**PHYLOGENETIC ANALYSIS**

We performed a non‑time calibrated Bayesian analysis using the Mkv model with the modified and augmented dataset of 377 characters using MrBayes v.3.2.5. The ‘standard’ datatype was used for morphological data, and the coding was set at ‘variable’ (that is, only variable characters being sampled) with rates set to a gamma distribution. Gamma distribution modifies the Mkv substitution model to allow variation in the rates of evolution among characters. The Mkv model analysis was performed with two runs of four chains each for 30 million generations, sampling trees every 500th generation with a 25% burn‑in. We applied a constraint on the analysis to simulate a molecular backbone for squamates, the details of which are provided in the script for the analysis provided in Supplementary Data. The average effective sample size (ESS) for the two parameters (tree length and shape of gamma distribution) were in excess of 27,000, and the average potential scale reduction factor (PSRF) was 1.000, with both chains demonstrating good convergence (average standard deviation of split frequencies 0.0035). We used a maximum clade credibility tree (Fig. 20) (MCC) to summarize the results of our analysis. The MCC tree is a single tree in the posterior sample with the maximum product of posterior clade probabilities across all the constituent bifurcations (Heled and Bouckarert 2013). We used TreeAnnotator v.1.10.4 (Rambaut and Drummond 2016) to generate the MCC by combining the tree files (.t files) of both runs derived from the MrBayes analysis. The 50% majority‑rule tree is also provided in our analysis (halfcompat command in MrBayes) (see Supplementary Data). Optimisation of the state/node distribution of the MCC tree was performed in PAUP v 4.0 for Mackintosh (Swafford 2003) for both delayed transition (deltran) and accelerated transition (acctran).

**Compilation of phylogenetic data**

A modified and augmented the version of the dataset of 347 morphological characters and 129 taxa complied by Simões *et al.* (2018) was used to determine the phylogenetic position of *Marmoretta*. The modifications and additions made to the dataset are summarised as follows:

**Taxon choice**

We revised the scores of many taxa and characters, focusing on the basal saurians including *Megachirella, Sophineta, Palaegama, Gephyrosaurus, Diphydontosaurus, Kuehneosaurus* and *Pamelina*. These changes are detailed below, along with some explanatory notes. Our final analysis includes all taxa included in the analysis of Simoes *et al.* (2018) except for several early reptiles that were not relevant to this analysis of the lepidosaur stem, e.g. *Protorothyris*, *Protocaptorhinus*, *Captorhinus*, *Labidosaurus*, *Araeoscelis gracilis*, *Araeoscelis pricei*, *Hovasaurus* and *Saurosternon*. We retained *Petrolacosaurus, Acerosodontosaurus, Youngina* and *Claudiosaurus* to provide outgroup definition. We omitted the marine reptiles *Parvinatator*, *Gulosaurus*, *Mixosaurus*, *Endennasaurus* and *Xinpusaurus,* thestem turtle *Kayentachelys*, the archosauriform *Erythrosuchus* and the tanystropheid *Macrocnemus bessanii* as we did not have detailed observations of these taxa, and their groups are well represented in the remaining taxa. In respect to crown-group lepidosaurs, only *Homeosaurus* and *Kallimodon* were omitted since we were unable to verify the scores based on the available published data, and the specimens were not personally examined. We also added several taxa: the early lepidosauromorph *Fraxinisaura rozynekae, Chaohusaurus* *chaoxianensis* and *Cartorhynchus lenticarpus* as representative basal ichthyopterygians*,* and *Vallesaurus* *cenensis* as an additional drepanosaur, resulting in a total of 115 operational taxonomic units.

**New, modified and deleted characters**

We added 32 new characters to the original dataset. Of these, 30 are numbered c.348 to c.377 and are detailed below. Two further new characters replaced the original squamosal characters c.51 (Squamosals, posterior process: absent/present) and c.55 (Squamosal, anterior margin, bifid facet for postorbital: absent/present), and the original c.52 has been renumbered as c.51. Therefore, the two new squamosal characters are detailed below as c.52 and c.55. Otherwise all characters are numbered in accordance with the character list of Simões *et al.* (2018). The wording of eight of the original characters has been modified for clarity or to reflect redundant character states. These characters are also detailed below.

New characters:

52. Squamosal, dorsal process, contact with supratemporal or supratemporal process of parietal: sutured (0) / not sutured, forms a buttress for posterolateral corner of the skull roof (1) – NEW

Notes: the loss of sutural contact between the squamosal and the skull roof is a key modification in the transition to squamate streptostyly (Evans 2008). In many squamates the dorsal process of the squamosal is lost (see c.51), and the squamosal is a narrow and curves posteroventrally (‘hockey-stick’ shaped, e.g. scincids, lacertids, gymnophthalmids, anguids and varanids – Evans 2008). In some squamates the dorsal process is retained, but this process abuts the parietal or supratemporal rather than making a sutural contact (e.g. in iguanians and some teiids). This character seeks to differentiate between taxa scored for state (1) in c.51 (dorsal process is present), where there is sutural contact of the dorsal process/skull roof (e.g. in non-lepidosaurian lepidosauromorphs and other diapsids) and crown-group squamates where the contact is not sutured allowing cranial kinesis to occur.

55. Squamosal, anterior process, dorsoventral length: narrow, < one‑quarter of the dorsoventral length of the postorbital region (0) / deep, > one‑third of the dorsoventral length of the postorbital region (1) -– NEW

Notes: Contact between the anterior region of the squamosal and the dorsal process of the jugal occurs in rhynchocephalians and several squamates (see Gauthier et al. 2012 c.154). However, in rhynchocephalians this contact is due to a dorsoventrally deep region of the squamosal, rather than an elongate dorsal process of the jugal. This region, along with the postorbital, forms a thick lower bar of the upper temporal fenestra present in rhynchocephalians. This character seeks to identify this morphology as synapomorphy of rhynchocephalians, which is independently present in several secondarily marine taxa.

348. Skull proportions: preorbital skull length equal to postorbital length (0) / preorbital length exceeds postorbital skull length (1) / postorbital length exceeds preorbital skull length (2) (modified from Gauthier *et al.* 1988 ch.44; Rieppel and de Braga 1997 ch.19, Reisz *et al.* 2010 ch.6, Benson 2012 ch.2, Modesto et al 2015 ch.47, Ford and Benson 2020 ch.1).

Note: In early diapsids, with few exceptions (e.g. rhynchosaurs), the preorbital region of the skull is longer than the postorbital region (state 1). This condition is also found in early lepidosauromorphs (e.g. *Marmoretta, Sophineta* and *Fraxinisaura*) as well as early rhynchocephalians (e.g. *Gephyrosaurus*, *Diphydontosaurus* and *Planocephalosaurus*). However, in derived rhynchocephalians and many squamates the postorbital region is longer than the preorbital (state 2), or both regions are of similar length (state 0).

349. Prefrontal/palatine antorbital contact: absent (0) / narrow forming less than 1/3 the transverse distance between the orbits (1) / contact broad, forming at least 1/2 the distance between the orbits (2) (modified from Laurin and Reisz 1995 ch.6 and 7; Rieppel and deBraga 1997 ch.20, Müller 2004 ch.130, Modesto et al. 2015 ch.12 and 13, Ford and Benson 2020 ch.56 and 57)

Note: In squamates the ventral region of the prefrontal contacts the maxillary process of the palatine, forming either a narrow (state 1) or broad (state 2) medial contact. In early diapsids the contact is either absent (state 0) or, if present, narrow (state 1).

350. Postfrontal contribution to upper temporal fenestra: postfrontal excluded (0) / postfrontal included (1) (from Rieppel and deBraga 1997 ch. 29)

Note: The exclusion of the postfrontal from the upper temporal fenestra in diapsids is considered the plesiomorphic condition. This morphology was present in early diapsids (e.g. *Petrolacosaurus*, *Claudiosaurus* and *Youngina*), in early archosauromorphs (e.g. *Protorosaurus* and *Prolacerta*), in archosauriforms (e.g. *Proterosuchus* and *Euparkeria*) and kuehneosaurs. In *Marmoretta*, *Sophineta* and all lepidosauromorphs where the postfrontal is not fused to the postorbital, the postfrontal participates in the upper temporal opening (state 1).

351. Angular lateral exposure: exposed along 1/3 of the lateral face of the mandible (0) / exposed only as a small sliver along the lateral face (1) (from Rieppel and deBraga 1997 ch.20)

Note: In early diapsids and most archosauriforms the angular has extensive exposure in lateral view (state 0). In *Marmoretta* and many lepidosauromorphs, including all rhynchocephalians, the angular is reduced to a dorsoventrally narrow exposure in the lateral surface of the mandible (state 1). The derived condition was considered a synapomorphy of lepidosauromorphs (Rieppel and deBraga 1997), with convergence in rhynchosaurs (e.g. *Mesosuchus*).

352. Maxilla orbital exposure: absent (0) / present (1) (from Rieppel and deBraga 1997 ch.15)

Note: In many early diapsids, the maxilla is prevented form contributing to the orbital margin (state 0) by contact between the lacrimal and jugal. In kuehneosaurs and non-lepidosaurian lepidosauromorphs, the maxilla contributes to the anteroventral region of the orbit (state 1). The derived state is also present in rhynchocephalians and some squamates, although reversed in some squamate groups (e.g. iguanians and agamids).

353. Maxilla length: extends at least to the posterior orbital margin (0) / does not reach posterior margin of orbit (1) (from Rieppel and deBraga 1997 ch.14, Müller 2004, Ezcurra et al. 2014 c.122, Ford and Benson 2020 ch.41)

Note: An elongate suborbital process of the maxilla is present in basal testudines (e.g. *Eunotosaurus* and *Proganochelys*), some rhynchosaurs and archosauriforms (e.g. *Proterosuchus* and *Euparkeria)*(state 0)*.* In all non-lepidosaur lepidosauromorphs and squamates, with the exception of snakes and some amphisbaenians, the suborbital process of the maxilla is short and does not extend to the posterior margin of the orbit (state 1).

354. Frontal, morphology: parallelogram shaped (0) / hour‑glass shaped (1) (from Rieppel and deBraga 1997 ch.27)

Note: the plesiomorphic state of the paired frontals in amniotes are take the form of a parallelogram when view dorsally (state 0). Mid-length constriction of the frontals resulting in a hourglass shape morphology (state 1) is found in most saurians, with the exception of some rhynchosaurs, snakes and amphisbaenians.

