:

No autapomorphies:

Pholidosaurus :

All trees:

Char. 2: 0 --> 1

Sarcosuchus :

All trees:

Char. 3: 2 --> 3

Char. 80: 0 --> 1

Char. 100: 1 --> 0

Char. 278: 0 --> 1

Char. 386: 1 --> 0

Terminonaris :

All trees:

No autapomorphies:

Rugosuchus :

All trees:

Char. 128: 1 --> 0

Char. 257: 0 --> 1

Char. 280: 0 --> 1

Char. 386: 0 --> 1

Argochampsia :

All trees:

Char. 25: 1 --> 0
Char. 36: 0 --> 1
Char. 68: 1 --> 0
Char. 183: 1 --> 0
Char. 234: 1 --> 0
Char. 257: 0 --> 1

Node 110 :

All trees:

Char. 33: 0 --> 1
Char. 128: 1 --> 0

Node 111 :

All trees:

No synapomorphies

Node 112 :

All trees:

Char. 17: 0 --> 1
Char. 135: 0 --> 1
Char. 212: 0 --> 1

Node 113 :

All trees:

Char. 2: 0 --> 1
Char. 58: 0 --> 1
Char. 100: 0 --> 1
Char. 216: 0 --> 1

Node 114 :

All trees:

Char. 50: 0 --> 1
Char. 73: 1 --> 2
Char. 74: 0 --> 1
Char. 91: 0 --> 234
Char. 103: 3 --> 0

Node 115 :

All trees:

Char. 1: 0 --> 2
Char. 16: 0 --> 1
Char. 19: 0 --> 1
Char. 24: 0 --> 1
Char. 30: 0 --> 1
Char. 45: 0 --> 2
Char. 47: 0 --> 1
Char. 51: 0 --> 1

Char. 55: 0 --> 1
Char. 67: 0 --> 1
Char. 68: 0 --> 1
Char. 78: 0 --> 1
Char. 82: 0 --> 1
Char. 95: 0 --> 1
Char. 99: 0 --> 1
Char. 122: 1 --> 0
Char. 196: 0 --> 1
Char. 197: 0 --> 2
Char. 204: 0 --> 1
Char. 205: 0 --> 1
Char. 252: 0 --> 1
Char. 329: 0 --> 1

Node 116 :

All trees:

Char. 117: 0 --> 1
Char. 134: 1 --> 0
Char. 139: 0 --> 1
Char. 324: 0 --> 1

Node 117 :

All trees:

Char. 39: 0 --> 1
Char. 108: 0 --> 2
Char. 160: 0 --> 1
Char. 162: 0 --> 1
Char. 188: 0 --> 1
Char. 195: 0 --> 1
Char. 210: 0 --> 1
Char. 390: 0 --> 1

Node 118 :

All trees:

Char. 1: 2 --> 1
Char. 32: 0 --> 1
Char. 75: 0 --> 1
Char. 97: 0 --> 1
Char. 206: 1 --> 0
Char. 214: 0 --> 1
Char. 215: 0 --> 1
Char. 216: 0 --> 1
Char. 217: 0 --> 1
Char. 219: 0 --> 1
Char. 220: 0 --> 1
Char. 221: 0 --> 1
Char. 222: 0 --> 1
Char. 223: 0 --> 1
Char. 224: 0 --> 1

Node 119 :

All trees:

Char. 36: 0 --> 2
Char. 49: 0 --> 2
Char. 85: 0 --> 1
Char. 100: 0 --> 1
Char. 107: 1 --> 0
Char. 164: 0 --> 1
Char. 269: 0 --> 1

Node 120 :

All trees:

Char. 37: 2 --> 1
Char. 202: 0 --> 1
Char. 219: 0 --> 1

Some trees:

Char. 78: 1 --> 0
Char. 138: 0 --> 1
Char. 164: 1 --> 0
Char. 206: 1 --> 0
Char. 216: 0 --> 1
Char. 220: 0 --> 1

Node 121 :

All trees:

Char. 201: 0 --> 1
Char. 211: 0 --> 1

Node 122 :

All trees:

Char. 31: 0 --> 1

Node 123 :

All trees:

Char. 37: 0 --> 2
Char. 39: 0 --> 1
Char. 41: 0 --> 1
Char. 79: 0 --> 1
Char. 103: 3 --> 0
Char. 125: 0 --> 1
Char. 150: 0 --> 1
Char. 192: 0 --> 1

Node 124 :

All trees:

Char. 16: 1 --> 0
Char. 37: 2 --> 1
Char. 102: 1 --> 0
Char. 107: 0 --> 1
Char. 128: 1 --> 0

Node 125 :

All trees:

Char. 17: 0 --> 1
Char. 46: 0 --> 1
Char. 73: 1 --> 0
Char. 77: 0 --> 2
Char. 78: 1 --> 0
Char. 119: 0 --> 1
Char. 122: 0 --> 1
Char. 148: 1 --> 0
Char. 168: 0 --> 1
Char. 203: 1 --> 0
Char. 234: 0 --> 1
Char. 375: 0 --> 1

Node 126 :

All trees:

Char. 183: 1 --> 0
Char. 193: 0 --> 1

Node 127 :

All trees:

Char. 31: 0 --> 1
Char. 225: 2 --> 1

Node 128 :

All trees:

Char. 191: 0 --> 1
Char. 271: 0 --> 1

Node 129 :

All trees:

Char. 27: 0 --> 1
Char. 76: 0 --> 1
Char. 143: 1 --> 2
Char. 145: 1 --> 0
Char. 149: 0 --> 1
Char. 187: 0 --> 1
Char. 197: 0 --> 1
Char. 209: 0 --> 1

Some trees:

Char. 159: 0 --> 1
Char. 400: 0 --> 1

Node 130 :

All trees:

Char. 26: 0 --> 1
Char. 273: 0 --> 1
Char. 284: 0 --> 1
Char. 295: 0 --> 1
Char. 307: 0 --> 1

Char. 338: 0 --> 1

Node 131 :

All trees:

Char. 23: 0 --> 1
Char. 70: 0 --> 1
Char. 90: 0 --> 1
Char. 152: 0 --> 1
Char. 157: 0 --> 1
Char. 165: 1 --> 0
Char. 171: 0 --> 1
Char. 186: 0 --> 1
Char. 272: 0 --> 1
Char. 296: 0 --> 1
Char. 299: 0 --> 1
Char. 302: 0 --> 1
Char. 303: 0 --> 1
Char. 305: 0 --> 1
Char. 314: 0 --> 1
Char. 326: 0 --> 1
Char. 327: 0 --> 1
Char. 328: 0 --> 1
Char. 343: 1 --> 2
Char. 356: 1 --> 2
Char. 368: 0 --> 1
Char. 369: 0 --> 1
Char. 379: 0 --> 1

Node 132 :

All trees:

Char. 10: 0 --> 2
Char. 15: 0 --> 1
Char. 19: 1 --> 0
Char. 45: 2 --> 1
Char. 71: 0 --> 1
Char. 83: 0 --> 1
Char. 199: 0 --> 1

Node 133 :

All trees:

Char. 78: 0 --> 1
Char. 103: 0 --> 1
Char. 170: 0 --> 1
Char. 226: 0 --> 1

Some trees:

Char. 135: 0 --> 1

Node 134 :

All trees:

Char. 79: 1 --> 0
Char. 105: 1 --> 2

Char. 107: 0 --> 1

Node 135 :

All trees:

Char. 1: 2 --> 1

Char. 74: 0 --> 1

Char. 187: 0 --> 1

Char. 376: 0 --> 1

Node 136 :

All trees:

Char. 79: 0 --> 1

Char. 122: 1 --> 0

Char. 186: 1 --> 0

Char. 195: 0 --> 1

Char. 349: 0 --> 1

Char. 390: 0 --> 1

Node 137 :

All trees:

Char. 106: 0 --> 1

Char. 108: 0 --> 3

Char. 141: 0 --> 1

Char. 145: 1 --> 0

Char. 168: 1 --> 0

Some trees:

Char. 69: 2 --> 1

Node 138 :

All trees:

Char. 154: 0 --> 1

Char. 164: 1 --> 0

Char. 226: 1 --> 2

Node 139 :

All trees:

Char. 42: 0 --> 1

Char. 77: 2 --> 1

Char. 120: 1 --> 2

Char. 149: 0 --> 1

Char. 232: 0 --> 1

Char. 279: 0 --> 1

Char. 292: 0 --> 1

Char. 311: 0 --> 1

Char. 355: 0 --> 1

Some trees:

Char. 162: 1 --> 0

Node 140 :

All trees:

Char. 137: 0 --> 1

Node 141 :

All trees:

Char. 108: 3 --> 2
Char. 127: 1 --> 0
Char. 363: 0 --> 1
Char. 381: 0 --> 1

Node 142 :

All trees:

Char. 67: 1 --> 2
Char. 79: 0 --> 1
Char. 120: 2 --> 0
Char. 131: 0 --> 1
Char. 159: 0 --> 2
Char. 284: 0 --> 1

Node 143 :

All trees:

Char. 262: 0 --> 1
Char. 367: 0 --> 1
Char. 392: 0 --> 1

Some trees:

Char. 31: 0 --> 1
Char. 55: 0 --> 1
Char. 67: 1 --> 2
Char. 119: 1 --> 0
Char. 195: 0 --> 1
Char. 264: 1 --> 0
Char. 350: 0 --> 1
Char. 352: 0 --> 1
Char. 353: 0 --> 1
Char. 354: 0 --> 1
Char. 370: 0 --> 1
Char. 378: 0 --> 1

Node 144 :

All trees:

Char. 135: 1 --> 0

Node 145 :

All trees:

Char. 106: 1 --> 3
Char. 112: 1 --> 0
Char. 124: 0 --> 1
Char. 143: 1 --> 0
Char. 145: 0 --> 1
Char. 164: 1 --> 0
Char. 357: 1 --> 2
Char. 381: 1 --> 0

Node 146 :

All trees:

Char. 127: 0 --> 1
Char. 262: 1 --> 0
Char. 360: 1 --> 0
Char. 399: 0 --> 1

Node 147 :

All trees:

Char. 393: 0 --> 1

Some trees:

Char. 148: 0 --> 1
Char. 295: 0 --> 1
Char. 365: 0 --> 1
Char. 389: 0 --> 1
Char. 397: 0 --> 1
Char. 411: 0 --> 1

Node 148 :

All trees:

Char. 67: 2 --> 1
Char. 351: 0 --> 1

Node 149 :

All trees:

Char. 225: 2 --> 1
Char. 353: 1 --> 0

Node 150 :

All trees:

Char. 386: 1 --> 0
Char. 391: 0 --> 1

Node 151 :

All trees:

Char. 9: 2 --> 3
Char. 138: 0 --> 1
Char. 227: 0 --> 1

Node 152 :

All trees:

Char. 354: 0 --> 1

Node 153 :

All trees:

Char. 362: 0 --> 1
Char. 402: 0 --> 1
Char. 405: 0 --> 1

Node 154 :

All trees:

Char. 129: 0 --> 1
Char. 361: 0 --> 1
Char. 406: 0 --> 1
Char. 410: 0 --> 1

Node 155 :

All trees:

Char. 9: 01 --> 2
Char. 80: 0 --> 1
Char. 107: 1 --> 0
Char. 118: 0 --> 1
Char. 130: 0 --> 1
Char. 138: 1 --> 0
Char. 155: 1 --> 0
Char. 168: 0 --> 1
Char. 181: 0 --> 1
Char. 193: 1 --> 0
Char. 268: 0 --> 1
Char. 399: 0 --> 1

Node 156 :

All trees:

Char. 411: 0 --> 1

Node 157 :

All trees:

Char. 399: 1 --> 0

Node 158 :

All trees:

Char. 67: 2 --> 1
Char. 161: 0 --> 1

Node 159 :

All trees:

Char. 56: 0 --> 1
Char. 108: 3 --> 0
Char. 112: 1 --> 0
Char. 141: 1 --> 0
Char. 149: 1 --> 0
Char. 157: 1 --> 0
Char. 179: 0 --> 1
Char. 186: 1 --> 0
Char. 192: 1 --> 0
Char. 212: 0 --> 1
Char. 316: 0 --> 1
Char. 331: 0 --> 1
Char. 332: 0 --> 1
Char. 335: 0 --> 1
Char. 355: 1 --> 0

Node 160 :

All trees:

Char. 226: 0 --> 2

Char. 285: 1 --> 2

Char. 409: 0 --> 1

Node 161 :

All trees:

Char. 288: 0 --> 1

Node 162 :

All trees:

Char. 69: 1 --> 0

Node 163 :

All trees:

Char. 7: 0 --> 1

Char. 135: 1 --> 0

Char. 142: 0 --> 1

Char. 145: 0 --> 1

Char. 156: 0 --> 1

Char. 226: 2 --> 0

Some trees:

Char. 407: 1 --> 0

Node 164 :

All trees:

Char. 140: 1 --> 2

Some trees:

Char. 9: 2 --> 1

Node 165 :

All trees:

Char. 213: 0 --> 1

Some trees:

Char. 214: 0 --> 1

Char. 283: 0 --> 1

Node 166 :

All trees:

Char. 120: 1 --> 0

Char. 128: 1 --> 0

Char. 171: 1 --> 0

Char. 237: 0 --> 1

Char. 243: 01 --> 2

Char. 396: 0 --> 1

Some trees:

Char. 69: 2 --> 1

Node 167 :

All trees:

Char. 159: 0 --> 3
Char. 359: 0 --> 1

Node 168 :

All trees:

Char. 164: 1 --> 0
Char. 192: 1 --> 0
Char. 212: 0 --> 1
Char. 227: 0 --> 1
Char. 286: 0 --> 1

Some trees:

Char. 56: 0 --> 1

Node 169 :

All trees:

Char. 1: 2 --> 1
Char. 3: 1 --> 3
Char. 5: 0 --> 1
Char. 6: 0 --> 2
Char. 36: 2 --> 4
Char. 43: 0 --> 1
Char. 76: 0 --> 1
Char. 103: 0 --> 2
Char. 105: 1 --> 2
Char. 126: 0 --> 2
Char. 143: 1 --> 2
Char. 154: 0 --> 2
Char. 191: 0 --> 1
Char. 257: 0 --> 1
Char. 294: 0 --> 1
Char. 357: 0 --> 1
Char. 366: 1 --> 2
Char. 398: 0 --> 1
Char. 399: 0 --> 1

Some trees:

Char. 123: 1 --> 0

Node 170 :

All trees:

Char. 17: 1 --> 0
Char. 31: 0 --> 1
Char. 35: 0 --> 1
Char. 83: 1 --> 0
Char. 100: 1 --> 0

Node 171 :

All trees:

Char. 26: 0 --> 1
Char. 81: 0 --> 1
Char. 144: 1 --> 0
Char. 178: 0 --> 1

Char. 183: 0 --> 1
Char. 264: 1 --> 0

Node 172 :

All trees:

Char. 6: 0 --> 12
Char. 36: 2 --> 01
Char. 112: 1 --> 0
Char. 116: 1 --> 0
Char. 147: 0 --> 1
Char. 150: 1 --> 0
Char. 153: 0 --> 1
Char. 160: 0 --> 1
Char. 164: 1 --> 0
Char. 192: 1 --> 0
Char. 212: 0 --> 1
Char. 317: 0 --> 1
Char. 356: 1 --> 0
Char. 358: 0 --> 1

Node 173 :

All trees:

Char. 13: 0 --> 1
Char. 101: 0 --> 1
Char. 161: 0 --> 1
Char. 207: 0 --> 1
Char. 400: 0 --> 1

Node 174 :

All trees:

Char. 56: 0 --> 1
Char. 67: 1 --> 2
Char. 79: 1 --> 2
Char. 105: 1 --> 0
Char. 169: 0 --> 1
Char. 173: 0 --> 1
Char. 278: 0 --> 1

Node 175 :

All trees:

Char. 10: 2 --> 1

Some trees:

Char. 37: 2 --> 1

Node 176 :

All trees:

Char. 79: 2 --> 1

Some trees:

Char. 7: 1 --> 0

Node 177 :

All trees:

Char. 22: 0 --> 1
Char. 59: 1 --> 0
Char. 219: 0 --> 2
Char. 279: 0 --> 1

Node 178 :

All trees:

Char. 90: 0 --> 1
Char. 91: 2 --> 3
Char. 92: 0 --> 1
Char. 165: 1 --> 0

Node 179 :

All trees:

Char. 43: 0 --> 1
Char. 94: 0 --> 1
Char. 96: 2 --> 1
Char. 97: 0 --> 1

Node 180 :

All trees:

Char. 269: 1 --> 0

Node 181 :

All trees:

Char. 43: 1 --> 2
Char. 44: 01 --> 2
Char. 265: 0 --> 1
Char. 278: 1 --> 0

Node 182 :

All trees:

Char. 268: 0 --> 1

Node 183 :

All trees:

Char. 23: 0 --> 1
Char. 260: 0 --> 1

Node 184 :

All trees:

Char. 238: 0 --> 1

Some trees:

Char. 126: 1 --> 2

Node 185 :

All trees:

Char. 3: 3 --> 2
Char. 20: 0 --> 1
Char. 57: 0 --> 1

Char. 178: 1 --> 0
Char. 270: 1 --> 0
Some trees:
Char. 13: 0 --> 1
Char. 79: 2 --> 0
Char. 162: 1 --> 0
Char. 243: 0 --> 1
Char. 267: 1 --> 0
Char. 360: 1 --> 0

Node 186 :
All trees:
Char. 165: 0 --> 1
Some trees:
Char. 82: 1 --> 2
Char. 258: 0 --> 1

Node 187 :
All trees:
Char. 264: 0 --> 1
Some trees:
Char. 278: 0 --> 1
Char. 295: 0 --> 1

Node 188 :
All trees:
Char. 169: 1 --> 0
Char. 279: 0 --> 1
Some trees:
Char. 77: 2 --> 0

Node 189 :
All trees:
Char. 118: 0 --> 1
Char. 248: 0 --> 1

Node 190 :
All trees:
Char. 14: 0 --> 1
Char. 16: 1 --> 2
Char. 17: 1 --> 0
Char. 24: 1 --> 0
Char. 30: 1 --> 0
Char. 33: 0 --> 1
Char. 46: 1 --> 0
Char. 47: 1 --> 0
Char. 49: 2 --> 1
Char. 60: 0 --> 1
Char. 68: 1 --> 0
Char. 84: 1 --> 0
Char. 86: 2 --> 1

Char. 166: 0 --> 1
Char. 175: 0 --> 1
Char. 179: 0 --> 2
Char. 197: 0 --> 1
Char. 206: 1 --> 0
Char. 228: 0 --> 2
Char. 244: 0 --> 1
Char. 249: 0 --> 1
Char. 267: 1 --> 0
Char. 325: 0 --> 1

Node 191 :

All trees:

Char. 13: 0 --> 1
Char. 45: 1 --> 0
Char. 63: 1 --> 0
Char. 77: 2 --> 3
Char. 79: 1 --> 0
Char. 117: 1 --> 0
Char. 295: 0 --> 1
Char. 386: 0 --> 1

Some trees:

Char. 377: 1 --> 0

Node 192 :

All trees:

Char. 75: 0 --> 1
Char. 102: 1 --> 0
Char. 111: 0 --> 1
Char. 172: 1 --> 0
Char. 246: 0 --> 1
Char. 247: 0 --> 1
Char. 250: 0 --> 1
Char. 251: 0 --> 1

Some trees:

Char. 1: 2 --> 0
Char. 106: 1 --> 2

Node 193 :

All trees:

Char. 66: 1 --> 0

Node 194 :

All trees:

Char. 69: 1 --> 0
Char. 254: 0 --> 1

Some trees:

Char. 131: 0 --> 1
Char. 245: 0 --> 1
Char. 386: 1 --> 0

Node 195 :

All trees:

Char. 3: 2 --> 1

Char. 120: 1 --> 0

Char. 140: 0 --> 1

Node 196 :

All trees:

Char. 252: 1 --> 0

Node 197 :

All trees:

Char. 33: 0 --> 1

Char. 64: 0 --> 1

Char. 68: 1 --> 0

Char. 128: 1 --> 0

Char. 257: 0 --> 1

Node 198 :

All trees:

Char. 28: 0 --> 1

Char. 256: 0 --> 1

Node 199 :

All trees:

Char. 43: 0 --> 1

Char. 56: 0 --> 1

Char. 67: 1 --> 2

Char. 238: 0 --> 1

Node 200 :

All trees:

Char. 78: 0 --> 1

Char. 163: 0 --> 1

Char. 239: 0 --> 1

Char. 240: 0 --> 1

Char. 241: 0 --> 1

Char. 265: 0 --> 1

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