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PART B. SYSTEMATIC PALEONTOLOGY, INCLUDING FULL DIAGNOSIS OF *VINTANA SERTICHI*, NEW GENUS AND NEW SPECIES

MAMMALIA Linnaeus, 1758
?ALLOTHERIA Marsh, 1880
GONDWANATHERIA Mones, 1987
SUDAMERICIDAE Scillato-Yané and Pascual, 1984
VINTANA gen. nov.

Type species. *Vintana sertichi* gen. et sp. nov.

Included Species. Type species only.

Etymology. Vintana (Malagasy), *luck*, in reference to the circumstances of discovery of the holotype and only known specimen.

Diagnosis. As for type and only known species.

VINTANA SERTICHI gen. et sp. nov.
(Fig. 1)

Holotype and only known specimen. UA (Université d'Antananarivo) 9972, virtually complete and well-preserved cranium (Fig. 1; Supplementary Videos 1–3).

Referred specimens. None.

Etymology. After Joseph J. W. Sertich, discoverer of the holotypic and only specimen, in recognition of his skill, hard work, prescience, and good fortune in discovering this and numerous other specimens and productive fossil sites in the Late Cretaceous of Madagascar.

Type locality. Locality MAD10-24 (S16° 07' 10.3", E45° 44' 39.7") in the Kinkony Study Area of northwestern Madagascar, west-southwest of the port city of Mahajanga, near Lac Kinkony.

Age and distribution. Known only from the Upper Cretaceous (Maastrichtian) Lac Kinkony Member, Maevarano Formation, Mahajanga Basin, northwestern Madagascar (Rogers et al., 2013).

Diagnosis. Differs from all other gondwanatherians in its large size and in exhibiting wear features on molariform tooth crowns indicating a distobuccal (rather than strictly distal) power stroke of the chewing cycle. Differs from ferugliotheriid gondwanatherians in possessing hypsodont and unwaisted molariform cheek teeth with prominent, cementum-filled infundibula. Differs from all other sudamericid gondwanatherians in possessing molariform teeth that are approximately as wide as they are long. Further differs from non-Indo-Malagasy sudamericids in possessing prominent interrow sheets of interprismatic enamel; from *Sudamerica*, *Lavanify*, and perhaps *Bharattherium* in having sidewall furrows that terminate on molariform crowns before reaching roots; from *Bharattherium* and *Lavanify* in having enamel on all sides of molariform crowns; and from *Sudamerica* in having molariform crowns with furrows on only one side (rather than both buccally and lingually), infundibula that extend far vertically into crowns, and in lacking a parasagittal longitudinal ridge with Type 2 islets (Koenigswald et al., 1999) on the occlusal surface.

PART C. COMPUTED TOMOGRAPHY AND COMPUTER-GENERATED IMAGERY

The plaster jacket-encased block of matrix containing UA 9972 was initially scanned on a GE Lightspeed VCT 64-source medical CT scanner in Stony Brook University's Department of Radiology. The 16 bit DICOM data from the Lightspeed VCT were reviewed in ImageJ and Avizo 7.1 during the course of mechanical preparation. Subsequent micro-CT (μCT) scanning used for analysis of the specimen was conducted using a GE Phoenix vtome x s240 μCT scanner (240kv micro-focus reflection target x-ray tube; DXR250RT detector panel) in the Microscopy and Imaging Facility of the American Museum of Natural History (AMNH) in New York, NY, and also using a Nikon Metrology MCT225 industrial μCT scanner (225kV micro-focus reflection target x-ray tube; Perkin Elmer XRD 1621 AN3 ES detector panel) at Avonix Imaging in Plymouth, MN. VG Studio Max software created the 16 bit TIFF slices of subsequent μCT datasets that were utilized for the purposes of digital preparation. DICOM and TIFF stacks were rendered into polygonal surface models using Avizo 7.1 Isosurface and Volume Rendering options, as well as labeling individual voxels in the Label Field Editor and extracting polygon surface files of labeled materials.

All orthographically-projected renderings and images of them were produced with Avizo 7.1 (Vizualization Sciences Group). An Avonix μCT dataset (kv = 225; μA = 35) of a volume encompassing the entire cranium (1151 x 1251 x 1776 voxels; 1 voxel = 72.6 x 72.6 x 72.6 μm) served as the basis for Figs 1, 2a, and 2b, as well as Extended Data Figs 2c, 2d, 3a, and 4a. Photo-realistic images in Fig. 1 and Extended Data Fig. 4a were produced using Adobe Photoshop, with images of shadows cast onto a polygon surface model from the dataset using simulated traditional camera lighting superimposed onto images of a custom false-color volume rendering approximating the true color attributes of the actual specimen. Additionally, enamel on the teeth was colored as in the fossil on the composite images in Fig. 1a, c, d, and Extended Data Fig. 4a. Fig. 2a and 2b represent polygon surface models generated from segmented endocasts of incisor alveoli visualized within a semi-transparent grayscale model of the skull. The medial view of the cranium in Extended Data Fig. 2c was created from a composite of polygon models of segmented cranial elements comprising the right side of the skull, with some element models divided at the approximate midline (frontal, parietal, occipital, basisphenoid, and orbitosphenoid), and with some some polygon mesh editing and reconstruction to correct for crushing and distortion in the fossil not present in life. Extended Data Figs 2d and 5 were also generated from composites of segmentations of individual elements, but importantly did not undergo reconstruction of any sort to their meshes, though fragments within the sphenorbital fissure and anterior portions of the zygomatic arch were removed from the volumes for clarity in Fig. 2d. Extended Data Fig. 3a represents a composite of polygon models of segmented cranial elements comprising the right side of the skull, into which polygon models of endocranial volumes are also visualized; areas of the endocranial volume were removed in front of right cranial nerve passages and the right inner ear region for visibility. The polygon models in Extended Data Fig. 3b were produced from a more finely resolved Avonix μCT dataset of the posterior enodcranium and inner ear region (1812 x 1579 x 1288 voxels; 1 voxel = 29.7 x 29.7 x 29.7 μm).

Supplemental videos were created using the Animation Producer in Avizo 8.0 and exported 1536 x 864 pixel tiff files were compiled in Quick Time Pro. Supplemental videos 1, 2, and 3 were created using the full-skull Avonix dataset. Supplemental videos 4 and 5 were derived from a cropped subset (401 x 688 x 998 voxels; 1 voxel = 49.8 x 49.8 x 49.8 μm) of an AMNH dataset (kv = 225; μA = 150).

PART D. ADDITIONAL DETAILS OF GROSS DENTAL MORPHOLOGY AND ENAMEL MICROSTRUCTURE

Dental Formula

The upper dental formula of *Vintana sertichi* is interpreted here to be 2.0.1.4. The incisor alveoli have been reconstructed on the basis of μCT images (Fig. 2a, b). There is no evidence of a canine. Evidence for the presence of a small premolariform tooth is provided by two small, mesiodistally aligned alveoli immediately mesial to the vastly larger alveolus for the first molariform tooth on the right side (Fig. 2c); the left side is too crushed in this area to reveal alveoli for the left premolariform tooth. There were four molariform (MF) teeth on each side but only the left second, third, and fourth molariform teeth (MF2–4) and the right third molariform tooth (MF3) are preserved. Neither of the first molariform teeth (MF1) are preserved, but their alveoli, although crushed, are evident. The size and shape of the left alveolus, mesial to the preserved MF2–4, indicates that MF1 was much larger than the premolariform tooth mesial to it and that it had at least four roots. Indeed, in the absence of replacement data, the huge discrepancy in size of the two relatively tiny alveoli mesial to a massive, multi-rooted alveolus is the primary basis for identifying the two tooth types (premolariform versus molariform). Furthermore, it should be noted that there is a gradual wear gradient in the three molariforms on the left side, from MF2 (most worn) to MF4 (least worn). Such a wear gradient is consistent with an interpretation that the molariforms are all part of the same series (i.e., that the preserved MF2 is not a premolar/premolariform).

Hypsodonty

We regard the molariform cheek teeth of *Vintana sertichi* to be hypsodont. This, however, must be qualified by the observation that the teeth in the holotypic and only known specimens, UA 9972, are heavily worn and, in their current state, do not fully reflect the high-crowned nature of these teeth as they probably were earlier in life. A parallel for this is found in another sudamericid gondwanatherian, *Greniodon sylvaticus* (see Goin et al., 2012). We infer that, as in other ‘protohypsodont’ (sensu Mones, 1982) mammals, the roots of the molariform cheek teeth had closed off and that the remainder of the crowns were in the process of being worn down when the individual represented by UA 9972 died. As in those mammals that have hypsodont cheek teeth, the walls of the crown are essentially straight, a ‘neck’ between crown and root is absent, and cementum filled in the infundibula and furrows and likely also covered the external surfaces, as indicated by their irregular, roughened texture (Koenigswald, 2011). Nonetheless, it appears that the molariform cheek teeth of *V. sertichi* were likely not as tall during earlier stages of life as in most other sudamericids (i.e., *Bharattherium bonapartei*, *Gondwanatherium patagonicum*, *Lavanify miolaka*, *Sudamerica ameghinoi*).

Molariform Tooth Root Structure

Although the base of the alveolus for MF1 is poorly preserved on both sides, enough of the rims are preserved to suggest that each MF1 was supported by at least four large roots. This, coupled with the vastly larger size of the alveolus than the two, small alveoli mesial to it, suggests that it is a molariform, rather than a premolariform, tooth. MF1, based on its alveolus, had two buccal and two lingual roots, although we cannot be sure that it did not have other, smaller accessory roots. MF2, based on the preserved left tooth, had three large roots buccally, four small roots lingually, and a tiny root mesially. MF3, based on the preserved teeth on both sides, had three roots buccally and three roots lingually, all of approximately equal size except for the one positioned distolingually, which is roughly twice the size of the others. MF4 had five roots, but they were arranged differently on the two sides: two mesially, two distally, and one between the mesiobuccal and distobuccal roots on the right side (as revealed by the well-preserved alveolus) and a large root mesiobuccally, a much smaller root mesiolingually, two roots distally, and a tiny root lingually on the left side (based on the tooth itself).