355. Dorsal vertebrae, transverse processes: short no more than the total transverse width of the neural arch (0) / long exceeding the transverse width of the neural arch (1) (modified from Laurin 1991 F.5, Rieppel and deBraga 1997 ch.108, Reisz et al. 2010 ch.75, Benson 2012 ch.158, Ezcurra 2016 ch.358, Ford and Benson 2020 ch.201)

Note: In early diapsids the transverse processes of the dorsal vertebrae are short (state 0) (e.g. *Petrolacosaurus, Youngina, Acerosodontosaurus*). In many archosauromorphs and kuehneosaurs, the transverse processes are elongate (state 1). All lepidosauromorphs possess short transverse processes (state 0).

356. Pterygoid, orientation of transverse flange: directed predominantly laterally or posterolaterally (0) / oriented in an anterolateral direction (1) (modified from Laurin and Reisz 1995 ch.45, Rieppel and deBraga 1997 ch.108, Müller 2004 ch.140, Maddin 2008 ch.37, Benson 2012 ch.118, Pritchard et al. 2015 ch.53, Ford and Benson 2020 ch.137)

Note: All non-lepidosaur lepidosauromorphs and rhynchocephalians share the plesiomorphic condition (state 0), as do most non-lepidosauromorph diapsids, with the exception of *Claudiosaurus*, choristoderans and some marine taxa. Many squamates have an anterolaterally directed transverse flange, including the basal squamates *Huehuecuetzpalli* and *Eichstaettisaurus* (state 1).

357. Humerus, torsion: proximal and distal end are off‑set at an angle of at least 45°(0) / off set is reduced to no more than 20° (1) (Rieppel and deBraga 1997 ch.123)

Note: Primitively, the proximal and distal epiphyses of the humerus are offset by at least 45° in relation to each other (state 0). In some taxa the offset may be as much as 90° (e.g. *Youngina* and *Claudiosaurus*). In many squamates, including early members such as *Ardeosaurus, Eichstaettisaurus* and *Huehuecuetzpalli* the humeral torsion is reduced (state 1). The derived condition is also found in testudines and sauropterygians.

358. Mandible, adductor chamber: small, quadrate does not extend well below level of occipital condyle (0) / enlarged adductor chamber, and quadrate extends well below occipital condyle (1) (from Gauthier *et al.* 1988a ch.17)

Note: In many squamates (with the exception of snakes, dibamids and amphisbaenians) and in sphenodontians (e.g. *Priosphenodon* and *Sphenodon*) the adductor chamber is enlarged (state 1). The derived condition is considered a synapomorphy of lepidosauromorphs and kuehneosaurs (Gauthier *et al.* 1988)

359. Metacarpals, length of third and fourth: fourth metacarpal longer than third (0) / third and fourth metacarpals subequal in length (1) / fourth metacarpal shorter than third (2) (from Gauthier *et al.* 1988a ch.105)

Note: In early diapsids, metacarpals I to IV increase in length (state 0), with metacarpal V being shorter than metacarpal I. This condition is also found in *Megachirella* and the early squamate *Eichstaettisaurus*. In other squamates generally, metacarpal IV is reduced, and is either subequal to (state 1) or shorter than (state 2) metacarpal III. Exceptionally in drepanosaurs and some archosauromorphs (e.g. *Tanystropheus* and *Euparkeria*) metacarpal IV is also shorter than metacarpal III (state 2). The derived condition (state 2) is considered a synapomorphy of lepidosaurs (Gauthier et al. 1988).

360. Lacrimal, size: large, with an anterior or posterior (suborbital) process which is longer anteroposteriorly than the dorsoventral length of the lacrimal in lateral view (0): small, dorsoventral length greater than anteroposterior length and confined to the orbital rim (1) (from Gauthier *et al.* 1988a ch.1)

Note: Ancestrally, diapsids possess a large lacrimal that extends along the snout, and in some early diapsids contacts the external naris (e.g. *Petrolacosaurus*). Plesiomorphically, therefore, the anteroposterior length of the lacrimal is greater than the dorsoventral length (state 0). This condition is also present in archosauromorphs and marine taxa. The exception to this, in non-lepidosauromorph diapsids, can be found in drepanosaurs and coelurosauravids. In all lepidosauromorphs, the lacrimal, where present, is greatly reduced anteroposteriorly, and often limited to a small bone confined to the orbit rim (state 1). In many squamates, the lacrimal is absent (a condition addressed in c.27). A reduced lacrimal is considered a synapomorphy of lepidosaurs (Gauthier et al. 1988).

361. Fibula, articulation with femur: fibula/femur articulation end to end (0) / fibula sits in a recess on lateral margin of distal end of femur (1) (modified from Gauthier *et al.* 1988a ch.124)

Note: In most diapsids the proximal epiphysis of the fibula meets the distal epiphysis of the femur in a straight end-to-end contact (state 0). All limbed squamates, with few exceptions (e.g. *Pachyrachis* and *Xenosaurus*), share a derived condition, where the proximal epiphysis of the fibula is flattened and pointed, and fits into a recess on the dorsal surface of the distal epiphysis of the femur (state 1).

362. Palatine, lateral row of enlarged teeth: absent (0) / lateral tooth row present on palatine, converging posteriorly (1) (Evans 1980, Gauthier *et al.* 1988a ch.124)

Note: Rhynchocephalians possess a conspicuously enlarged row of teeth on the dorsolateral surface of the palatine (state 1). Snakes often have a single row of large teeth on the palatine, but this is not homologous with that found in rhynchocephalians.

363. Dentary, posterior extent: extends posteriorly no further than the level of coronoid eminence or slightly beyond (0) / extends posteriorly more than halfway between coronoid eminence and articular condyle (1) (from Gauthier *et al.* 1988a ch.66)

Note: All rhynchocephalians possess a posterior process or the dentary that extends well beyond the coronoid eminence and terminates close to the articular condyle (state 1). This was recovered as a synapomorphy of Rhynchocephalia (Gauthier *et al.* 1988)

364. Ectopterygoid, contact with maxilla: absent (0) / present (1) (Dilkes 1988 ch.40, Müller 2004 ch.94, Ezcurra 2016 ch.206, Ford and Benson 2020 ch.146)

Note: In many early diapsids (e.g. *Petrolacosaurus, Claudiosaurus, Eunotosaurus* and *Prolacerta*), the ectopterygoid is restricted to contact with the jugal laterally (state 0). This is also the case in non-lepidosaur lepidosauromorphs (e.g. *Marmoretta* and *Sophineta*). Contact between the ectopterygoid and maxilla (state 1) is found in lepidosaurs, with few exceptions (e.g. *Planocephalosaurus, Elgaria* and *Heloderma*). It is also present convergently in choristoderans, rhynchosaurs, saurosphargids, placodonts and some archosauriforms (e.g. *Trilophosaurus*).

365. Vertebrae, cervical and/or dorsal, anterior centrodiapophyseal or paradiapophyseal lamina: absent (0) / present (1) (from Brinkman and Eberth 1983 ch.17, Ezcurra 2016 ch.315, Ford and Benson 2020 ch.215)

Note: The dorsal vertebrae in many archosauromorphs, apart from rhynchosaurs, display a conspicuous lamina that extends anteroventrally from the base of the transverse process to the anterodorsal corner of the centrum or the anteroventral base of the neural arch (state 1). This is absent (state 0) in non-saurian diapsids and lepidosauromorph.

366. Vertebrae, posterior cervical and/or dorsal, prezygodiapophyseal lamina: absent (0) / present (1) (from Ezcurra 2016 ch.317)

Note: The prezygodiapophyseal lamina connects the base of the transverse process to the lateral margin of the prezygopophysis, and is present (state 1) in many archosauromorphs, although absent in rhynchosaurs. It is also absent (state 0) in non-saurian diapsids and lepidosauromorphs.

367. Jugal, anterior suborbital extension: broadly separated from prefrontal or posterior to the midpoint of the orbit (0) / reaches level of prefrontal or anterior margin of orbit (1) (modified from deBraga and Rieppel 1997 ch.33, Ezcurra 2016 ch.95, Gauthier *et al.* 2012 ch.144)

Note: The suborbital process of the jugal is does not approach the anterior margin of the orbit and is broadly separated from the ventral process of the prefrontal (state 0) in several early diapsids (e.g. *Petrolacosaurus, Claudiosaurus* and *Coelurosauravus*), kuehneosaurs, rhynchocephalians and non-lepidosaur lepidosauromorphs (e.g. *Megachirella, Marmoretta* and *Sophineta).* In many squamates, including early members (e.g. *Ardeosaurus, Eichstaettisaurus* and *Huehuecuetzpalli*) the anterior process is elongate and contacts the prefrontal (state 1). The derived state was recovered as an unambiguous synapomorphy of the clade *Huehuecuetzpalli* + Squamata (Gauthier *et al.* 2012).

368. Basioccipital, articular surface of the occipital condyle: concave (0) / hemispherical (1) (Ezcurra 2016 ch.229)

Note: In early diapsids (e.g. *Petrolacosaurus, Youngina, Coelurosauravus* and *Hovasaurus*) and convergently in rhynchocephalians, the articular surface if the occipital condyle bears a distinct concavity (state 0). The occipital condyle of archosauromorphs bears a convex surface (state 1).

369. Jugal, lateral exposure below orbit: absent (0) / partly exposed above orbital margin of maxilla (1) /entirely exposed above orbital margin of maxilla (2) (Gauthier *et al.* 2012 ch.149)

Note: In many early diapsids, including non-lepidosaur lepidosauromorphs (e.g. *Marmoretta*), the suborbital process of the jugal is partially obscured in lateral view by the overlying posterior process of the maxilla (state 1). In a few cases, such as *Sphenodon* and *Cordylus*, the suborbital process is entirely obscured (state 0). In many squamates (e.g. basal squamates *Ardeosaurus, Eichstaettisaurus* and *Huehuecuetzpalli* and extant agamids, iguanians and monitors) the anterior process of the jugal is fully exposed in lateral view (state 2). State 2 is also present independently in early ichthyosauriforms, thalattosaurs and choristoderans and some rhynchosaurs. This condition (state 2) was recovered as an unambiguous synapomorphy of the clade *Huehuecuetzpalli* + Squamata (Gauthier *et al.* 2012).