The tooth roots on the preserved molariform teeth (MF2–4) are positioned near the periphery of the crown, leaving the more central area of the base of the crown relatively unsupported. This appears to be an unusual condition, particularly among Mesozoic mammaliaforms, but is approached by that seen in the tooth identified as M1 in the haramiyidan *Megaconus mammaliaformis* (Zhou et al., 2013:fig. S4F).

Enamel Microstructure

The enamel microstructure of *Vintana sertichi* is composed of small prisms and a prominent interprismatic matrix arranged into interrow sheets. This is known as modified radial enamel and is regarded to be more derived than enamel composed of prisms surrounded by an interprismatic matrix that anatomoses around the prisms, rather than being arranged into interrow sheets.

PART E. BODY MASS ESTIMATE FOR *VINTANA SERTICHI*

Cranial size for *Vintana sertichi*, based on UA 9972, was calculated as the geometric mean of maximum cranial length and width. Cranial length was measured as the linear distance from the anterior-most point on the premaxilla to the posterior-most point on the occipital condyles. Cranial width was measured as the linear distance between the lateral-most margins of the left and right zygomatic arches. Estimated dimensions for the *V. sertichi* holotype specimen are: cranial length = 124.1 mm, cranial width = 83.4 mm, cranial size = 101.7 mm. To estimate body mass, a least-squares regression was fit to a bivariate plot of $\log_{10}$Cranial Size (x-axis) versus $\log_{10}$Body Mass (y-axis) for 418 extant therian species. Adult cranial sizes of extant species were taken from Muchlinski (2008, 2010) and adult body masses were taken from Smith and Jungers (1997) for primates and from Silva and Downing (1995) for non-primate mammals. This regression is significant ($p < 0.0001$) with an r^2 value of 0.973, a slope of 3.4347506 (95% confidence interval = 3.380015 – 3.4894863), and a y-intercept of -5.943518 (95% confidence interval = -6.037849 – -5.849188). These empirically derived estimates of slope and y-intercept were used to derive lower, mean, and upper estimates of body mass for *V. sertichi* with the following equations:

Lower Estimate: $\log_{10}$Body Mass = (3.380015 x $\log_{10}$Cranial Size) - 6.037849
Mean Estimate: $\log_{10}$Body Mass = (3.4347506 x $\log_{10}$Cranial Size) - 5.943518
Upper Estimate: $\log_{10}$Body Mass = (3.4894863 x $\log_{10}$Cranial Size) - 5.849188

PART F. RECONSTRUCTION OF JAW MOVEMENT DURING MASTICATION

The masticatory movement of *Vintana sertichi* was elucidated primarily from the orientation of wear striations on the occlusal surfaces of enamel and dentine, investigating the orientation of shearing crests (islets and synclines) on the molariform teeth, and the pattern of dentine erosion (identification of leading and trailing edges) across enamel-dentine transitions. For comparison, the wear patterns of extant caviomorph rodent species of comparable size were investigated (*Myocastor coypus*, *Cuniculus paca*, *Dasyprocta leporina*). The striation angles were measured directly on scanning electron microscope images using ImageJ (US National Institutes of Health, Bethesda, USA). The predominant direction of jaw movement was identified using the mean vector of all striation angle measurements computed with the RoseChartApp (written by P. Göddertz, Universität Bonn, Germany). The striation values were "corrected" in order to account for the degree of mesial or distal divergence of the tooth rows of each taxon.

Identification of Leading and Trailing Edges

Greaves (1973), Rensberger (1973), and Costa and Greaves (1981) demonstrated that the amount of dentine wear on occlusal surfaces of mammalian molars differs between the leading and trailing edges of an enamel crest, and that the asymmetrical wear of dentine can be used to infer the direction of masticatory movement. The dentine on the leading edge is excavated relatively deeply, producing a distinct step between enamel and dentine, whereas on the trailing edge the transition is smooth.

The mesial and mesiolingual sides of the enamel edges of the islets on the molariforms of *Vintana sertichi* show a distinct and prominent step between dentine and enamel. Such a step is caused by food particles trapped between the enamel edges of antagonistic upper and lower molariforms during movement of the dentary during the power stroke of the chewing cycle. The more deeply exposed dentine areas along the mesial and mesiolingual sides of the enamel islets are a result of abrasion (tooth-food interaction). In contrast, the distal and distobuccal sides of the enamel islets show no step between the enamel and dentine. As such, the leading edges were positioned mesially and mesiolingually on the upper molariforms of *V. sertichi* and the trailing edges distally and distobuccally.

The occlusal surfaces on the molars of the comparative caviomorph rodent sample also show asymmetrical excavation of dentine but with an arrangement that is directly opposite to that in *V. sertichi*.

Orientation of Shearing Crests

The major axes of the elliptical islets on the molariforms of *Vintana sertichi* are oriented buccolingually, almost perpendicular to the sagittal midline of the cranium (at angles of 70–83°). On those islets and synclines that are slightly curved, the concave side faces distally or distolabially and the convex sides mesially or mesiolingually. In contrast, the curved islets on the cheekteeth of the extant rodents *Myocastor coypus*, *Cuniculus paca*, and *Dasyprocta leporina* generally lie in the opposite orientation, with the concave sides facing mesiolingually and the concave sides facing distobuccally. Their long axes are oriented at angles of 48–57°, 60–97°, 80–97° relative to the sagittal plane, respectively.

Wear Striation Analysis

The wear striations detected on the enamel bands of the flat occlusal surfaces of the upper molariforms of *Vintana sertichi* reveal a mesiolingual-distobuccal orientation (mean = 70º). Some striations of identical orientation are also evident on the dentine. Taking the posterior convergence of the tooth rows into account, the value is ~62.5° for *Vintana*. *Myocastor coypus* and *Dasyprocta leporina* show nearly identical striation orientations (means = 51º and 49º); those on the upper molars of *Cuniculus paca* are oriented more mesiodistally (mean = 33º). The corrected values, accounting for the different degrees of posterior divergence of the tooth rows, are ~59.5° for *Myocastor coypus*, ~52° for *Dasyprocta leporina*, and ~40° for *Cuniculus paca*.

These three lines of evidence lead us to conclude that the lower jaw of *Vintana* moved from mesiolingual to distobuccal during the power stroke. In the comparative sample of caviomorph rodents, the opposite condition obtains, because lower jaw movement during the power stroke in these forms is from distobuccal to mesiolingual.

PART G. BIOMECHANICAL ANALYSIS OF MOMENTS AND BITE FORCES GENERATED BY PRIMARY JAW ADDUCTORS

Cranium and Lower Jaw Reconstruction

In order to predict muscle moments and bite forces in *Vintana sertichi*, the skull was reconstructed using software to extract (MIMICS v. 16.0, Materialise, Ann Arbor, MI, USA) and edit (GEOMAGIC STUDIO v. 12.0, Research Triangle Park, NC, USA) 3D surface images of each fragment from a stack of 1001 micro computed tomography (µCT) sections (648 x 690, slice thickness = 0.152 mm). Badly distorted regions of the cranium were mirrored and missing sections were interpolated based on the curvature of adjacent surfaces. In order to estimate the insertions of the primary masticatory muscles on the jaw, artist Lucille Betti-Nash (Stony Brook University) sculpted a clay model of a hypothetical dentary. The model was based on the dentary fragments of *Sudamerica ameghinoi* (MPEFCH 534; Pascual et al., 1999) and the unnamed Tanzanian gondwanatherian (NMT 02067; Krause et al., 2003), and on knowledge of other gondwanatherians (Krause et al., 1992; Krause and Bonaparte, 1993). The clay dentary was laser scanned (NextEngine 3D Scanner Model 2020i), and the scanned image mirrored and fused to form the lower jaw (ScanStudio HD 1.3.2). For comparison, we also created surface models of a cranium and jaws of *Myocastor coypus* from a stack of 958 µCT sections (slice thickness = 0.149 mm). *Myocastor coypus* is a large caviomorph rodent (~6.5 kg, Woods et al. 1992), whose molar teeth are superfically similar to the molariform teeth of *V. sertichi*.

Muscle Attachments and Force

The origins and insertions of the primary jaw adductors were identified on the *Vintana sertichi* and *Myocastor coypus* surface models based on anatomical descriptions of caviomorph rodents (Herring, 1976; Woods and Howland, 1979; Hautier and Saksiri, 2009; Cox and Jeffery, 2011), visible muscle markings on the cranium of *V. sertichi*, our knowledge of comparative anatomy, and reference to literature (e.g., Turnbull, 1970; Evans, 1993; Druzinsky et al., 2011). We used the areas of the muscle origins as a proxy for their relative contributions to total muscle force, and assigned an arbitrary value of 10 N of force per cm^2 of muscle origin. This resulted in a total of 887.2 N of force applied to the cranium of *V. sertichi* and 439.8 N of force applied to the cranium of *M. coypus*.

Muscle Vectors and Moments

The magnitude of muscle vectors and the moments they produce around the axis of the dentary-squamosal joint were predicted using the tangential traction option in the program BONELOAD v. 6.0 (Davis et al., 2010). The temporalis of *Myocastor coypus* was subdivided because it made a sharp turn as it wrapped around the posterior root of the zygomatic arch. The directions of all muscle vectors were defined by lines drawn between the 3D centroids of their origins and insertions. We ran BONELOAD with the jaws at two different gape angles, 2° and 20°. The former replicates biting when the teeth are in close proximity to one another, and the latter approximates the gape angle at which peak bite force occurs in rodents (Williams et al., 2009). We calculated bite forces by summing the moments of all of the muscles around the axis of the dentary-squamosal joint and dividing by the perpendicular distance from the axis to the incisors and 1st molar/molariform tooth.