370. Manus, penultimate phalanges: shorter than or equal to antepenultimate (0) / longer than antepenultimate (1) (Gauthier *et al.* 2012 ch.546)

Note: State (0) is present in early diapsids (e.g. *Petrolacosaurus* and *Youngina*) and archosauromorphs. In many lepidosauromorphs, including *Marmoretta, Palaeopleurosaurus*, geckotids and scincomorphs, the penultimate phalange of the manus is longer than the antepenultimate (state 1). This condition is also present independently in drepanosaurs. The derived condition was recovered as an unambiguous synapomorphy of Squamata (Gauthier *et al.* 2012).

371. Jugal, posteroventral process: short or spur‑like, anteroventrally less than 20% of the total ventral length (0) / long, greater than 25% of the total ventral length (1) (modified from Gauthier *et al.*1988b ch.34, deBraga and Rieppel 1997 ch.33, Müller 2004 c.16, Reisz *et al.* 2009 c.49, Benson 2012 ch.75, Ford and Benson 2020 ch.78)

Notes: In early archosauromorphs (e.g. *Protorosaurus* and tanystropheids) and non-saurian diapsids (e.g. *Petrolacosaurus* and *Acerosodontosaurus*) the posteroventral process of the jugal is short relative to the length of the ventral surface of the jugal (state 0). In choristoderans, coelurosauravids, rhynchosaurs and archosauriforms (e.g. *Proterosuchus* and *Euparkeria*) the posteroventral process is relatively long, extending posteriorly into the temporal region. This character is inapplicable to taxa where the posteroventral process is scored as absent (c.36).

372. Jugal, contact with quadratojugal: absent (0) / present (1) (from Nesbitt 2011 ch.70)

Notes: Contact between the jugal and quadratojugal (where present) is almost completely absent (state 0) in lepidosauromorphs (with the exception of some rhynchocephalians and some polyglyphanodont squamates). In choristoderans, rhynchosaurs and archosauriforms the jugal and quadratojugal meet (state 1) to provide a ventral bar to the lower temporal fenestra.

373. Vomers, contact with anterior region of maxilla: absent (0) / present (1) (Dilkes 1998 ch.38)

Notes: In choristoderans and rhynchosaurs the vomer contacts the anteromedial surface of the maxilla (state 1). This contact is absent in most other taxa considered herein. In neochoanate squamates (e.g. *Mabuya, Petracola* and *Dibamus*) there is also contact between the vomer and maxilla. However, this character is not devised to describe the complexities of the neochoanate condition in squamates, and these taxa are scored as (0).

374. Prefrontal, contact with counterpart at midline: absent (0) / present (1) (Dilkes 1998 ch.125)

Notes: Midline contact of the prefrontals (state 1) is a synapomorphy of the choristoderans.

375. Interclavicle, notch on anterior margin: absent (0) / present (1) (Dilkes 1998 ch.97)

Notes: A distinctive notch or concavity on the midline of the anterior surface of the interclavicle (state 1) is present in several archosauromorphs (e.g. *Tanystropheus, Prolacerta, Mesosuchus* and *Proterosuchus*). It is absent in all other taxa where the interclavicle is preserved.

376. Tibia, contact with centrale: absent (0) / present (1) (Dilkes 1998 ch.117)

Notes: The distal epiphysis of the tibia contacts the centrale of the pes (state 1) in some archosauromorphs (e.g. *Langobardisaurus, Macrocnemus* and *Prolacerta*), drepanosaurs, rhynchosaurs (e.g. *Mesosuchus*) and archosauriforms (e.g. *Proterosuchus*). It is absent in lepidosauromorphs (state 0).

377. Premaxilla, contact with prefrontal: absent (0) / present (1) (Dilkes 1998 ch.7)

Notes: Contact between the premaxilla and prefrontal (state 1) is a synapomorphy of rhynchosaurs.

Modified characters (changes underlined):

23. Nasals, anterolateral process: absent (0) / present (1)

41. Quadratojugal, ornamentation, on external surface: absent (0) / present (1).

Note: in the revised matrix only two states of the original four were scored. Therefore this character has been changed to binary.

61. Postfrontals, concavity between the frontal and parietal processes (dorsomedial margin of postfrontal): absent (0) / present (1)

108. Pterygoids, transverse process: posteroventrally orientated (0) / flat, on same plane as the posterior region of the palatal ramus of the pterygoid (1)

116. Epipterygoid, base shape: base flared out (0) / base columnar, inserting into a pit on the surface of the pterygoid (1)

119. Quadrates, pterygoid process: present as broad, overlapping quadrate/pterygoid suture (0) / absent or reduced to a small lappet on the ventromedial surface of the quadrate (1)

122. Quadrates, posterodorsal suprastapedial recess with ventrally directed 'hook‑like' process: absent (0) / present (1)

309. Humeri, entepicondyle foramen: absent (0) / present (1). Note: This character has been simplified from four to two states.

**Changes to the coding of character states**

The changes made to the coding of the character states for each taxon, where applicable, are as follows:

*Petrolacosaurus*

Data sources – Literature: Reisz 1981. Specimens examined: KUVP 1424, 8351, 9951, 9952, 9957, 9958, 33603

10: ? 🡪 0

11: ? 🡪 1

16: ? 🡪 1

23: ‑ 🡪 0

30: ? 🡪 1

33: 0 🡪 1 (Simoes et al. 2018 score a crest or thickening of the prefrontal on the anterodorsal margin of the orbit as absent (0). However, The prefrontal is heavily thickened at the anterodorsal angle of orbit (see Reisz 1981 p.15))

39: ? 🡪 0

70: 0 🡪 ‑ (since the subolfactory processes are scored as absent (Simoes *et al.* 2018 c.69), the absence or presence of fusion between them should therefore be scored as inapplicable)

111: 1 🡪 0 (Simoes et al*.* 2018 score the arcuate flange of the quadrate ramus of the pterygoid as present (1). However, the ventral margin of the quadrate ramus, although thickened, does not form an arcuate flange (see Reisz 1981 p.23)

115: ? 🡪 0

116: ? 🡪 0

155: 1 🡪 ? (Simoes at al. 2018 score the dorsal process of the stapes as present (1). However, the proximal region of the stapes is poorly preserved and the dorsal process cannot be unequivocally defined as present (see Reisz 1981 p.26))

156: ? 🡪 0

*Eunotosaurus*:

70: 0 🡪 ‑ (since the subolfactory processes are scored as absent (Simoes et al. 2018 c.69), the absence or presence of fusion between them should therefore be scored as inapplicable)

*Proganochelys*:

Data sources – Literature: Gaffney and Meeker 1983, Gaffney 1990, Bever et al. 2015.

23: 1 🡪 0 (This character is based on the 'supranarial' process of Gauthier *et al.* 2012 (c.22) where a anterolateral process of the nasal bone extends to contact the lateral margin of the eternal naris. This morphology is not homologous with *Proganochelys* (see Gaffney 1990))

26: 1 🡪 0 (Gaffney (1990 p.31) notes that the ventral surface of the nasal in *Proganochelys* has a low parasagittal ridge defining the lateral limits of the sulcus olfactorius, rather than the ventromedial crest present in some squamates as inferred by the scoring of this character in Simoes *et al.* 2018)

41: 2 🡪 1 (This character has been modified to binary states – see note on c.41 above)

70: 0 🡪 ‑ (since the subolfactory processes are scored as absent (Simoes et al. 2018 c.69), the absence or presence of fusion between them should therefore be scored as inapplicable)

113: 1 🡪 0 (Simoes et al. 2018 score the ectopterygoid as present (1). Gaffney and Meeker (1983) note the ectopterygoid is absent in *Proganochelys*. Gaffney (1990) does not mention or illustrate the ectopterygoid. Bever et al. (2015) score as the ectopterygoid as absent (state 1) in their matrix.)

169: 0 🡪 ? (Simoes et al. 2018 suggest in this character and in characters 202-218 (see below) that *Proganochelys* possesses marginal dentition. However, as Gaffney (1990) notes, *Proganochelys* does not possess marginal dentition (see pp.59,61,67,90 and pers.comm. S. Evers 2020). Consequently, all scores pertaining to marginal dentition have been rescored as inapplicable)

202: ? 🡪 ‑

203: ? 🡪 ‑

204: ? 🡪 ‑

205: ? 🡪 ‑

206: ? 🡪 ‑

207: ? 🡪 ‑

208: ? 🡪 ‑

209: ? 🡪 ‑

210: 0 🡪 ‑

211: 0 🡪 ‑

212: 2 🡪 ‑

213: 2 🡪 ‑

214: ? 🡪 ‑

215: 0 🡪 ‑

216: 0 🡪 ‑

217: ? 🡪 ‑

218: ? 🡪 ‑

*Claudiosaurus*:

Data Source – Literature: Carroll 1981. Specimens examined: MNHN 1978-6-1/2

39: ? 🡪 0

42: ? 🡪 0

108: 0 🡪 1(This character has been revised (see above) - Carroll (1981) notes *Claudiosaurus* lacks a ventrally directed transverse flange, but that the flange is in the same plane as the rest of the palate)

113: ? 🡪 1

189: ? 🡪 0

197: 0 🡪 1 (Simoes et al. 2018 score the dorsal process of the coronoid as absent (0). However, Carroll (1981 p.348) notes that a small triangular coronoid extends above the margin of the jaw (also see Carroll 1981 Fig.12))

207: ? 🡪 0

*Youngina*:

Data sources – Literature: Romer 1956, Gow 1975, Carroll 1981, Ezcurra 2016. Specimens examined – BP/1/70, 2614, 2871, 3859, FMNH UC 1528

3: 1 🡪 0 (Simoes et al. 2018 score a posterodorsal process of the premaxilla as present (1). However, although Gow (1975 Fig1) does show a small process of the premaxilla that seems to overlay the subnarial process of the maxilla in BP/1/2871, upon examination of this specimen this morphology is not evident. Further, a slight overlay is not homologous with the posterodorsal process in other taxa scored as (1), where the process extends posterior to the external naris and prevents contact between the eternal naris and the maxilla)

10: 0 🡪 ? (Simoes et al. 2018 score the septomaxilla as present (0). However, Gow (1975) notes that the details of this bone are totally lacking. In Carroll’s reconstruction of the skull of *Youngina* (1981 fig 9) the septomaxilla is represented, however, it is not identifiable in any of the examined specimens)

11: 1 🡪 ? (The position of the septomaxilla relative to the nasal capsule cannot be determined (see above))

48: 0/1 🡪 0

89: ? 🡪 1

113: ? 🡪 1

115: ? 🡪 0

116: ? 🡪 0

128: 0/1 🡪 0

140: ? 🡪 0

172: ? 🡪 1

275: 1 🡪 ? (Simoes et al. 2018 score the supraglenoid foramen as present (1). In BP/1/3859, the only example of a scapulocoracoid in *Youngina*, the area around the glenoid facet is badly eroded, and although it does contain a small hole that may be mistaken for a supraglenoid foramen, the presence of a supraglenoid foramen is unclear. We agree with Ezcurra (2016), who scores this character as (?))