Extended Data Figure 7 illustrates the relative contributions of each muscle that contributes more than 2% to the total moment about the dentary-squamosal joint axis at 2° and 20° gape angles in both species. There is a clear emphasis on net retraction of the jaw in *Vintana sertichi* via the temporalis muscle, and net protraction of the jaw in *Myocastor coypus* via the inferior portion of zygomaticomandibularis. Bite force was estimated to be more than twice as high in *V. sertichi* than in *M. coypus* during incisor biting at both gape angles, and more than 2.5 times as high during molar biting at the 20° gape angle. Interestingly, bite force was 4% higher in *V. sertichi* at 20° gape than at 2° gape, while bite force was 1% lower in *M. coypus* at 20° gape than at 2° gape. This may suggest that *V. sertichi* had a stronger emphasis on chewing than does *M. coypus* (Cox et al., 2011). The absolute distances between the incisors and between the molars were similar in the two species at the 20° gape angle (*M. coypus* incisors = 27 mm, molars = 15 mm; *V. sertichi* incisors = 24 mm, molars = 16 mm), suggesting that they could eat similarly-sized food items. *Myocastor coypus* is a generalized feeder that consumes aquatic vegetation, terrestrial grasses, shrubs, bark, roots and is known to damage trees (Woods et al., 1992).

PART H. SENSORY ANATOMY OF *VINTANA SERTICHI*

Orbital Diameter

Measurements of orbital diameter were taken using digital calipers. Orbital diameter was measured in the coronal plane as the linear distance between the dorsal-most surface of the zygomatic arch and the presumptive site of attachment for the postorbital ligament on the frontal bone. Due to crushing of the specimen and asymmetrical distortion of the left and right orbits, multiple measurements yielded a final estimated range of orbital diameters for *Vintana sertichi* of 30–32 mm. These low and high estimates of orbital diameter for *V. sertichi* were subsequently compared with morphometric data for living mammals in a bivariate plot of $\log_{10}$Cranial Size (x-axis) versus $\log_{10}$Orbital Diameter (y-axis). The extant comparative sample includes cranial morphometric data for 350 species from 14 therian orders provided in Kirk (2003) and Heesy (2003), as well as measurements taken from adult crania of the platypus (*Ornithorhynchus anatinus* [N = 1]: orbital diameter = 9.75; cranial length = 90.20 mm; cranial width = 39.00 mm) and short-beaked echidna (*Tachyglossus aculeatus* [N = 2]: orbital diameter = 12.98; cranial length = 111.85 mm; cranial width = 49.05 mm) using digital calipers.

Cochlear Canal Length

The right cochlear labyrinth of *Vintana sertichi* was reconstructed in Avizo 7.1 using high-resolution µCT scans of the basicranium (Nikon Metrology MCT225 industrial µCT scanner, Avonix Imaging, Plymouth, MN; 225 kV micro-focus reflection target x-ray tube, Perkin Elmer XRD 1621 AN3 ES detector; 1,287 slices; 1voxel = 29.7 μm^3). Total cochlear length, from the apical border of the fenestra vestibuli to the apex of the cochlear canal, was measured on the reconstructed surface using the SplineProbe tool in Avizo 7.1 following the procedures described in Ekdale (2013). Comparative data on cochlear length in 46 extant mammals were compiled from the published literature (West and Harrison, 1973; Burda et al., 1984; Greenwood, 1990; Ketten, 1992; Müller et al., 1993; Echteler et al., 1994; Kössl and Vater, 1995; Lange et al., 2004; Begall and Burda, 2006; Manoussaki et al., 2008; Coleman and Colbert, 2010). Measurements for living therians were based either on basilar membrane length or the length of the bony cochlear canal. Values for living monotremes were based on the length of the organ of Corti only and exclude the lagenar portion of the cochlear canal (Ladhams and Pickles, 1996). The cochlear canal of *Vintana* is shorter than those of extant monotremes, but this feature may be related to *Vintana*'s apparent lack of a macula lagena (based on the absence of both cochlear apical expansion and a canal for the lagenar nerve).

Body masses for extant species were taken from the same source as that providing cochlear length or from Silva and Downing (1995). Published measurements of cochlear canal length and estimated body mass were also compiled for 14 additional fossil genera (Hopson, 1964; Allin, 1986; Meng and Wyss, 1995; Ladhams and Pickles, 1996; Hurum, 1998b; Ladevèze et al., 2010; Rodrigues et al., 2013). For fossil sources that did not also provide data on body mass, body mass was estimated based on cranial length using the regression in Luo et al. (2004), following the method of Gingerich and Smith (1984). Because both basilar membrane length and cochlear volume are highly positively correlated with body mass (Kirk and Gosselin-Ildari, 2009), relative cochlear length was compared across taxa using a bivariate plot of $\log_{10}$Body Mass (x-axis) versus $\log_{10}$Cochlear Length (y-axis).

Semicircular Canal Radius of Curvature and Orthogonality

The left vestibular labyrinth of *Vintana* was reconstructed in Avizo 7.1 using µCT scans of the basicranium. Measurements of semicircular canal radius of curvature were made using the procedure described by Spoor and Zonneveld (1995). The procedures for calculating deviation (90dev) and variance (90var) from orthogonality follow Berlin et al. (2013) and Malinzak et al. (2012), respectively.

Mean semicircular canal radius of curvature in *Vintana* was examined relative to comparable data provided by Spoor et al. (2007) for 205 extant mammalian species. Because approximately 60% of the interspecific variation in semicircular canal radius of curvature in mammals may be explained by differences in body mass (Kemp and Kirk, 2014), *Vintana sertichi* was compared with extant species using a bivariate plot of $\log_{10}$Cranial Size (x-axis) versus $\log_{10}$Mean Canal Radius (y-axis).

PART I. PHYLOGENETIC ANALYSIS

Taxa and Primary Literature Sources for Character State Scoring

In addition to referring to the character state scorings of Mesozoic mammaliamorphs and basal cynodonts in Rougier et al. (1997, 2011), Kielan-Jaworowska and Hurum (1997, 2001), Hu (2006), O'Leary et al. (2013), and various versions of those by Z.-X. Luo (the most recent being those of Yuan et al., 2013; Zheng et al., 2013; Zhou et al., 2013), and also referring to various compilations (e.g., Lillegraven et al., 1979; Kielan-Jaworowska et al., 2004) and the specialized literature for enamel microstructure (Carlson and Krause, 1985; Fosse et al., 1985, 1991; Wood and Rougier, 2005), we utilized the following literature sources (arranged alphabetically by genus, or family in the case of Paulchoffatiidae, Plagiaulacidae, Tritheledontidae, and Tritylodontidae):

Adelobasileus—Lucas and Hunt, 1990; Lucas and Luo, 1993

Akidolestes—Li and Luo, 2006; Chen and Luo, 2013

Ambondro—Flynn et al., 1999

Amphilestes—Simpson, 1928; Kielan-Jaworowska et al., 2004

Amphitherium—Simpson, 1928; Butler and Clemens, 2001

Arboroharamiya—Zheng et al., 2013

Asfaltomylos—Rauhut et al., 2002; Martin and Rauhut, 2005

Asiatherium—Szalay and Trofimov, 1996

Asioryctes—Kielan-Jaworowska, 1975, 1977, 1981; Rougier et al., 1998; Horovitz, 2000; Horovitz and Sánchez-Villagra, 2003; Wible et al., 2009

Ausktribosphenos—Rich et al., 1997, 1999; Rich and Vickers-Rich, 2004; Rich, 2008

Bharattherium—Krause et al., 1997; Prasad et al., 2007; Wilson et al., 2007; Verma et al., 2012

Bienotherium—Young, 1947; Hopson, 1964; Cui and Sun, 1987

Bienotheroides—Sun, 1984, 1986; Sun and Li, 1985; Cui and Sun, 1987; Sun and Cui, 1989

Bishops—Rich et al., 2001

Bocatherium—Clark and Hopson, 1985

Catopsbaatar—Kielan-Jaworowska, 1974; Hurum, 1994, 1998a, 1998b; Kielan-Jaworowska and Gambaryan, 1994; Gambaryan and Kielan-Jaworowska, 1995; Wible and Rougier, 2000; Kielan-Jaworowska et al., 2002, 2005; Hurum and Kielan-Jaworowska, 2008

Chulsanbaatar—Kielan-Jaworowska, 1974; Kielan-Jaworowska et al., 1986; Hurum, 1994, 1998a, 1998b; Kielan-Jaworowska and Gambaryan, 1994; Gambaryan and Kielan-Jaworowska, 1995; Wible and Rougier, 2000

Cronopio—Rougier et al., 2011, 2012

Cynognathus—Seeley, 1895; Broili and Schröder, 1934; Abdala, 1996, 1999

Dasypus—Wible, 2010; personal observation

Deltatheridium—Gregory and Simpson, 1926; Kielan-Jaworowska, 1975; Rougier et al., 1998; Horovitz 2000; Horovitz and Sánchez-Villagra, 2003

Diademodon—Seeley, 1894; Watson, 1911, 1913; Brink, 1955

Didelphis virginiana—Wible, 1990; personal observation

Dryolestes—Martin, 1997, 1999, 2000; Schultz and Martin, 2011; Luo et al., 2011, 2012

Eomaia—Ji et al., 2002

Erinaceus—personal observation

Exaeretodon—Bonaparte, 1962, 1963, 1966; Abdala et al., 2002; Oliveira et al., 2007

Ferugliotherium—Bonaparte, 1986a, 1990; Krause et al., 1992; Krause, 1993; Kielan-Jaworowska and Bonaparte, 1996

Gobiconodon—Jenkins and Schaff, 1988; Kielan-Jaworowska and Dashzeveg, 1998; Rougier et al., 2001; Wang et al., 2001; Li et al., 2003; Meng et al., 2003; Yuan et al., 2009

Gomphos—Meng et al., 2004; Asher et al., 2005; personal observation

Gondwanatherium—Bonaparte, 1986b, 1988, 1990; Krause et al., 1992; Krause and Bonaparte, 1993; Koenigswald et al., 1999; Gurovich, 2006

Greniodon—Goin et al., 2012

Hadrocodium—Luo et al., 2001; Rowe et al., 2011

Haldanodon—Lillegraven and Krusat, 1991; Martin, 2005; Luo and Martin, 2007; Ruf et al., 2013

Haramiyavia—Jenkins et al., 1997; Butler, 2000

Henkelotherium—Krebs, 1991; Ruf et al., 2009

Henosferos—Rougier et al., 2007

Jeholodens—Ji et al., 1999

Kayentatherium—Sues, 1986

Kielantherium—Crompton and Kielan-Jaworowska, 1978; Dashzeveg and Kielan-Jaworowska, 1984; Lopatin and Averianov, 2007

Kokopellia—Cifelli and Muizon, 1997

Kryptobaatar—Kielan-Jaworowska, 1970; Kielan-Jaworowska et al., 1987; Kielan-Jaworowska and Gambaryan, 1994; Gambaryan and Kielan-Jaworowska, 1995; Wible and Rougier, 2000; Kielan-Jaworowska and Lancaster, 2004; Macrini, 2006

Lambdopsalis—Miao, 1986, 1988; Meng, 1992; Meng and Wyss, 1995; Wible and Rougier, 2000

Lavanify—Krause et al., 1997

Maotherium—Rougier et al., 2003; Ji et al., 2009

Megazostrodon—Crompton and Jenkins, 1968; Crompton, 1974; Jenkins and Parrington, 1976; Gow, 1986b

Morganucodon—Kermack et al., 1973, 1981; Parrington, 1973; Crompton, 1974; Jenkins and Parrington, 1976; Graybeal et al., 1989; Crompton and Luo, 1993; Rowe et al., 2011

Nemegtbaatar—Kielan-Jaworowska, 1974; Kielan-Jaworowska et al., 1986; Hurum, 1994, 1998a, 1998b; Kielan-Jaworowska and Gambaryan, 1994; Gambaryan and Kielan-Jaworowska, 1995; Wible and Rougier, 2000

Obdurodon—Archer et al., 1993; Musser and Archer, 1998

Oligokyphus—Kühne, 1956; Crompton, 1964; Luo and Sun, 1994

Ornithorhynchus— Zeller, 1989; Wible and Hopson, 1995; personal observation

Pappotherium—Butler, 1978; Davis and Cifelli, 2011

Paulchoffatiidae—we originally scored *Kuehneodon*, *Paulchoffatia*, *Meketichoffatia*, and *Pseudobolodon* individually but, since all except *Kuehneodon* are intentionally oversplit to identify upper or lower dentitions, we combined all four genera in the analysis; Hahn, 1969, 1971, 1977, 1978, 1981, 1985, 1987,1988; Lillegraven and Hahn, 1993; Hahn and Hahn, 1994, 1998, 2000, 2002, 2004, 2005, 2006; Wible and Rougier, 2000; Lazzari et al., 2010

Peramus—Simpson, 1928; Clemens and Mills, 1971; Rougier et al., 1998; Sigogneau-Russell, 1999; Davis, 2012

Plagiaulacidae

Bolodon—Simpson, 1928; Kielan-Jaworowska et al., 1987; Kielan-Jaworowska and Ensom, 1992; Hahn and Hahn, 2006

Plagiaulax—Simpson, 1928; Kielan-Jaworowska et al., 1987; Hahn and Hahn, 2004

Priacodon—Marsh, 1887; Simpson, 1925a, 1925b; Rasmussen and Callison, 1981; Rougier et al., 1996; Engelmann and Callison, 1998

Probainognathus—Romer, 1970; Luo and Crompton, 1994; Wible and Hopson, 1995

Prokennalestes—Kielan-Jaworowska and Dashzeveg, 1989; Sigogneau-Russell et al., 1992; Rougier et al., 1998; Wible et al., 2001

Pseudotribos—Luo et al., 2007b

Ptilodus—Granger and Simpson, 1929; Simpson, 1937; Szalay, 1965; Krause, 1982a, 1982b; Krause and Jenkins, 1983; Hopson et al., 1989; Krause and Kielan-Jaworowska, 1993; Wible and Rougier, 2000; Scott et al., 2002

Pucadelphys—Marshall and Muizon, 1995; Marshall and Sigogneau-Russell, 1995; Rougier et al., 1998; Horovitz, 2000; Horovitz and Sánchez-Villagra, 2003; Ladevèze and Muizon, 2007; Macrini et al., 2007b

Repenomamus—Li et al., 2001; Wang et al., 2001; Hu et al., 2005; Hu, 2006

Rugosodon—Yuan et al., 2013

Sinobaatar—Hu and Wang, 2002; Kusuhashi et al., 2009

Sinoconodon—Patterson and Olson, 1961; Zhang and Cui, 1983; Crompton and Sun, 1985; Crompton and Luo, 1993; Luo, 1994; Luo et al., 1995; Zhang et al., 1998

Sinodelphys—Luo et al., 2003

Steropodon—Archer et al., 1985

Sudamerica—Scillato-Yané and Pascual, 1984, 1985; Bonaparte et al., 1993; Koenigswald et al., 1999; Pascual et al., 1999; Gurovich, 2006, 2008; Gurovich and Beck, 2009

Taeniolabis—Broom, 1914; Granger and Simpson, 1929; Simpson, 1937; Simmons, 1987; Greenwald, 1988

Tanzanian taxon—Krause et al., 2003; O'Connor et al., in prep.

Teinolophos—Rich et al., 1999, 2001

Thomasia—Simpson, 1928; Sigogneau-Russell, 1989; Butler and MacIntyre, 1994; Butler, 2000; Hahn and Hahn, 2006

Thrinaxodon—Estes, 1961; Crompton, 1963; Jenkins, 1971; Fourie, 1974; Gow, 1985, 1986a; Abdala et al., 2013

Tinodon—Simpson, 1925c, 1929; Ensom and Sigogneau-Russell, 2000

Trapalcotherium—Rougier et al., 2009

Tribosphenomys—Meng and Wyss, 2001; Lopatin and Averianov, 2004; Meng et al., 2007

Trioracodon—Simpson, 1928, 1929; Kermack, 1963; Wible and Hopson, 1993; Rougier et al., 1996

Tritheledontidae

Pachygenelus—Gow, 1980, 2001; Hopson and Rougier, 1993; Wible and Hopson, 1993; Hopson, 1994; Luo and Crompton, 1994

Brasilitherium—Bonaparte et al., 2005; Martinelli and Bonaparte, 2011; Bonaparte, 2013; Rodrigues et al., 2013

Brasilodon—Bonaparte et al., 2005; Martinelli and Bonaparte, 2011; Bonaparte, 2013

Ukhaatherium—Novacek et al., 1997; Rougier et al., 1998; Horovitz, 2000, 2003; Horovitz and Sánchez-Villagra, 2003; Wible et al., 2009

Vincelestes—Bonaparte and Rougier, 1987; Rougier et al., 1992; Hopson and Rougier, 1993; Rougier, 1993; Sigogneau-Russell, 1999; Macrini et al., 2007a

Yanoconodon—Luo et al., 2007a

Yunnanodon—Cui, 1976; Cui and Sun, 1987; Luo and Wu, 1994; Luo, 2001

Zalambdalestes—Gregory and Simpson, 1926; Kielan-Jaworowska, 1978; Novacek et al., 1997, Wible et al., 2004, 2009

Zhangheotherium—Hu et al., 1997, 1998; Luo and Ji, 2005

Limitations in Scoring Certain Taxa

We have not been able to observe firsthand all relevant material of all taxa in our character matrix; these are simply the practical limitations of such a broad study of specimens housed in institutions around the world, some of them described very recently and some with limited accessibility. The scoring of some taxa (e.g., *Arboroharamiya*, *Cronopio*, *Rugosodon*) is therefore strictly based on the literature but is further limited by the fact that the specimens comprising those taxa are not yet described or illustrated in detail. In those cases, certain character states were scored only on the basis of scorings made by the original authors themselves. Even further limiting is the fact that the anatomy of certain taxa is disputed. In those cases where several critical aspects of morphology (e.g., dental formulae) are potentially misinterpreted, we chose to not include those taxa. As such, *Megaconus*, for instance, is not scored in this study pending more detailed description and resolution of identification of various aspects of its anatomy (Meng et al., in prep.). Similarly, we have not included the South American marsupial genera, *Groeberia* (from the Eocene) and *Patagonia* (from the Miocene) in this study. These two genera have recently been purported to be late-surviving gondwanatherians (Chimento et al., 2014). However, we do not find the evidence for this conclusion well-substantiated or convincing and nor can it be evaluated in a phylogenetic context without observing and scoring the original specimens (and those of various other marsupial taxa), all of which lies outside the scope of the present study.

Assumptions Concerning Tooth Homologies

For scoring purposes, assumptions concerning tooth homologies must be made in order to develop a reasonable number of characters. Such assumptions are particularly problematic in dealing with non-therian taxa such as haramiyidans, multituberculates, and gondwanatherians relative to therians. A general principle guiding our assumptions is that incisors and molars are lost in mammalian lineages from the ends of tooth series (e.g., Luckett, 1993); this is clearly not the case with regards to premolars in several taxa.

As such, we conservatively score the two upper incisors in *Vintana* as I1 and I2 (although they may be, as in derived multituberculates, I2 and I3; see below). We further score the incisors in

Tribosphenomys and *Gomphos* as permanent in the absence of evidence for a deciduous nature (Meng and Wyss, 2001; Meng et al., 2004). It is however likely, given their position within or at the base of Glires, that they retain deciduous incisors as adults, similar to the condition in modern rodents and lagomorphs. Exceptions certainly exist, however, and must be taken into account. In this analysis, we accept that basal multituberculates had three upper incisors: I1, I2, and I3 (e.g., Clemens and Kielan-Jaworowska, 1979; Simmons, 1993; Kielan-Jaworowska and Hurum, 2001; Kielan-Jaworowska et al., 2004). More derived multituberculates (cimolodontans) are assumed to have lost I1, leaving only I2 and I3, and thus indicating that multituberculates lost incisors from mesial to distal rather than distal to mesial.

Further, following the AToL Mammal Tree of Life coding strategy (O'Leary et al., 2013), we regard premolar teeth as having been lost from the middle (p3/P3), then mesially (p1/P1 or p2/P2). The penultimate and ultimate premolar positions are thus identified as p4/P4 and p5/P5. This will also pertain to multituberculates and haramiyidans despite the fact that it is generally accepted that both groups do not have more than four lower premolars, identified as p1–4 (e.g., Jenkins et al., 1997; Kielan-Jaworowska et al., 2004). In this study, we have not scored specific mesial or middle premolars in any taxa, and therefore, as for other taxa, we have scored the two penultimate and ultimate lower and upper premolars of multituberculates and haramiyidans as p4/P4 and p5/P5. We further assume that metatherians retain the deciduous ultimate premolar (DP5/dp5) in adults (O'Leary et al., 2013). Ultimate permanent premolar characters were therefore scored as inapplicable or unknown for taxa considered to be Metatheria in some analyses (*Asiatherium*, *Deltatheridium*, *Didelphis*, *Kokopellia*, *Pappotherium*, *Pucadelphys*, *Sinodelphys*).