303: 1 🡪 0 (Simoes et al. 2018 score an emargination of the anterior border of the ischium as present (1) as a proxy for the thyroid fenestra. There is a small triangular shaped embayment of the anterior margin of the ischium in one specimen of *Youngina* (BP/1/3859). Gow (1975) notes that the notch may indicate an incomplete ossification of the ischium and pubis, and refers this to Romer (1956 p.318). Romer notes of the pubo-ischial plate, "primitively the ventral margin of the plate formed a nearly straight line. In incompletely ossified specimens there may be a notch or indentation at the suture between the pubis and ischium". In BP/1/3859, the ventral margin is more or less complete and would have met in a straight line with the pubis (although the specimen only has the left pubis and right ischium). Both specimens have been examined in close detail and the notch in both elements is clearly bordered by incomplete bone. We therefore agree with Romer that this is not homologous with the thyroid fenestra and the pubo-ischial plate is incomplete in BP/1/3859)

*Acerosodontosaurus*:

Data sources – Literature: Currie 1981, Bickelmann et al. 2009. Specimens examined: MNHN 1908-32-57

32: 0 🡪 ? (Simoes et al. 2018 score ornamentation on the lateral surface of the prefrontal as absent (0). However, we consider the natural mould of lateral surface of the prefrontal in MNHN 1908-32-57 is too poorly preserved to determine the presence or absence of ornamentation)

33: 1 🡪 ?

38: 0 🡪 ? (Simoes et al. 2018 score the quadratojugal as present (0). Bickelmann et al. (2009) note that the quadratojugal identified by Currie (1981) is a fragment of rib head, and that the quadratojugal is not preserved)

39: 0 🡪 ? (Simoes et al. 2018 score the anterior process of the quadratojugal as present (0). Since the quadratojugal is unknown (see above), we cannot determine whether or not an anterior process was present)

176: ? 🡪 1

177: ? 🡪 0

190: 0 🡪 1(Simoes et al. 2018 score the retroarticular process as absent (0). However, Bickelmann et al. (2009 p.655) note the presence of an elongated, tapering retroarticular process)

191: ‑ 🡪 ?

192: ‑ 🡪 ?

195: ‑ 🡪 ?

300: ? 🡪 1

301: ? 🡪 1

*Coelurosauravus jaekeli*:

Data sources: Literature: Evans and Haubold 1978, Bulanov and Sennikov 2015.

27: 1 🡪 0 (Simoes et al. 2018 score the lacrimal as absent (1). Evans and Haubold (1978 p.278) suggest a small bone mass ventral to the orbital region of the prefrontal may be a small lacrimal. In addition, Bulanov and Sennikov (2015 p.419) also note a rudimentary lacrimal was probably present in *C. elivensis –* see below)

70: 0 🡪 ‑ (since the subolfactory processes are scored as absent (Simoes et al. 2018 c.69), the absence or presence of fusion between them should therefore be scored as inapplicable)

*Coelurosauravus elivensis*:

27: ? 🡪 0

70: 0 🡪 ‑ (since the subolfactory processes are scored as absent (Simoes et al. 2018 c.69), the absence or presence of fusion between them should therefore be scored as inapplicable)

*Utatsusaurus*:

Data source: Literature: Cuthbertson et al. 2013

107: 0 🡪 1 (Simoes et al. score the transverse process of the pterygoid as absent (0). Cuthbertson et al. (2013 p.823) note that a transverse process is present on the pterygoid)

108: - 🡪 1

*Tanystropheus*:

70: 0 🡪 ‑ (since the subolfactory processes are scored as absent (Simoes et al. 2018 c.69), the absence or presence of fusion between them should therefore be scored as inapplicable)

*Langobardisaurus*:

Data sources – Literature: Dilkes 1998, Renesto 1994

36: ? 🡪 1

70: 0 🡪 ‑ (since the subolfactory processes are scored as absent (Simoes et al. 2018 c.69), the absence or presence of fusion between them should therefore be scored as inapplicable)

355: 0 🡪 1 (Renesto (1994 figs 7 and 8) shows the pedal lateral centrale as present, and Dilkes (1998) scores it as present, contacting the tibia)

*Macrocnemus fuyuanensis*:

Data source – Literature: Jiang et al. 2011

28: 2 🡪 1 (This character has been changed to a binary character since the revision of the taxon list rendered state (2) as uninformative. In addition, the lacrimal is anteriorly placed in relation to the prefrontal in *M. fuyuanensis* (see Jiang et al. 2011))

*Prolacerta*:

Data sources: Literature – Gow 1975, Evans 1986, Modesto and Sues 2004, Spiekman 2018. Specimens examined – BP/1/471, 2675, 4504, 5066, 5375, 5880.

60: 0/1 🡪 1

69: 1 🡪 ? (This character describes a ventral extension of the crista cranii (subolfactory processes), as per Gauthier et al. 2012 c.38. Simoes et al. 2018 score this as present in *Prolacerta*. We are unable to find any evidence of this morphology on the specimens of *Prolacerta* examined, or in the literature. We therefore consider this uncertain)

70: 0 🡪 ? (Simoes et al. 2018 score for the absence of fusion of the subolfactory processes (c.69). Since we consider the presence of these processes uncertain, we consequently score this character as (?))

73: 0 🡪 0/1 (Simoes et al. 2018 score the pineal foramen as present (0). The pineal foramen is distinctly polymorphic in *Prolacerta* specimens. For example, it is absent or reduced to a small scar in BP/1/471. This variation was noted by Modesto and Sues (2004) and they further note the foramen is entirely absent in UCMP 37151)

115: ? 🡪 0

116: ? 🡪 0

121: 1 🡪 0 (Simoes et al. 2018 score the quadrate conch as present (1) in *Prolacerta*. However, Modesto and Sues (2004 p.344) note that "the tympanic crest resembles that of lepidosauromorphs except for the absence of a conch". Also, the right quadrate in BP/1/5375 shows no sign of a conch.)

157: 0 🡪 1 (Simoes et al. 2018 score the laterosphenoid as absent (0). A recent scan of the braincase of *Prolacerta* has however provided evidence that the laterosphenoid is present (pers. comm. G. Viglietti 2020))

297: 0 🡪 1 (Simoes et al. 2018 score the supraacetabular buttress as absent (0) in *Prolacerta*. However, A supraacetabular buttress is present on the ilium of BP/1/2676 (see Spiekman 2018 Fig.11)

311: 1 🡪 0 (Simoes et al. 2018 score the pectoral process of the humerus as absent (1) in *Prolacerta*. However, Spiekman (2018) notes that the deltopectoral crest of both humeri of UWBM 95529 are present. This incorporates the pectoral process of the humerus, which connects the deltoid process to the humeral head (Simoes et al 2018 remarks). Therefore, the pectoral process is herein scored as present (0))

312: ‑ 🡪 1 (see above in respect to the connection of the pectoral process to the humeral head)

321: ? 🡪 1

*Megalancosaurus*:

Data sources; Literature – Renesto 1994, 2000, Renesto and Della Vecchia 2005, Castiello et al. 2016.

3: 1 🡪 0 (Simoes et al. 2018 score a posterodorsal process of the premaxilla as present (1). However, the overlay is minimal, and is not homologous with the posterodorsal process in other taxa scored as (1), where the process extends posterior to the external naris and prevents contact between the eternal naris and the maxilla)

27: ? 🡪 0

342: ? 🡪 0

*Askeptosaurus*:

Data source: Literature – Müller 2004. Specimens examined – MSNM V456

327: 1 🡪 0 (Simoes et al. 2018 scores the internal trochanter of the femur as absent (1). However, Müller (2004 p. 1359) suggests that a modest expansion on the medial edge of the proximal surface of the femur in MSNM V456 may be the internal trochanter. Our examination of this specimen concurs with this view)

*Philydrosaurus*:

41: 2 🡪 1 (This character has been modified to binary states – see note on c.41 above)

*Champosaurus*:

41: 2 🡪 1 (This character has been modified to binary states – see note on c.41 above)

*Teyumbaita*:

70: 0 🡪 ‑ (since the subolfactory processes are scored as absent (Simoes et al. 2018 c.69), the absence or presence of fusion between them should therefore be scored as inapplicable)

*Hyperodapedon*:

70: 0 🡪 ‑ (since the subolfactory processes are scored as absent (Simoes et al. 2018 c.69), the absence or presence of fusion between them should therefore be scored as inapplicable)

*Trilophosaurus*:

Data source: Spielman et al. 2008

27: 1 🡪 0 (Simoes et al. 2018 score the lacrimal as absent (1). However, Spielman et al. (2008 p.30) describe the lacrimal in some detail)

38: ? 🡪 0

70: 0 🡪 ‑ (since the subolfactory processes are scored as absent (Simoes et al. 2018 c.69), the absence or presence of fusion between them should therefore be scored as inapplicable)

*Proterosuchus alexanderi*:

Data sources: Literature – Modesto and Sues 2004, Ezcurra 2016

70: 0 🡪 ‑ (since the subolfactory processes are scored as absent (Simoes et al. 2018 c.69), the absence or presence of fusion between them should therefore be scored as inapplicable)

154: 0 🡪 1 (Simoes et al. 2018 score the medial contact of the exoccipitals as absent (0). However, Modesto and Sues (2004 p.344) note that the exoccipitals meet medially in *Proterosuchus*. Further, Ezcurra (2016 c.211) scores both *P. alexanderi* and *P. fergusi* as medial contact of the exoccipitals present)

*Proterosuchus fergusi*:

Data sources: Literature – Modesto and Sues 2004, Ezcurra 2016

70: 0 🡪 ‑ (since the subolfactory processes are scored as absent (Simoes et al. 2018 c.69), the absence or presence of fusion between them should therefore be scored as inapplicable)

154: 0 🡪 1 (Simoes et al. 2018 score the medial contact of the exoccipitals as absent (0). However, Modesto and Sues (2004 p.344) note that the exoccipitals meet medially in *Proterosuchus*. Further, Ezcurra (2016 c.211) scores both *P. alexanderi* and *P. fergusi* as medial contact of the exoccipitals present)

*Euparkeria*:

Data source: Literature – Sobral et al. 2016

135: 1 🡪 0 (Simoes et al. 2018 score the vidian canal as fully enclosed (1). However, there is no closure of the vidian sulcus prior to the entry foramen on the ventral surface of the parabasisphenoid (see Sobral et al. 2016 figs. 11a and 12f))

*Cyamodus*:

38: ? 🡪 0

329: 0 🡪 ? (Simoes et al. 2018 score the intertrochanteric fossa as present (0) in this character. However, they also score the internal trochanter as absent (1) in c.327. We feel that the presence of the fossa is uncertain given the absence of the trochanter)

*Placodus*:

Data source: Literature – Neenan et al. 2012

70: 0 🡪 ‑ (since the subolfactory processes are scored as absent (Simoes et al. 2018 c.69), the absence or presence of fusion between them should therefore be scored as inapplicable)

124: 0 🡪 1 (Simoes et al. 2018 score the position of the carotid foramen into the braincase as in the lateral wall (0). However, the entrance is ventral in *Placodus gigas* (see Neenan et al. 2012))

*Serpianosaurus*:

70: 0 🡪 ‑ (since the subolfactory processes are scored as absent (Simoes et al. 2018 c.69), the absence or presence of fusion between them should therefore be scored as inapplicable)

113: 1 🡪 ? (Simoes et al. 2018 score the ectopterygoid as present (1). However, Rieppel (1989 p.13) notes that the presence of the ectopterygoid cannot be unequivocally established, and it is probably absent. We therefore consider this state as uncertain)

*Kuehneosaurus*:

Data sources: Robinson 1962, 1967; Pamela Robinson unpublished manuscript notes; holotype of *Kuehneosaurus latus* BMNH R.8172; holotype of *Kuehneosuchus latissimus* BMNH R.6111; isolated cranial and postcranial elements: BMNH R. 6001, 6003, 6004, 6112- 6115, 12647, 12861, 12864, 12866-12871, 12874, 12877, 12879, 12880, 12885, 12890, 12894-12896, 12900, 12903, 12904, 12983, 12991, 12925 (as figured in Evans 2009); a large collection of isolated bones in the collections of the Natural History Museum, London, without formal BMNH catalogue numbers. Note that Robinson originally described all material of the British gliding reptile under the name *Kuehneosaurus*, as *K. latus* and *K. latissimus*. However, she subsequently moved *K. latissimus* into a new genus *Kuehneosuchus latissimus* but this designation is based on postcranial characters, with no cranial features described. Most other elements in the collection at the NHM are simply labelled *Kuehneosaurus*. Thus *Kuehneosaurus* herein should be considered as referring broadly to UK kuehneosaurs. The changes to scoring are based on a combination of personal observations of specimens by SEE, details from unpublished figures, and from unpublished manuscript notes by P.L. Robinson.

8: ? 🡪 1

16: ? 🡪 1

20: ? 🡪 1

21: ? 🡪 ‑

23: ? 🡪 0

24: ? 🡪 ‑

25: ? 🡪 1

26: ? 🡪 0

32: 1 🡪 2 (Tubercles present along orbital margin)

38: 1 🡪 ? (Changed to ? as there is a possibility of quadratojugal being fused to ventral edge of conch, e.g. in BMNH R12895, Evans 2009, Fig. 15C)

39: ‑ 🡪 ? (Changed from inapplicable to ? due to scoring of c.38)

40: ‑ 🡪 0 (as above)

41: ‑ 🡪 ? (as above)

42: ‑ 🡪 0 (There is no foramen)

48: ? 🡪 1 (A concavity is present (Evans 2009, Fig.12))

59: 2 🡪 3 (Given the arrangement of the facet for the postfrontal on the frontal, rather than the parietal, we interpret this position as largely anterior)

62: 0 🡪 ? (As there is no articulated material, there is no certainty that a supratemporal was absent)

63: ‑ 🡪 ? (Scored due to coding changed in c.62)

64: ? 🡪 1 (There are no facets on the parietal that could accommodate a tabular)

65: ? 🡪 1 (There are no facets on the parietal that could accommodate postparietals)

66: ? 🡪 ‑ (Non-applicable due to change in coding for c.65)

70: 0 🡪 ‑ (There are no subolfactory processes, only thickened cristae crania, so this is inapplicable)

73: 0 🡪 1 (There is no parietal foramen in kuehneosaurs – the reconstruction given by Robinson simply interprets a foramen at the frontoparietal border because there is a slight gap in the midline and the author (PLR) expected a foramen should be present.)

75: ‑ 🡪 0 (The parietals have a short supratemporal process that is single so cannot be inapplicable)

76: 0 🡪 1 (In mature specimens there are rugosities on the parietal (e.g. Evans 2009, Fig.8D))

86: 1 🡪 0 (There are no parasagittal crests on the kuehneosaur parietal – just a sharp right angle from dorsal to lateral margin)

97: ? 🡪 1

98: ? 🡪 0

99: ? 🡪 0

100: ? 🡪 1

101: ? 🡪 0

102: ‑ 🡪 0 (The palatine shows no palatine foramen)

103: ‑ 🡪 ? (The region is not well enough preserved on existing specimens)

104: ‑ 🡪 0 (The shelf is absent)

106: ? 🡪 0

113: ? 🡪 1

123: ? 🡪 0

124: 0 🡪 1 (The carotid arteries perforate the ventral surface of the sphenoid, not the lateral surface)

125: 0 🡪 ? (This region is insufficiently known in existing specimens)

137: ? 🡪 0

149: 0 🡪 1 (There is no crista interfenestralis in *Kuehneosaurus* because there is no lateral opening of the recessus scala tympani as the metotic fissure is undivided)

152: 0 🡪 - (The exoccipitals contribute to the occipital condyle but they tend to fuse with the basioccipital, e.g. AMNH 7770)

165: ? 🡪 0

166: ? 🡪 0

167: ? 🡪 1

168: ? 🡪 1

172: 1 🡪 0 (There is no coronoid process of the dentary in *Kuehneosaurus)*

173: 0 🡪 ‑ (This is inapplicable given the score of c.172)

174: ? 🡪 ‑ (as above)

175: ? 🡪 0

180: ? 🡪 0

182: ? 🡪 1

183: ? 🡪 0

184: ? 🡪 1

188: 0 🡪 ? (The articular is sheathed by the prearticular in *Kuehneosaurus* but the degree of fusion is uncertain)

189: 0 🡪 1 (There is a foramen for the chorda tympani)

193: 1 🡪 0 (There is no medial process in *Kuehneosaurus*)

206: ? 🡪 1

207: ? 🡪 0

208: ? 🡪 0

213: ? 🡪 3

219: ? 🡪 0

220: ? 🡪 0

221: ? 🡪 1

222: ? 🡪 0

223: ? 🡪 1

224: ? 🡪 0

227: ? 🡪 1

228: ? 🡪 4

231: ? 🡪 0

232: 0/1 🡪 0 (A crest (as opposed to a rounded midline ridge marking the position of the notochord) is absent)

237: ? 🡪 0

238: ? 🡪 ‑

240: ? 🡪 0

241: ? 🡪 ‑

243: ? 🡪 0

244: ? 🡪 0

260: ? 🡪 0

265: ? 🡪 1

266: ? 🡪 ‑

273: 0 🡪 ? (The preservation of specimens is such that this character is uncertain)

276: 0 🡪 1 (There is a supraglenoid buttress)

280: 1 🡪 0 (There is no emargination of the scapulocoracoid in *Kuehneosaurus*, but the bone is slender – not the same thing)

286: 0 🡪 ? (Calcified cartilage does not preserve in this fissure material, therefore this should be scored as uncertain)

287: ? 🡪 0

288: ? 🡪 0

290: ? 🡪 0

291: ? 🡪 0

292: ? 🡪 0

293: ? 🡪 0

294: ? 🡪 0

295: ? 🡪 1

297: 0 🡪 1 (There is a supra-acetabular buttress)

301: 0 🡪 1 (There is a pubic tubercle)

303: 1 🡪 ? (There is uncertainty as to this feature in *Kuehneosaurus* – a small notch can simply be due to non-ossification at this point)

307: 1 🡪 3 (There is a complete ectepicondylar foramen)

310: 1 🡪 0 (There is a large capitellum)

314: ? 🡪 0

316: 0 🡪 ? (This region of the radius is poorly known in *Kuehneosaurus*)

327: 1 🡪 0 (There is an internal trochanter in *Kuehneosaurus*)

329: 1 🡪 0 (There is an intertrochanteric fossa in *Kuehneosaurus*)

332: ? 🡪 0

334: ? 🡪 1

338: ? 🡪 1

340: ? 🡪 0

341: ? 🡪 0

342: 0 🡪 1 (Gastralia were present on the holotype of *Kuehneosaurus latus* (BMNH R.8172) although Robinson (in lit.) reported that many of them were removed when the specimen was prepared).

*Icarosaurus*:

Data source: Colbert 1966, 1970; specimen AMNH 2101; unpublished personal notes from P.L. Robinson; personal observations by SEE of holotype.

59: 2 🡪 3 (The articular facets on the frontals show that the postfrontal was mainly anterior to the parietal (e.g. Colbert 1966, Fig.6; Colbert 1970, Fig.7))

70: 0 🡪 ‑ (The frontals are seen in dorsal view only, but they are extremely shallow and given that the right bone has rotated over the left (e.g. Colbert 1966, Fig. 6; 1970, Fig.6), it is unlikely that there is a strong lateral ridge (crista crania) or subolfactory process that would limit this movement. It is therefore scored as inapplicable)

73: 0 🡪 1 (There is no evidence of a parietal foramen. Colbert (1970) says its presence ‘cannot be established beyond all doubt’ but reconstructs one between the frontal and parietal because of a possible midline gap between the frontals, possibly influenced by Robinson’s reconstruction of *Kuehneosaurus*)

75: ‑ 🡪 ? (This is not inapplicable because there are at least short supratemporal processes (partially hidden at their tips by overlying bones e.g. Colbert 1070, Fig.6))

228: 0/3 🡪 4 (The vertebral centra are described by Colbert (1966) as amphicoelous, but they are not notochordal, so amphiplatyan is a closer description)

280: 1 🡪 0 (The scapula blade appears slender (although Colbert, 1966, describes it as ‘rather broad and blade-like’) but there is no evidence that it is emarginated)

300: 0 🡪 ? (The blade of the pubis is not well preserved and Colbert’s sketch (1966, Fig. 10) does not match the shape of the bone in his photographic image (1966, Fig. 9). It is therefore preferable to code this character with (?))