Molar characters were only scored for tooth positions m1/m2 and M1/M2. Referring to and scoring a specific molar position is particularly problematic in basal cynodonts as premolars and molars cannot be clearly distinguished based on morphological criteria or replacement pattern (e.g., Crompton, 1963; Crompton and Jenkins, 1979; Gow, 1980, 1985; Luo et al., 2004; Martinelli and Bonaparte, 2011; Abdala et al., 2013). Thus, any premolar or molar character referring to a specific premolar/molar position was scored as inapplicable for *Thrinaxodon*, *Probainognathus*, and tritheledontids. Despite replacement of some "molariform postcanines" in *Sinoconodon* and *Gobiconodon* (Jenkins and Schaff, 1988; Zhang et al., 1998), scoring molar characters for these taxa seems justified. "Premolars" and "molars" are clearly morphologically differentiated in *Sinoconodon* (Zhang et al., 1998) and the "successor permanent tooth is similar to its deciduous predecessor in the complexity of molariform morphology" in *Gobiconodon* (Luo et al., 2004:166). Further, we scored dental characters for tritylodontids, to explicitly allow for testing of the relationships among tritylodontids, multituberculates, and gondwanatherians. This approach is partly justified because none of postcanines are replaced in tritylodontids. Tritylodontids have a sequential replacement in which they shed anterior postcanines while adding postcanines posteriorly (Kühne, 1956, Luo et al., 2004; Abdala et al., 2013).

For scoring purposes only, we make the assumption that the molariform cheek teeth and alveoli in the dentary of the gondwanatherian *Sudamerica* are for molars, and score them as m1, m2, m3, and m4. Micro-CT analysis of the dentary of the unnamed Tanzanian taxon (O'Connor et al., in prep.) suggests that it too housed four molariform teeth that, for scoring purposes, we will regard as molars. In the same way, we score the four upper molariform teeth in the holotype cranium of *Vintana sertichi* as molars, M1–M4. Nonetheless, in order to test the hypothesis proposed by Gurovich and Beck (2009) that the two mesial cheek tooth positions in the dentary of *Sudamerica* are molariform premolars, we ran an analysis in which the cheek-tooth series in each quadrant of these three taxa were comprised of only two molars, with the cheek teeth mesial to them being premolars (whether two, as in the lower dentitions of *Sudamerica* and the Tanzanian form, or three, as in the upper dentition of *Vintana*).

Systematic Characters and Character State Descriptions

Characters have been culled from various references including Rougier et al. (1997, 1998, 2007, 2011), Hopson and Kitching (2001), Luo et al. (2002, 2007a, 2007b, 2011), Hu (2006), Liu and Olson (2010), O'Leary et al. (2013), Wible et al. (2009), Yuan et al. (2013), Zheng et al. (2013), and Zhou et al. (2013). Characters specifically targeting relationships within multituberculates were obtained from Simmons (1993), Rougier et al. (1997), Kielan-Jaworowska and Hurum (1997, 2001), Gurovich and Beck (2009), and Yuan et al. (2013). Several dental characters targeting the relationships within Gondwanatheria were taken from Krause (in press). Furthermore, 12 newly developed characters (nos. 75, 83, 93, 109, 137, 164, 204, 239, 243, 253, 317, 440) were included.

Postcranium

1. Fusion of atlantal neural arch and intercentrum in adults:
   0) unfused
   1) fused
   Vintana = ?

2. Atlantal ribs in adults:
   0) present
   1) absent
   Vintana = ?

3. Fusion of dens to axis:
   0) unfused
   1) fused
   Vintana = ?

4. Ribs of axis in adults:
   0) free ribs present
   1) ribs fused to form transverse processes
   Vintana = ?

5. Postaxial cervical ribs in adults:
   0) free ribs present
   1) free ribs absent
   Vintana = ?

6. Thoracic vertebrae, number:
   1) ≤14
   2) ≥15
   Vintana = ?

7. Lumbar ribs:
   0) unfused to vertebrae
   1) synostosed to vertebrae to form transverse processes
   Vintana = ?

8. Interclavicle in adults:
   0) present
   1) absent

Vintana = ?

9. Contact relationships between interclavicle and sternal manubrium in adults:
   0) posterior end of interclavicle abuts anterior border of manubrium
   1) interclavicle broadly overlaps ventral side of manubrium
   Vintana = ?

10. Cranial margin of interclavicle:
    0) emarginated or flat
    1) with median process
    Vintana = ?

11. Sternoclavicular joint:
    0) immobile
    1) mobile
    Vintana = ?

12. Acromioclavicular joint:
    0) extensive articulation
    1) limited articulation
    Vintana = ?

13. Clavicle, curvature:
    0) boomerang-shaped
    1) slightly curved
    Vintana = ?

14. Scapula, supraspinous fossa:
    0) absent
    1) weakly developed, present only along part of scapula
    2) fully developed, present along entire anterodorsal border of scapula
    Vintana = ?

15. Scapula, acromion process:
    0) short, even with or behind glenoid
    1) hook-like, extending below glenoid
    Vintana = ?

16. Scapula, fossa or process for teres major muscle:
    0) absent
    1) present
    Vintana = ?

17. Procoracoid:
    0) present as free element
    1) fused to sternal apparatus in adults
    Vintana = ?

18. Procoracoid foramen:

0) present
1) absent
Vintana = ?

19. Coracoid:
0) large, with posterior process
1) small, without posterior process
Vintana = ?

20. Sternum, manubrium size relative to succeeding sternebrae:
0) large
1) small
Vintana = ?

21. Scapula, orientation of glenoid relative to plane or axis of scapula:
0) nearly parallel to long axis, facing posterolaterally
1) oblique to long axis, facing more posteriorly
2) perpendicular to long axis
Vintana = ?

22. Scapula, shape and curvature of glenoid:
0) saddle–shaped, oval, elongate
1) uniformly concave, more rounded in outline
Vintana = ?

23. Scapula, subscapular (vertebral) surface:
0) concave
1) flat
Vintana = ?

24. Humeral head:
0) subspherical, weakly inflected
1) spherical, strongly inflected
Vintana = ?

25. Humerus, intertubercular groove separating deltopectoral crest from lesser tubercle:
0) shallow, broad
1) narrow, deep
Vintana = ?

26. Humerus, size of lesser tubercle:
0) wider than greater tubercle
1) narrower than greater tubercle
Vintana = ?

27. Humerus, torsion between proximal and distal ends:
0) strong (>30°)
1) moderate (30–15°)
2) weak (<15°)

Vintana = ?

28. Humerus, ventral extension of deltopectoral crest or position of deltoid tuberosity:
    0) not extending beyond midpoint of humeral shaft
    1) extending ventrally (distally) past midpoint of humeral shaft
    Vintana = ?

29. Humerus, ulnar articulation on distal end:
    0) bulbous ulnar condyle
    1) incomplete trochlea with vestigial ulnar condyle in anterior view
    2) trochlea extending to anteroventral side
    Vintana = ?

30. Humerus, radial articulation on distal end:
    0) distinct and rounded condyle separated from ulnar articulation in anteroventral view of humerus
    1) radial articulation forms rounded condyle anteriorly but posterior surface nearly cylindrical
    2) capitulum, radial articulating structure forms continuous synovial surface with ulnar trochlea
    Vintana = ?

31. Humerus, entepicondyle and ectepicondyle:
    0) robust
    1) weak
    Vintana = ?

32. Humerus, rectangular shelf for supinator ridge extending from ectepicondyle:
    0) absent
    1) present
    Vintana = ?

33. Radius, styloid process:
    0) weak
    1) strong
    Vintana = ?

34. Scaphoid, enlargement with distomedial projection:
    0) absent
    1) present
    Vintana = ?

35. Hamate (unciform), size and shape:
    0) anteroposteriorly compressed (wider than longer in dorsal view)
    1) mediolaterally compressed (longer than wide in dorsal view)
    Vintana = ?

36. Acetabulum, dorsal margin:
    0) emarginated
    1) with complete rim
    Vintana = ?

37. Acetablum, internal sutures of ilium, ischium, and pubis in adults:
    0) unfused
    1) fused
    Vintana = ?

38. Ischiatic tuberosity:
    0) small or absent
    1) hypertrophied
    Vintana = ?

39. Epipubic bone:
    0) absent
    1) present
    Vintana = ?

40. Femur, proximal end:
    0) neck absent, head oriented dorsally
    1) neck present, head inflected medially
    Vintana = ?

41. Femur, fovea for acetabular ligament on femoral head:
    0) absent
    1) present
    Vintana = ?

42. Femur, orientation of greater trochanter:
    0) directed dorsolaterally
    1) directed dorsally
    Vintana = ?

43. Femur, position of lesser trochanter:
    0) on medial side of shaft
    1) on ventromedial or ventral side of shaft
    Vintana = ?

44. Femur, size of lesser trochanter:
    0) large
    1) small
    Vintana = ?

45. Femur, patellar groove:
    0) absent
    1) shallow, weakly developed
    2) well developed
    Vintana = ?

46. Tibia, proximolateral tubercle or tuberosity:
    0) large, hook–like
    1) indistinct

2) fused to fibula
Vintana = ?

47. Tibia, distal malleolus:
0) weak
1) distinct
Vintana = ?

48. Fibula, contact with distal end of femur:
0) present
1) absent
2) fibula contacts through fusion with tibia
Vintana = ?

49. Fibula, styloid process on distal end:
0) weak or absent
1) distinct
Vintana = ?

50. Fibula, contact with calcaneus:
0) extensive contact
1) reduced
2) absent
Vintana = ?

51. Astragalus, superposition over calcaneus:
0) slight or absent
1) astragalus partially superposed over calcaneus
2) astragalus completely superposed dorsally over calcaneus
Vintana = ?

52. Astragalus, orientation of sustentacular facet relative to horizontal plane of astragalus:
0) nearly vertical
1) oblique (<70°) to nearly horizontal
Vintana = ?

53. Astragalus, neck:
0) absent
1) weakly developed
2) well developed
Vintana = ?

54. Astragalus, trochlea:
0) absent
1) present
Vintana = ?

55. Calcaneus, distal end of tubercle:
0) short, without terminal swelling

1) elongate, with terminal swelling
Vintana = ?

56. Calcaneus, peroneal process:
0) absent
1) present
Vintana = ?

57. Calcaneus, shape of peroneal process:
0) ridge or flange
1) knob
Vintana = ?

58. Calcaneus, contact with cuboid:
0) on anterior end of calcaneus, cuboid aligned with long axis of calcaneus
1) on anteromedial aspect of calcaneus, cuboid skewed to medial side of long axis of calcaneus
Vintana = ?

59. Metatarsal III, alignment with calcaneus:
0) metatarsal III aligned with (or parallel to) long axis of calcaneus
1) metatarsal III oriented obliquely to long axis of calcaneus
Vintana = ?

60. Metatarsal V, alignment with cuboid:
0) metatarsal V offset from cuboid
1) metatarsal V far offset from cuboid, so that it contacts calcaneus
2) metatarsal V aligned with cuboid
Vintana = ?

61. Sesamoid bones in pedal flexor tendons:
0) absent
1) present
Vintana = ?

62. Sesamoid bones in pedal flexor tendons, pairing:
0) unpaired
1) paired

63. Tarsal spur:
0) absent
1) present
Vintana = ?

Cranial Proportions

64. Shape of snout in dorsal view:
0) incurved in front of zygomatic arches with anterior zygomatic root directed posterolaterally
1) incurved in front of zygomatic arches with anterior zygomatic root directed transversely

2) trapezoid, not incurved in front of anterior zygomatic root
Vintana = 0

65. Snout length (boundary at anterior orbital margin):
0) <50% of total skull length
1) ≥50% of skull length
Vintana = 0

66. Skull width:skull length ratio:
0) ≤0.8
1) ≥0.8
Vintana = 0

Premaxilla

67. Premaxillary internarial process:
0) complete bar (connected to nasal)
1) incomplete bar (ventral process present but not connected to nasal)
2) absent
Vintana = 1

68. Facial process of premaxilla, contact with nasal:
0) absent
1) present
Vintana = 0

69. Facial process of premaxilla, contact with lacrimal:
0) absent
1) present
Vintana = 1

Septomaxilla

70. Septomaxilla:
0) present
1) absent
Vintana = 0

71. Intranarial process of septomaxilla:
0) present
1) absent
Vintana = 0

72. Septomaxillary foramen at junction of maxilla and septomaxilla:
0) present
1) absent
Vintana = 1

73. Septomaxillary canal ventral to intranarial process:
    0) present
    1) absent
    Vintana = 1

74. Facial process of septomaxilla (in adult):
    0) large, plate-like
    1) small, splint-like
    Vintana = 0

75. Septomaxilla articulation with maxilla:
    0) present
    1) absent
    Vintana = 1

Nasal

76. Anterior nasal notch:
    0) present
    1) absent
    Vintana = 1

77. Nasals extending more anteriorly than lateral margin of external nasal aperture, forming a nasal overhang:
    0) absent
    1) present
    Vintana = 1

78. Posterior width of nasals:
    0) broader than width at mid-length
    1) narrower or equal to width at mid-length
    Vintana = 1

79. Nasal-frontal contact:
    0) medial process of frontals wedged between nasals
    1) anterolateral projection of frontals contacting nasals medially
    2) no distinct wedging between nasals and frontals
    Vintana = 0

80. Nasal-lacrimal contact vs. maxilla-frontal contact:
    0) nasal-lacrimal contact
    1) maxilla-frontal contact
    Vintana = 0

81. Foramina on dorsal surface of nasal:
    0) absent
    1) present

Vintana = 1

82. Number of pairs of nasal foramina:
    0) one
    1) two
    2) more than two
    Vintana = 0

83. Size of nasal foramina:
    0) small (typical of nutrient foramina)
    1) large (larger than typical nutrient foramina)
    Vintana = 1

Nasal Cavity

84. Ossified cribriform plate of ethmoid:
    0) absent
    1) present
    Vintana = 1

85. Posterior excavation of nasal cavity into bony sphenoid complex:
    0) absent
    1) present
    Vintana = 1

86. Posterior excavation of nasal cavity into bony sphenoid complex, connection to nasal cavity:
    0) confluent with nasal cavity
    1) partitioned from nasal cavity
    Vintana = 0

Maxilla

87. Contribution of maxilla to ventral wall of orbit (subtemporal margin), best seen in ventral view:
    0) absent, jugal forming subtemporal margin
    1) present
    Vintana = 1

88. Number of infraorbital foramina:
    0) numerous small foramina of similar size
    1) two or more, at least one of them large
    2) one
    Vintana = 1

89. Opening of primary infraorbital foramen visible in ventral view (Fi I sensu Hahn, 1985; not applicable to taxa with numerous small foramina):
    0) opens anteriorly, not visible in ventral view
    1) opens ventrally, visible in ventral view

Vintana = 1

90. Position of primary infraorbital foramen (Fi 1 sensu Hahn, 1985; not applicable to taxa with numerous small foramina):
0) dorsal to premolar region (or dorsal to diastema)
1) dorsal to molar region
Vintana = 0

91. Composition of posterior opening of infraorbital canal (maxillary foramen):
0) maxilla
1) maxilla, lacrimal
2) maxilla, lacrimal, palatine
Vintana = 0

Lacrimal

92. Outline of facial part of lacrimal:
0) large, a quarter to half of snout length
1) small, on orbital rim
2) excluded from face
Vintana = 0

93. Lacrimal contact with septomaxilla:
0) absent
1) present
Vintana = 1

94. Lacrimal foramen position:
0) on edge of orbit or on face
1) within orbit
Vintana = 1

95. Lacrimal foramen number:
0) two
1) one
Vintana = 1

Prefrontal

96. Prefrontal:
0) present
1) absent
Vintana = 1

Palate

97. Shape of incisive foramen:
    0) small, round to oval
    1) intermediate, elongate
    2) very large within palatal fossa
    Vintana = 0

98. Posterior edge of incisive foramen:
    0) formed by maxilla
    1) formed by premaxilla
    Vintana =1

99. Palatine-premaxilla contact:
    0) absent, maxillae contact in midline
    1) present, maxillae do not contact in midline
    Vintana = 1

100. Thickenings in palatal process of premaxilla:
    0) absent
    1) present
    Vintana = 0

101. Ridge between palate and lateral walls of premaxilla:
    0) absent
    1) present
    Vintana = 0

102. Length of bony secondary palate relative to tooth row:
    0) terminating anterior to posterior end of tooth row
    1) termination level with posterior end of tooth row
    2) extending posterior to end of tooth row
    Vintana = 0

103. Palatine, length of palatal process compared to total length of bony palate (measured from choana to incisive foramen):
    0) ≤50% of total length of palate
    1) >50% of total length of palate
    Vintana = 0

104. Palatal vacuities
    0) absent
    1) present
    Vintana = 0

105. Minor palatine foramen:
    0) absent
    1) present
    Vintana = 0

106. Ventral opening of minor palatine foramen:

0) encircled by pterygoid (and ectopterygoid if present) in addition to palatine
1) encircled by palatine and maxilla
2) encircled completely by palatine
Vintana = inapplicable

107. Major palatine foramina:
0) present
1) absent
Vintana = 1

108. Postpalatine torus:
0) absent
1) present
Vintana = 0

109. Alisphenoid extending medial to tooth row onto palate:
0) absent
1) present
Vintana = 0

Orbit and Sidewall of Braincase (Zygomatic Arch, Jugal, Maxilla)

110. Jugal contribution to zygomatic arch:
0) jugal well-developed, forming most of zygomatic arch
1) jugal reduced
Vintana = 0

111. Reduced jugal:
0) not restricted, forming middle part of zygomatic arch
1) restricted to medial side of zygomatic arch
2) restricted to dorsal side of zygomatic arch
Vintana = inapplicable

112. Anterior part of jugal:
0) extends onto facial part of maxilla, forms part of anterior orbital rim
1) does not reach facial part of maxilla, excluded from anterior orbital rim
Vintana = 0

113. Posterior part of jugal:
0) contributes to squamosal glenoid
1) borders on but does not contribute to squamosal glenoid
2) terminates anterior to squamosal glenoid
Vintana = 1

114. Maximum vertical depth of zygomatic arch relative to length of skull:
0) 10–20%
1) <10%
2) >20%

Vintana = 2

115. Location of anterior zygomatic root (as marked by its posterior edge):
0) anterior to ultimate premolar
1) at ultimate premolar or at premolar/molar junction
2) at molar level
3) posterior to tooth row
Vintana = 2

116. Palatine, orbital exposure:
0) absent
1) present
Vintana = 1

117. Palatine, orbital process contact with frontal:
0) absent
1) present
Vintana = 1

118. Frontal, orbital process contact with maxilla within orbit:
0) absent
1) present
Vintana = 0

119. Postorbital:
0) present
1) absent
Vintana = 1

120. Postorbital process:
0) absent or very small
1) large
Vintana = 0

121. Position of postorbital process:
0) on frontal
1) on parietal
2) on postorbital
Vintana = 0

122. Supraorbital crest:
0) absent
1) present
Vintana = 0

123. Development of orbitosphenoid:
0) orbitosphenoid not ossified, large orbital vacuity present
1) small ossified orbitosphenoid, sizable orbital vacuity present
2) orbitosphenoid closes orbital vacuity

Vintana = 2

124. Alisphenoid-frontal contact:
  0) present
  1) absent
  Vintana = 0

125. Alisphenoid-frontal contact, extent:
  0) anterodorsal corner of alisphenoid contacts posteroventral corner of frontal (frontal-parietal suture)
  1) approximately one-half of dorsal edge of alisphenoid contacts frontal
  Vintana = 0