301: 0 🡪 ? (As above. There is a distinct angulation on the anterior margin of the pubis (e.g. as seen in Colbert 1970, Fig.12) that is not shown his (1970, Fig.13) line drawing of the bone)

342: 0 🡪 ? (The only known specimen is preserved in dorsal view precluding a view of the anteroventral region of the abdomen. It is therefore not possible to determine whether gastralia were present. Given they were present in *K. latus*, it is likely they were also present in *Icarosaurus* but it is scored conservatively as (?))

*Pamelina*:

Data source: Evans 2009; Specimens in the collections of the Institute of Paleobiology, Polish Academy of Sciences, Warsaw (ZPAL); holotype maxilla ZPAL RV/1036; and a large collection of isolated skull and postcranial elements including ZPAL RV/143, 144, 147, 157, 378, 383, 384, 387,441, 451, 555, 612, 617, 627, 936, 975, 979, 981, 1003, 1004, 1008, 1011, 1013,10151027,1029, 1034-1036, 1039, 1042,1043, 1046, 1047, 1048, 1049, 1066, 1067, 1072, 1077, 1081,1082, 1128, 1194, 1197, 1199, 1203, 1204, 1205, 1208, 1211, 1214, 1215, 378, 381, 383-384, 387, 537

18: ? 🡪 0

20: ? 🡪 1

21: ? 🡪 ‑

27: ? 🡪 0

34: 0 🡪 ? (As the material is all disarticulated this is unknown)

38: 1 🡪 ? (There is a notch in the margin of the quadrate resembling that of taxa with a quadratojugal foramen. The presence or absence of a quadratojugal is therefore uncertain (Evans 2009))

39: ‑ 🡪 ?

40: ‑ 🡪 ?

41: ‑ 🡪 ?

42: ‑ 🡪 ?

59: 2 🡪 3 (Given the position of the postfrontal facet on the frontal rather than the parietal, its medial margin lies anterior to the parietal (Evans 2009))

64: ? 🡪 1

70: 0 🡪 ‑ (There are no subolfactory processes – only shallow cristae crania. The character is therefore inapplicable)

73: ? 🡪 1 (There is no parietal foramen in *Pamelina*)

78: 0 🡪 1 (There are tabs from the parietals underlying the frontal)

123: ? 🡪 0 (Although the tip of the quadrate is damaged in specimens of *Pamelina*, the narrow cephalic condyle, and the morphology of the squamosal itself, shows that there is not a notch for the squamosal as in the typical squamate joint)

137: 0 🡪 1 (The dorsum sella is present (Evans 2009, Fig 17))

148: ? 🡪 0 (The morphology of the parasphenoid rostrum shows that an orbitosphenoid process cannot have been present)

150: 0 🡪 ? (As no exoccipitals are recognised for this taxon, this should be (?))

151: 0 🡪 ? (As above)

152: 1 🡪 ? (As above)

153: 0 🡪 ? (As above)

154: 0 🡪 ? (As above)

208: ? 🡪 0

228: ? 🡪 0

229: ? 🡪 1  
230: ? 🡪 0

231: ? 🡪 0

232: ? 🡪 0

233: ? 🡪 0

236: ? 🡪 0

247: ? 🡪 0

248: ? 🡪 0

249: ? 🡪 ‑

251: ? 🡪 0

252: ? 🡪 0

253: ? 🡪 0

254: ? 🡪 0

255: ? 🡪 0

256: ? 🡪 0

257: ? 🡪 0

258: ? 🡪 0

260: ? 🡪 0

266: ? 🡪 1

268: ? 🡪 1

269: ? 🡪 1

270: ? 🡪 1

297: ? 🡪 1

298: ? 🡪 0

299: ? 🡪 0

*Megachirella*:

Data source: Renesto & Posenato (2003), Renesto & Bernardi 2014, Simoes et al. 2018. Type and only specimen, PZO 628 Museo di Scienze Naturali dell ‘Alto Adige, Bolzano, Italy.

The specimen has been redescribed (Simoes et al. 2018) based on CT scans but appears very compressed. Several characters appear to be too poorly preserved to code and these have been changed to (?) below.

18: 0 🡪 ? (Preservation too poor)

47: 1 🡪 ? (Simoes et al. (2018) have a POF labelled on the right but crushed into level of palate. Renesto & Bernardi (2014, Fig.3) show a short ventral process reaching the jugal on this side)

59: 2 🡪 ? (As above – this POF element lies medial to the coronoid process and the jugal lies lateral to the coronoid, so the original position of this element is uncertain. Renesto & Bernardi’s (2014, Fig.3) suggests the postfrontal-postorbitofrontal lies mostly anterior to the parietal)

67: 1 🡪 ? (Only part of the frontal is preserved. It is probably but not certainly fused)

72: 1 🡪 ? (It is unclear whether the parietals are fused (Simoes et al. 2018) or paired (Renesto & Bernardi 2014))

73: 0 🡪 ? (A parietal foramen is coded as present (Simoes et al. 2018, Fig.1) but it is not labelled and it is not obvious where it is supposed to be. It does not appear in Renesto & Bernardi (2014))

97: ? 🡪 1 (Simoes et al. 2018 figure (Fig.1e) of the palate shows palatal tooth rows running forward from the pterygoid into the region identified as palatine)

106: 0 🡪 ? (Given the poor preservation of the anterior end of the pterygoid, this should be (?))

109: 0 🡪 ? (The poor preservation of this region makes it difficult to code with confidence)

122: 1 🡪 0 (There is no hook-like suprastapedial process (Simoes Fig. 1d))

123: 1 🡪 0 (The squamosal appears to sheath the top of the quadrate – this is not equivalent to the peg and notch arrangement in a squamate)

142: 1 🡪 0 (The structure labelled (Simoes et al. Fig.1f) seems to be the ridge of the anterior semi-circular canal – not a separate alar process)

150: 0 🡪 ? (The poor preservation of this region makes it better to code as (?))

151: 0 🡪 ? (The exoccipital is not labelled in Simoes et al. (2018) figure of the braincase, making it difficult to confirm this coding)

170: 0 🡪 ? (As the lingual surface is covered by the splenial, this feature is not visible and it is not shown in the section of the jaw (Simoes et al. Fig. 1g))

179: ? 🡪 3

198: 0 🡪 1

200: 1 🡪 ? (This cannot be confirmed on the images shown in Simoes et al. (2018, Fig.1))

201: 0 🡪 ? (This cannot be confirmed on the images shown in Simoes et al. (2018, Fig.1))

206: 1 🡪 ? (The dentition is not preserved well enough to score this confidently)

216: ? 🡪 0

217: 0 🡪 ?

272: 0 🡪 ? (The mode of preservation is not good enough to determine whether this cartilaginous/mineralised cartilage structure is present)

273: 0 🡪 ? (As above)

287: 1 🡪 ? (Given the compression of this region this should be coded as (?))

289: 0 🡪 ? (As above)

323: 0 🡪 ?

*Sophineta*:

Data source; Evans & Borsuk-Białynicka 2009; specimens in the collections of the Institute of Paleobiology, Polish Academy of Sciences, Warsaw (ZPAL); holotype ZPAL RV/175, maxilla and a large collection of referred cranial and postcranial elements including ZPAL RV/3,7,10, 13, 23, 174-178, 189, 226-249, 392, 443, 445, 455, 472, 493, 627-628, 823-824, 948-950, 952, 959, 965-974,1053-1059, 1061-1063, 1069, 1079-1080, 1086, 1098,1101, 1108, 1110, 1121. Simoes et al. (2018) did not score postcranial characters as described in Evans & Borsuk-Białynicka (2009), presumably questioning their attribution. However, the size and morphology of these elements would preclude their attribution to any of the other small reptiles in the Czatkowice assemblage. These characters(from 228 onward) have therefore been scored herein.

32: ? 🡪 0 (There is no sculpture on the preserved parts of attributed prefrontals)

45: ? 🡪 0 (The position of the facets on postorbital and postfrontal suggests the postorbital lies mainly lateral to the postfrontal)

64: ? 🡪 1 (Neither squamosals nor parietals show any trace of a facet that might have accommodated a tabular)

76: 0 🡪 1 (The parietals are weakly sculptured with ridges and tuberosities)

78: 0 🡪 1 (Facets on the frontals imply the presence of parietal tabs)

118: ? 🡪 0 (A small foramen pieces the quadrate pillar e.g in ZPAL RV/974)

123: ? 🡪 0 (Although the tips of the quadrates are damaged, the morphology of the tip, and that of the squamosal, shows that the squamate ‘peg-in’notch’ arrangement cannot have been present)

172: ? 🡪 0 (The morphology of the post-dental margin of the dentary, and the position of the long coronoid facet along this margin, argues against the presence of a coronoid process)

173: ? 🡪 0 (There is no expansion of the post-dental ramus of the dentary)

174: ? 🡪 ‑ (Given the absence of a process, this is inapplicable)

197: 1 🡪 ? (In the absence of an attributed coronoid bone, this character is scored (?))