126. Exit for mandibular division of trigeminal nerve:
  0) between anterior lamina and alisphenoid
  1) multiple foramen within anterior lamina in addition to foramen between anterior lamina and alisphenoid
  2) within anterior lamina
  3) largely within alisphenoid
  Vintana = 0

127. Number of exit(s) for mandibular branch of trigeminal nerve:
  0) one
  1) two or more
  Vintana = 0

128. Orbitotemporal groove/canal:
  0) orbitotemporal groove present on lateral side of braincase
  1) intramural or endocranial, with anterior opening of orbitotemporal canal present
  2) absent
  Vintana = 1

Squamosal and Glenoid Region

129. External size of cranial moiety of squamosal:
  0) narrow
  1) broad
  Vintana = 0

130. Participation of cranial moiety of squamosal in braincase:
  0) does not participate in endocranial wall of braincase
  1) participates in endocranial wall of braincase
  Vintana = 0

131. Neck between glenoid fossa and cranial moiety of squamosal:
  0) absent
  1) present
  Vintana = 1

132. Position of craniomandibular joint (center of articular surface):
    0) posterior or lateral to level of fenestra vestibuli
    1) anterior to level of fenestra vestibuli
    Vintana = 1

133. Orientation of glenoid fossa for dentary condyle:
    0) on inner side of zygoma, facing ventromedially
    1) on platform of zygoma, facing ventrally
    Vintana = 1

134. Outline of glenoid fossa:
    0) subcircular
    1) oval, long axis anteroposterior
    2) oval, long axis mediolateral
    Vintana =1

135. Contour of glenoid fossa:
    0) concave
    1) flat
    2) convex
    Vintana =1

136. Postglenoid process:
    0) absent
    1) present as distinctive, ventrally projecting process
    Vintana = 0

137. Postglenoid region extending posteriorly into postglenoid shelf:
    0) absent
    1) present
    Vintana = 1

138. Entoglenoid process on squamosal:
    0) absent or vestigial
    1) present
    Vintana = 0

139. Postglenoid foramen within squamosal:
    0) absent
    1) present
    Vintana = 0

140. Medial margin of glenoid fossa:
    0) formed entirely by squamosal
    1) with contribution from alisphenoid
    Vintana = 0

Pterygoid-Basisphenoid Region

141. Entopterygoid crest, composition:
 0) palatine, pterygoid
 1) palatine, alisphenoid
 2) maxilla, pterygoid
 Vintana = 2

142. Pterygopalatine ridge:
 0) present
 1) absent
 Vintana = 0

143. Transverse process of pterygoid:
 0) present, massive
 1) present as hamulus
 2) greatly reduced or absent
 Vintana = 0

144. Left/right pterygoid contact at midline:
 0) present
 1) absent
 Vintana = ?

145. Interpterygoid vacuity:
 0) present
 1) absent
 Vintana = 1

146. Ectopterygoid bone:
 0) present
 1) absent
 Vintana = 1

147. Mesocranial width anterior to basisphenoid:
 0) width at choanae narrower than width of basisphenoid
 1) width at choanae subequal to or broader than width of basisphenoid
 Vintana = 0

148. Vault of basipharyngeal passage near pterygoid-basisphenoid junction:
 0) roof of pharynx V-shaped in transverse section, narrowing toward basisphenoid
 1) roof of pharynx U-shaped in transverse section
 Vintana = 0

Ear Region

149. Basisphenoid wing on ventral aspect of skull:
 0) present, overlapping part of or whole cochlear housing

1) absent
Vintana = 1

150. Prootic and opisthotic fusion:
0) absent
1) present
Vintana = 1

151. Relationship of pars cochlearis to lateral lappet (muscular tubercle) of basioccipital:
0) pars cochlearis entirely covered by basioccipital
1) pars cochlearis partially covered by basioccipital
2) pars cochlearis fully exposed
Vintana = 1

152. Ventromedial surface of pars cochlearis:
0) flat
1) inflated, convex
Vintana = 1

153. Ventral outline and morphology of pars cochlearis:
0) triangular
1) elongate, cylindrical
2) oval–shaped, bulbous
Vintana = 1

154. Cochlea:
0) short, uncoiled
1) elongate canal, straight or slightly curved
2) elongate canal, partly coiled >270°
3) coiled at least 360°
Vintana = 1

155. Internal acoustic meatus cribriform plate:
0) absent
1) present
Vintana = 1

156. Internal acoustic meatus, depth:
0) shallow, depth less than maximum width
1) deep, depth greater than maximum width
Vintana = 1

157. Primary bony lamina within cochlear canal:
0) absent
1) present
Vintana = 1

158. Secondary bony lamina within cochlear canal:
0) absent

1) present
Vintana = 1

159. Crista interfenestralis:
0) horizontal, extending to base of paroccipital process
1) vertical, delimiting back of promontorium
Vintana = 1

160. Post-promontorial tympanic recess:
0) absent
1) present
Vintana = 1

161. Caudal tympanic process of petrosal:
0) absent
1) present
Vintana = 1

162. Caudal tympanic process of petrosal, shape:
0) continuous crest
1) notched
Vintana = 0

163. Tympanic opening for prootic canal:
0) present
1) absent
Vintana = 1

164. Endocranial opening for prootic canal:
0) absent
1) present
Vintana = 1

165. Prootic canal confluent with pterygoparoccipital foramen (foramen for ramus superior; tympanic opening of ventral ascending canal):
0) absent
1) present
Vintana = inapplicable

166. Bony floor anterior to tympanic aperture of prootic canal and/or primary facial foramen:
0) absent
1) present, extending length of pars cochlearis
2) present, extending half length of pars cochlearis
Vintana = 1

167. Anteroventral opening of cavum epiptericum:
0) large opening (approximately same length as pars cochlearis)
1) small opening (less than length of pars cochlearis)
2) absent

Vintana = 2

168. Flooring of geniculate ganglion by bony floor of petrosal:
0) absent
1) present
Vintana = 1

169. Cavum supracochleare for geniculate ganglion:
0) confluent with cavum epiptericum
1) separated by at least partial bony wall
Vintana = 1

170. Quadrate ramus of alisphenoid:
0) present, forming rod overlapping anterior part of lateral flange
1) present, mostly laminar process in vicinity of foramen ovale
2) absent
Vintana = 1

171. Tympanic process of alisphenoid:
0) absent or vestigial
1) present
Vintana = 0

172. Ectopterygoid process of alisphenoid:
0) absent
1) present
Vintana = 1

173. Anterior part of lateral flange:
0) present
1) vestigial or absent
Vintana = 0

174. Orientation of anterior part of lateral flange:
0) horizontal shelf
1) ventrally directed
2) medially directed, contacting promontorium
Vintana = 1

175. Vascular foramen in posterior part of lateral flange anterior to pterygoparoccipital foramen:
0) present
1) absent
Vintana = 1

176. Relationship of lateral flange to anterior paroccipital process (crista parotica):
0) widely separated
1) narrowly separated
2) continuous bone formed by petrosal
Vintana = 2

177. Paroccipital process of petrosal:
   0) no ventral projection below level of surrounding structures
   1) projecting ventrally below level of surrounding structures
   Vintana = 1

178. Morphological differentiation of anterior paroccipital region:
   0) anterior paroccipital region indistinct from surrounding structures
   1) anterior paroccipital region bulbous, distinctive from surrounding structures
   2) anterior paroccipital region with distinct crista parotica
   Vintana = 2

179. Epitympanic recess:
   0) absent
   1) present
   Vintana = 1

180. Fossa incudis:
   0) continuous with epitympanic recess
   1) separate from epitympanic recess
   Vintana = ?

181. Epitympanic recess size:
   0) subequal to fossa incudis
   1) larger than fossa incudis
   Vintana = ?

182. Relationship of squamosal on paroccipital process:
   0) squamosal covers entire paroccipital region
   1) no squamosal cover of anterior paroccipital region
   2) squamosal covering part of paroccipital region, but not crista parotica (squamosal wall and crista parotica separated by epitympanic recess)
   Vintana = 1

183. Medial process of squamosal directed toward foramen ovale:
   0) absent
   1) present
   Vintana = 0

184. Thickened rim of fenestra vestibuli:
   0) present
   1) absent
   Vintana = 1

185. Stapedial artery sulcus on pars cochlearis:
   0) absent
   1) present
   Vintana = 0

186. Transpromontorial sulcus for internal carotid artery on pars cochlearis:
 0) absent
 1) present
 Vintana = 0

187. Carotid foramen:
 0) present
 1) absent
 Vintana = 0

188. Carotid foramen position:
 0) within basisphenoid
 1) at junction of basisphenoid and petrosal
 2) through opening of cavum epiptericum
 Vintana = 1

189. Pterygoparoccipital foramen (foramen for ramus superior of stapedial artery; tympanic opening of ventral ascending canal):
 0) present
 1) absent
 Vintana = 0

190. Pterygoparoccipital foramen, morphology:
 0) laterally open notch
 1) foramen enclosed by petrosal or squamosal or both
 Vintana = 1

191. Pterygoparoccipital foramen, position relative to fenestra vestibuli:
 0) posterior or lateral to level of fenestra vestibuli
 1) anterior to level of fenestra vestibuli
 Vintana = 1

192. Separation of fenestra cochleae/perilymphatic foramen from jugular foramen:
 0) within same depression
 1) separated
 Vintana = 1

193. Jugular fossa, size:
 0) small, shallow
 1) large, deep
 Vintana = 0

194. Jugular foramen size relative to fenestra cochleae/perilymphatic foramen (applicable only to those taxa with jugular foramen fully separated from fenestra cochleae/perilymphatic foramen):
 0) jugular foramen subequal to fenestra cochleae/perilymphatic foramen
 1) jugular foramen larger than fenestra cochleae/perilymphatic foramen
 Vintana = 0

195. Channel of perilymphatic duct:

0) open channel and sulcus
1) channel partially or fully enclosed
2) no indication
Vintana = 0

196. Tensor tympani fossa on petrosal:
0) indistinct or very shallow
1) deep recess on lateral trough/tegmen tympani
Vintana = 0

197. Fossa for stapedius muscle:
0) absent
1) present
Vintana = 1

198. Hypoglossal foramen:
0) confluent with jugular foramen or sharing depression with jugular foramen
1) separate from jugular foramen
Vintana = 1

199. Number of hypoglossal foramina:
0) one
1) two
Vintana = 1

200. Hiatus Fallopii:
0) on tympanic surface of petrosal
1) at anterior edge of petrosal
2) endocranial
Vintana = 2

201. Tympanohyal relationship with pars cochlearis:
0) not contacting
1) contacting
Vintana = 1

202. Tympanohyal fusion with pars cochlearis (only applicable for taxa with contact):
0) not fused to petrosal
1) fused to petrosal
Vintana = 0

203. Pila antotica:
0) present
1) absent (in adults)
Vintana = ?

204. Extent of ossification of pila antotica
0) present as complete bar
1) only ventromedial part ossified

Vintana = ?