198: ? 🡪 0 (The facet for the coronoid on the dentary is confined to the medial side of the dentary)

200: 1 🡪 ? (As for 197 above)

201: 0 🡪 ? (As for 197 above)

208: ? 🡪 0 (The eroded bases of dentary teeth show that replacement was lingual)

228: ? 🡪 0

229: ? 🡪 0

230: ? 🡪 1

231: ? 🡪 1

232: ? 🡪 0

233: ? 🡪 0

234: ? 🡪 0

236: ? 🡪 0

243: ? 🡪 0

244: ? 🡪 0

246: ? 🡪 0

247: ? 🡪 0

248: ? 🡪 0

249: ? 🡪 ‑ (There are no zygosphenes developed on the vertebrae and the character is inapplicable)

251: ? 🡪 0

252: ? 🡪 0

253: ? 🡪 0

255: ? 🡪 0

256: ? 🡪 0

257: ? 🡪 0

258: ? 🡪 0

269: ? 🡪 1

270: ? 🡪 1

296: ? 🡪 0

297: ? 🡪 1

298: ? 🡪 1

*Palaegama*:

Data source: Carroll 1975, 1977; specimen No.3707 McGregor Museum (type and only specimen), Kimberley (personal observation, SEE, and cast of the type held at UCL)

18: ? 🡪 0 (Prefrontal, maxilla/lacrimal contact one another anterior to the orbit (e.g. Carroll 1975, Fig.2))

19: ? 🡪 0 (As above)

26: 0 🡪 ? (The preservation of this region is not good enough to code this character)

47: ? 🡪 1

48: ‑ 🡪 0

49: ? 🡪 0

61: ‑ 🡪 0

64: ? 🡪 1

68: 1 🡪 ? (Preservation does not permit this to be coded)

71: 0 🡪 ? (Preservation does not permit this to be coded)

78: 0 🡪 ? (This is questionable as Carroll’s figure (1975,Fig.2) suggests a tab may be present)

81: 1 🡪 ? (Preservation does not permit this to be coded)

82: ‑ 🡪 ? (Preservation does not permit this to be coded)

228: 0 🡪 ? (The centra are probably amphicoelous but none seems to be preserved end on)

230: 0 🡪 ? (Preservation does not permit this to be coded with assurance)

232: 1 🡪 ? (There are rounded keels but these are not homologous to the keels on snakes)

233: ‑ 🡪 ? (As the articular surfaces of the centra are not visible, and are obscured in ventral view by intercentra, this cannot be coded with certainty)

235: 2 🡪 ? (Carroll (1975) describes 2 sacral ribs but the preservation of this region is poor with only one pair of ribs seen clearly)

236: 0 🡪 ? (Most of the tail is missing)

263: 0 🡪 ? (Very few of the rib heads are visible and intact)

264: 0 🡪 ? (Very few of the rib heads are visible and intact)

268: 1 🡪 ? (It is unclear in Carroll’s figure (1975, Fig 1) whether the single exposed sacral rib is fused or sutured to the vertebral centrum)

273: 0 🡪 ? (The preservation is not good enough to code this confidently)

287: 0 🡪 ? (The clavicles are incompletely preserved)

289: 0 🡪 ? (The clavicles are incompletely preserved)

298: 0 🡪 ? (The preservation is not good enough to code this confidently)

301: 1 🡪 ? (The preservation is not good enough to code this confidently)

304: 0 🡪 ? (The preservation is not good enough to code this confidently)

306: 0 🡪 ? (The preservation is not good enough to code this confidently)

310: 1 🡪 ? (The preservation is not good enough to code this confidently)

316: 0 🡪 ? (The preservation is not good enough to code this confidently)

319: 0 🡪 ? (The preservation is not good enough to code this confidently)

327: 0 🡪 ? (The preservation is not good enough to code this confidently)

328: 0 🡪 ? (The preservation is not good enough to code this confidently)

329: 0 🡪 ? (The preservation is not good enough to code this confidently)

330: 0 🡪 ? (The preservation is not good enough to code this confidently)

331: 0 🡪 ? (The preservation is not good enough to code this confidently)

342: 0 🡪 ? (Carroll (1975) figures fragments of slender elements between the ribs (Fig.1) that are likely to be gastralia)

*Gephyrosaurus*:

Data source: Evans 1980, 1981; extensive collection of catalogued cranial and postcranial bones in the collections of the Natural History Museum London, and uncatalogued specimens at UCL and NHM. Material of the braincase, as described in Evans 1977 PhD thesis, provides extra scoring for braincase characters.

1: 0 🡪 0/1 (The premaxillae occasionally fuse in mature *Gephyrosaurus*)

9: 0 🡪 1 (The premaxilla of Gephyrosaurus has a posterior flange bearing a distinct facet for the vomer (e.g. Evans 1980, Fig.30))

16: ? 🡪 1 (A superior alveolar foramen is present)

24: 2 🡪 1 (The ventrolateral flange of the nasal articulates with the anterior margin of the maxillary facial (=nasal) process. It therefore lies anterior to the maxillary process)

25: 0 🡪 1 (The nasals contain foramina (Evans 1980, Fig.5))

34: 0 🡪 ? (Although it is unlikely that these bones were present, the fact that *Gephyrosaurus* is based on re-articulated isolated elements means it is preferable to code this as (?))

45: 1 🡪 0 (Postorbital dorsal margin lies mainly lateral to the postfrontal)

59: 2 🡪 3 (The postfrontal overlies the parietal at its articulation (i.e. dorsal) but most of the postfrontal medial margin lies against the frontal, anterior to the parietal, i.e. state (3))

61: 1 🡪 0 (The medial margin of the postfrontal has only a slight concavity and does not clasp a projecting frontoparietal expansion. It is therefore coded as (0))

64: ? 🡪 1 (There are no facets on parietals or squamosals that could accommodate this element)

68: 0 🡪 1 (The facets on the anterior margin of the parietal suggest that the frontal had short posterior processes that overlapped the parietal laterally)

76: 3 🡪 1 (The parietal has ridges and concavities between them, not strictly pits)

78: ? 🡪 1 (Facets on the anterior margin of the parietal suggest that the frontal and parietal slotted into each other, with a parietal shelf briefly underlapping the frontal)

86: 1 🡪 0 (There is no crest on the dorsolateral region of the parietal)

90: ? 🡪 1 (The vomer is a thin element that is rarely preserved intact, but the facet on the premaxilla (see ch.9) shows that the vomer contacted the premaxilla)

98: ? 🡪 0

99: ? 🡪 0

102: ? 🡪 0

103: ? 🡪 1

106: ? 🡪 0

110: ? 🡪 1

111: ? 🡪 1

112: ? 🡪 0

123: 1 🡪 0 (There is no notch on the cephalic condyle of the quadrate – the facet for the squamosal extends along the upper margin of the quadrate tympanic crest (e.g. Evans 1980, Fig.17) and the articulation is like that of *Sphenodon* not squamates)

124: 0 🡪 1 (The carotid foramen is ventral not lateral. A lateral position occurs when the parasphenoid expands to close a vidian canal)

125: ? 🡪 0 (Braincase material of *Gephyrosaurus* (unpublished except in thesis) shows no lateral ascending process)

126: ? 🡪 0

127: ? 🡪 0

128: ? 🡪 0

129: ? 🡪 0

131: ? 🡪 0 (There are sufficient specimens of basioccipital to show that no epiphyses were present)

132: 0 🡪 1 (The basioccipital is fused to the exoccipitals (e.g. Evans, Fig. 37 ) in mature individuals)

152: 1 🡪 ‑ (Inapplicable as elements are fused)

157: ? 🡪 0 (There are no laterosphenoids)

170: 0 🡪 0/1 (The development of the dorsal and medial margins of the Meckelian fossa is variable and there can be a short closure)

184: ? 🡪 0 (There does not appear to be an anterior surangular foramen)

193: 0 🡪1 (There is a small tuberosity for pterygoideus (e.g. Evans 1980, Fig.45))

195: ‑ 🡪 ? (As the prearticular and articular are fused, the contribution of the prearticular is not known)

200: 1 🡪 0 (The coronoid is almost completely medial on the lower jaw and bears a long posterior process)

201: ? 🡪 0 (A short posteroventromedial flange is present (e.g. Evans 1980, Fig.43))

208: ? 🡪 0 (This is the position of posterior replacements, i.e. (0) as lingual)

221: 0 🡪 1 (The atlas arch has postzygapophyses (Fig. 2, Evans 1981))

222: 1 🡪 0 (Atlas ribs present (0) as shown by rib tubercles on atlas intercentrum (Evans 1981, Fig. 2))

223: ? 🡪 1 (Atlas pleurocentrum is fused to axis (Evans 1981, Fig. 3))

224: ? 🡪 0 (Axis intercentrum is present and fused between the atlas pleurocentrum (odontoid process) and the axis pleurocentrum (Evans 1981, Fig.3))

225: ? 🡪 0 (IC2 alone lies below the axis)

226: 0 🡪 1 (Axis IC fused to axis pleurocentrum (Evans 1981, Fig.3))

227: ? 🡪 0 (There are rib tubercles on the axis intercentrum (Evans 1981, Fig. 3))

232: 1🡪 0 (Posterior dorsal vertebral do not have a midventral crest – the rounded ridge is a typical feature of notochordal vertebrae – it does not constitute a crest)

235: ? 🡪 2 9There are two sacral vertebrae)

237: ? 🡪 1 (Cervical intercentra were present – as indicated by the recovery of isolated elements of both cervical intercentra (small crested) and dorsal intercentra (simple hemicircles) (Evans 1981, Fig.11))

238: ? 🡪 0 (As there are no facets on the cervical centra, the intercentra were intercentral)

243: ? 🡪 0 (Given the absence of any articular facets or haemapophyses on caudal vertebrae, the chevrons clearly articulated intervertebrally, as also indicated by the dorsal bar)

244: ? 🡪 0 (They were clearly free as they are found complete in the fissure material)

252: ? 🡪 0 (Are any cervical spines preserved well enough to show if there was a notch?)

262: ? 🡪 0 (Many rib fragments have been recovered and there is no evidence of uncinate processes on any)

267: ? 🡪 0 (There is no evidence of forking on preserved sacrals)

268: ? 🡪 1 (They are evidently fused)

274: ? 🡪 0 (There is no evidence for the presence of distal ribs and the curvature of the primary ribs would preclude it anatomically)

276: 0 🡪 1 (There is a supraglenoid buttress)

280: 1 🡪 0 (The scapula is not emarginated)

283: ? 🡪 0 (There is no evidence of a procoracoid attachment)

284: ? 🡪 0 (There is no coracoid emargination)

285: ? 🡪 0 (There is no evidence of an articulation for a posterior coracoid)

291: ? 🡪 0 (The clavicles end distally in a narrow tip that from the length of the clavicle in relation to the scapulocoracoid, and the orientation of the tip must have made contact with the anterior edge of the scapula blade)

295: 1 🡪 ? (Although it is unlikely that a cleithrum was present, it is preferable to score this as (?))

297: 0 🡪 1 (There is a supra-acetabular buttress (Evans 1981, Fig. 17 ))

300: ? 🡪 1 (The pubis has a complete obturator foramen (Evans 1981, Fig. 22))

301: ? 🡪 1 (The pubis has a pubic tubercle (= pectineal process, Evans 1981 Fig.22))

314: ? 🡪 1 (Epiphyses were present – as indicated by flat porous surfaces at the end of several limb bones where the epiphysis has detached (e.g. Evans 1981, Fig.19))

330: 0 🡪 ? (The distal end of the tibia is incompletely preserved)

334: ? 🡪 0 (The astragalus and calcaneum are fused in *Gephyrosaurus* and there is no foramen (Evans 1981, Fig. 27))

335: ? 🡪 0 (The fusion of the astragalus and calcaneum precludes the presence of a pedal lateral centrale (Evans 1981, Fig. 27))

342: ? 🡪 1 (Fragments are gastralia were recovered from the fissure deposits (Evans 1981, text))

*Diphydontosaurus*:

Data source: Whiteside 1981; uncatalogued articulated skeleton in the collections of PL Robinson (as deposited in the Natural History Museum, London); large collection of isolated postcranial specimens SEM scanned at UCL but undescribed. Characters 219 onward are therefore scored for the first time.

3: 1 🡪 0 (*Diphydontosaurus* does not have a posterodorsal process of the premaxilla (Whiteside 1981))

14: 1 🡪 0 (As in *Gephyrosaurus*, there is no obvious sutural surface for attachment of the maxilla (Whiteside 1981, Fig. 5); the anterior end of the maxilla has a small concavity that abutted the premaxilla (Whiteside 1981, Fig. 7))

61: 1 🡪 0 (As in *Gephyrosaurus*, the medial edge of the postfrontal is largely straight in *Diphydontosaurus* (Whiteside 1981, Fig. 12))

78: 0 🡪 ?

86: 1 🡪 0 (Unclear from Whiteside’s figure whether tabs are present or not)

123: 1 🡪 0 (There is no notch on the cephalic condyle of the quadrate that corresponds to the articular complex in squamates. The quadrate sits against a shelf on the squamosal as it does in *Sphenodon* and *Gephyrosaurus* (Whiteside 1981, Figs 17, 18))

124: 0 🡪 1 (In the absence of a closed vidian canal, the internal carotid enters ventrally (Whiteside 1981, Fig. 27))

219: ? 🡪 1

220: ? 🡪 0

221: ? 🡪 1

222: ? 🡪 1

223: ? 🡪 1

226: ? 🡪 0

228: ? 🡪 0

229: ? 🡪 0

230: ? 🡪 1

232: ? 🡪 0

234: ? 🡪 0

235: ? 🡪 2

236: ? 🡪 1

242: ? 🡪 0

243: ? 🡪 0

244: ? 🡪 0

245: ? 🡪 2

246: ? 🡪 0

247: ? 🡪 0

248: ? 🡪 0

249: ? 🡪 ‑

250: ? 🡪 ‑

252: ? 🡪 0

253: ? 🡪 0

255: ? 🡪 0

256: ? 🡪 0

257: ? 🡪 0

258: ? 🡪 0

259: ? 🡪 0

260: ? 🡪 0

262: ? 🡪 0

263: ? 🡪 0

264: ? 🡪 0

268: ? 🡪 1

274: ? 🡪 0

296: ? 🡪 1

297: ? 🡪 1

299: ? 🡪 0

400: ? 🡪 1

301: ? 🡪 1

302: ? 🡪 0

303: ? 🡪 1

305: ? 🡪 1

308: ? 🡪 0

313: ? 🡪 0

315: ? 🡪 0

326: ? 🡪 0

328: ? 🡪 0

331: ? 🡪 1

332: ? 🡪 ‑

334: ? 🡪 0

340: ? 🡪 1

343: ? 🡪 0

344: ? 🡪 ‑

345: ? 🡪 0

346: ? 🡪 0

347: ? 🡪 0

*Planocephalosaurus*:

123: 1 🡪 0

*Clevosaurus*:

123: 1 🡪 0

*Trioceros*:

70: 0 🡪 ‑

329: 0 🡪 ?

*Xantusia*:

70: 0 🡪 ‑

*Plestiodon*:

119: 0 🡪 1

*Mabuya*:

36: 0 🡪 1

*Cordylus*:

13: 1 🡪 0

119: 0 🡪 1

*Broadleysaurus*:

119: 0 🡪 1

*Timon*:

119: 0 🡪 1

*Lacerta*:

119: 0 🡪 1

*Meyasaurus*:

86: 1 🡪 0

*Teius*:

119: 0 🡪 1

*Slavoia*:

70: 0 🡪 ‑

*Gobinatus*:

70: 0 🡪 ‑

119: 0 🡪 1

*Gilmoreteius*:

119: 0 🡪 1

*Petracola*:

119: 0 🡪 1

*Eichstaettisaurus*:

119: 0 🡪 1

*Huehuecuetzpalli*:

86: 1 🡪 0

*Dalinghosaurus*:

119: 0 🡪 1

*Lanthanotus*:

119: 0 🡪 1

*Pontosaurus*:

86: 1 🡪 0

In the original dataset of Simões *et al.* (2018) eight characters were parsimony uninformative (c.19, c.112, c.160, c.177, c.180, c.196, c.209, c.285, c.346). The changes detailed above resulted in seven characters .(c.19, c.53, c.155, c.302, c.312, c.317, c.328) with non‑variable scoring and these characters are therefore excluded from the Bayesian analysis. Nine characters were parsimony uninformative (c.10, c. 112, c.160, c.177, c.180, c.196, c.209, c.285, c.346). All characters have been retained in the matrix to inform future studies.

**Optimisation of character states at key nodes for MCC tree**

**Lepidosauromorpha:**

Unambiguous -

42 0 → 1

50 0 → 1

68 0 → 1

201 1 → 0

Acctran -

67 0 → 1

98 0 → 1

213 2 → 0

219 0 → 1

221 0 → 1

236 0 → 1

237 0 → 1

239 0 → 1

240 0 → 1

271 0 → 1

273 0 → 1

286 0 → 1

293 0 → 1

304 0 → 1

314 0 → 1

322 0 → 1

331 0 → 1

333 1 → 0

334 1 → 0

335 1 → 0

336 0 → 1

338 1 → 0

340 0 → 1

341 0 → 1

344 0 → 1

354 0 → 1

361 0 → 1

Deltran –

167 0→1

303 0→1

352 0→1

360 0→1

370 0→1

***Marmoretta + Fraxinisaura*:**

Unambiguous –

20 0→1

73 0→1

101 0→1

Acctran –

8 0 → 1

81 1 → 0

82 0 → 1

85 1 → 0

120 1 → 0

121 1 → 0

181 2 → 0

189 1 → 0

190 1 → 0

200 1 → 0

221 0 → 1

292 0 → 2

296 1 → 0

307 3 → 0

Deltran –

229 0 → 1

293 0 → 1

354 0 → 1

**Lepidosauria:**

Unambiguous –

69 0 → 1

231 0 → 1

298 0 → 1

Acctran –

45 1 → 0

118 1 → 0

188 0 → 1

229 1 → 0

371 0 → 1

Deltran –

81 0 → 1

98 0 → 1

109 1 → 0

120 0 → 1

121 0 → 1

219 0 → 1

237 0 → 1

239 0 → 1

240 0 → 1

271 0 → 1

286 0 → 1

314 0 → 1

322 0 → 1

334 1 → 0

335 1 → 0

336 0 → 1

338 1 → 0

340 0 → 1

**Rhynchocephalia:**

Unambiguous –

55 0 → 1

59 2 → 1

111 0 → 1

114 0 → 1

173 0 → 1

176 1 → 0

182 0 → 1

362 0 → 1

363 0 → 1

Acctran –

25 0 → 1

62 1 → 0

92 0 → 1

188 1 → 2

210 0 → 1

211 0 → 1

293 1 → 0

354 1 → 0

359 0 → 2

364 0 → 1

Deltran –

23 0 → 1

188 0 → 2

310 0 → 1

333 1 → 0

**Squamata (total group):**

Unambiguous –

61 0 → 1

Acctran –

36 1 → 0

89 1 → 0

95 0 → 1

116 0 → 1

124 1 → 0

125 0 → 1

151 0 → 1

162 0 → 1

168 1 → 0

226 0 → 1

265 0 → 1

272 0 → 1

288 0 → 1

291 0 → 2

310 1 → 0

324 0 → 1

349 1 → 0

Deltran –

354 0 → 1

**Squamata excluding *Sophineta*:**

Unambiguous –

50 1 → 0

198 0 → 1

Acctran –

7 0 → 1

21 0 → 1

27 0 → 1

45 0 → 1

68 1 → 0

71 0 → 1

118 0 → 1

170 0 → 1

229 0 → 1

348 1 → 0

349 0 → 2

Deltran –

324 0 → 1

**Squamata excluding *Sophineta* and *Megachirella*:**

Unambiguous –

38 0 → 1

123 0 → 1

227 0 → 1

284 0 → 1

342 1 → 0

356 0 → 1

357 0 → 1

367 0 → 1

Acctran –

85 1 → 0

97 1 → 0

105 1 → 0

135 0 → 1

138 0 → 2

142 0 → 1

171 0 → 1

316 0 → 1

352 1 → 0

364 0 → 1

369 1 → 2

371 1 → 0

Deltran –

27 0 → 1

36 1 → 0

188 0 → 1

236 0 → 1

265 0 → 1

273 0 → 1

348 1 → 0

361 0 → 1

**Squamata (crown group):**

Unambiguous –

1 0 → 1

83 0 → 1

348 0 → 2

Acctran –

43 0 → 1

49 0 → 1

67 1 → 0

73 0 → 1

352 0 → 1

359 0 → 1

369 2 → 1

Deltran -

71 0 → 1

89 1 → 0

95 0 → 1

97 1 → 0

105 1 → 0

116 0 → 1

124 1 → 0

125 0 → 1

162 0 → 1

272 0 → 1

288 0 → 1

293 0 → 1

305 1 → 0

309 1 → 0

330 0 → 1

333 1 → 0

341 0 → 1

364 0 → 1