205. Sigmoid sinus sulcus:
0) present
1) absent
Vintana = ?

206. Sigmoid sinus sulcus, extent:
0) extends to jugular foramen
1) extends to foramen magnum
Vintana = ?

207. Inferior petrosal sinus:
0) intrapetrosal
1) intramural
2) endocranial
3) no indication
Vintana = 3

Ear Ossicles

208. Shape of incudo-mallear (quadrate-articular) contact:
0) trochlear surface on incus
1) trough or saddle–shaped contact on incus
2) flat surface on incus
Vintana = ?

209. Incus (quadrate) neck, separation of dorsal plate and trochlea of quadrate (representing differentiation between body and crus breve of incus):
0) absent
1) present
Vintana = ?

210. Crus longum (stapedial process) of incus (quadrate):
0) absent
1) present
Vintana = ?

211. Crus breve (dorsal plate) of incus (quadrate):
0) broad plate
1) pointed triangle
2) reduced
Vintana = ?

212. Incus (quadrate), angle of crus breve (dorsal plate) to crus longum (stapedial process):
0) alignment or obtuse angle between crus longum and crus breve
1) perpendicular
2) acute angle of crus breve and crus longum

Vintana = ?

213. Primary suspension of incus (quadrate) on basicranium:
    0) by squamosal and quadratojugal
    1) by squamosal only
    2) by petrosal (either by preserved direct contact of incus or by inference from presence of well-defined crista parotica)
    Vintana = 2

214. Quadratojugal notch in squamosal:
    0) present
    1) absent
    Vintana = 1

215. Shape of stapes:
    0) columnar
    1) columelliform
    2) triangular
    3) bicrurate
    Vintana = ?

216. Stapedial foramen:
    0) well-developed
    1) vestigial or absent
    Vintana = ?

217. Malleus (articular) and gonial (prearticular):
    0) not fused
    1) at least partially fused
    Vintana = ?

218. Mallear neck:
    0) absent
    1) present
    Vintana = ?

219. Length of mallear manubrium:
    0) shorter than combined width of surangular and prearticular anterior to incudo-malleolar joint
    1) longer than combined width of surangular and prearticular
    Vintana = ?

220. Thickness of mallear manubrium:
    0) robust
    1) gracile
    Vintana = 1

221. Ectotympanic (angular) size/shape:
    0) plate-like
    1) curved, rod-like

2) ring-shaped
3) slightly expanded (fusiform)
4) expanded
5) tube-like
Vintana = ?

222. Angle of the ectotympanic (angular) to skull base:
0) primarily vertical
1) primarily oblique
2) primarily horizontal
Vintana = ?

223. Anterior process of ectotympanic (angular):
0) present
1) absent
Vintana = ?

224. Position/orientation of incisura tympanica:
0) posteroventral
1) posterior
2) posterodorsal
3) dorsal
Vintana = ?

Cranial Roof

225. Anterior extension of frontal:
0) posterior to anterior border of orbit
1) anterior to orbit but posterior to anterior tip of lacrimal
2) anterior to lacrimal
Vintana = 1

226. Parietal foramen:
0) present
1) absent
Vintana = 1

227. Morphology of frontal-parietal suture in dorsal view:
0) V-shaped, apex directed posteriorly
1) U-shaped, convex posteriorly
2) U-shaped, convex anteriorly
3) roughly transverse
Vintana = 2

228. Contact between nasals and parietals:
0) absent
1) present
Vintana = 0

229. Sagittal crest:
   0) prominently developed
   1) weakly developed
   2) absent
   Vintana = 0

Occipital Region

230. Posterior opening of posttemporal canal:
   0) present
   1) absent
   Vintana = 0

231. Position of posterior opening of posttemporal canal:
   0) at junction of petrosal, squamosal, and tabular
   1) between petrosal and squamosal
   2) within petrosal
   3) between petrosal and tabular
   4) within tabular
   Vintana = 2

232. Ascending vascular canal (for ramus superior of stapedial artery) in temporal region:
   0) open groove
   1) intramural
   2) endocranial
   3) absent
   Vintana = 1

233. Orientation of ventral ascending canal:
   0) vertical
   1) oblique
   Vintana = 1

234. Nuchal (=lambdoid) crest:
   0) crest overhanging concave or straight occipital plate
   1) weak crest with convex dorsal part of occipital plate
   Vintana = 0

235. Interparietal:
   0) present as separate element in adults
   1) absent as separate element in adults
   Vintana = 0

236. Tabular bone:
   0) present
   1) absent
   Vintana = 0

237. Suture separating basioccipital and exoccipital:
    0) present
    1) absent
    Vintana = 1

238. Suture separating exoccipital and supraoccipital:
    0) present
    1) absent
    Vintana = 1

239. Dorsal extent of occipital bone on occiput:
    0) ≤ one-half height of occiput
    1) > one-half height of occiput
    Vintana = 0

240. Position of occipital condyles relative to foramen magnum:
    0) at ventrolateral corners of foramen
    1) lateral to foramen
    Vintana = 0

241. Occiput slope:
    0) occiput slopes posterodorsally, or vertically from occipital condyles
    1) occiput slopes anterodorsally from occipital condyles
    Vintana = 0

Cranial Vault and Brain Endocast

242. External bulging of braincase in parietal region:
    0) absent
    1) expanded, parietal part of cranial vault wider than frontal part, but expansion does not extend to lambdoidal region
    2) greatly expanded, expansion of cranial vault extends to lambdoidal region
    Vintana = 1

243. Endocast flexure, measured as acute angle between two lines, one through olfactory bulb and circular fissure, and other through foramen magnum and pituitary gland:
    0) >25°
    1) ≤25°
    Vintana = 0

244. Percentage of endocast composed of olfactory bulb casts:
    0) >12%
    1) 6–12%
    2) <6%
    Vintana = 0

245. Circular fissure (separating olfactory bulbs from cerebral hemispheres) on endocast:

0) absent
1) well defined
Vintana = 1

246. Lateral extent of cerebral hemisphere cast:
0) most lateral point of cerebral cast medial to or even with parafloccular cast
1) cerebral cast clearly extends laterally beyond parafloccular cast
Vintana = 0

247. Ossified tentorium septum:
0) present
1) absent
Vintana = 1

248. Overall size of vermis:
0) small
1) large
Vintana = 1

249. Subarcuate fossa:
0) present
1) absent
Vintana = 0

250. Subarcuate fossa, depth:
0) deep
1) shallow
Vintana = 1

251. Subarcuate fossa position relative to internal acoustic meatus:
0) posterodorsal
1) dorsal
Vintana = 0

252. Percent of endocast composed by cava epipterica:
0) >0.5%
1) ≤0.5%
Vintana = 0

Mandible

253. Dentary shape (applicable only to those taxa with a dentary-squamosal joint):
0) long and shallow (depth below m1 less than one-third length)
1) short and deep (depth below m1 equal to or greater than one-third length)
Vintana = ?

254. Dentary symphysis:
0) fused

1) unfused
Vintana = ?

255. Symphysis orientation:
0) vertical
1) oblique or nearly horizontal
Vintana = ?

256. Mental foramen, morphology:
0) multiple small perforations
1) well-developed foramen or foramina
Vintana = ?

257. Mental foramina, number (only applicable in taxa with well-developed foramina):
0) one
1) two
2) three
3) four
4) five or more
Vintana = ?

258. Anterior-most mental foramen, vertical position:
0) at ventral margin of mandible
1) at midline of mandible
2) at dorsal margin of mandible, close to tooth row
Vintana = ?

259. Anterior-most mental foramen, anteroposterior position:
0) below incisors or canine
1) below mesial premolars (p1, p2) or diastema
2) more posterior
Vintana = ?

260. Postdentary trough, behind tooth row:
0) present
1) absent
Vintana = ?

261. Meckelian groove in adults:
0) present
1) absent
Vintana = ?

262. Curvature of Meckelian groove in adult, under tooth row:
0) parallel to ventral border of mandible
1) convergent to ventral border of mandible
Vintana = ?

263. Groove for replacement dental lamina:

0) present
1) absent
Vintana = ?

264. Angular process:
0) absent
1) present
Vintana = ?

265. Angular process orientation:
0) not posteriorly projecting, possibly slightly inflected
1) straight, posteriorly directed
2) transversely flaring
3) strongly medially inflected
Vintana = ?

266. Anteroposterior position of angular process relative to dentary condyle:
0) anterior position, angular process below main body of coronoid process
1) posterior position, angular process placed at same level as posterior border of coronoid process
Vintana = ?

267. Vertical position of angular process:
0) low, at or near level of ventral border of mandibular horizontal ramus
1) high, at or near level of molar alveolar line
Vintana = ?

268. Medial concavity (fossa for reflected lamina) on dentary angular process:
0) present
1) absent
Vintana = ?

269. Coronoid bone, or its attachment scar, in adults:
0) present
1) absent
Vintana = ?

270. Medial pterygoid ridge or shelf along ventral border of body of mandible:
0) absent
1) present
Vintana = ?

271. Medial pterygoid ridge or shelf depth:
0) forming distinct crest
1) medially expanded, forming deep pterygoid fossa
Vintana = ?

272. Medial pterygoid ridge or shelf posterior direction:
0) directed to angular process
1) reaching dentary condyle via low crest

Vintana = ?

273. Position of mandibular foramen:
0) below or near base of anterior border of coronoid process
1) posterior to anterior border of coronoid process
Vintana = ?

274. Ventral border of masseteric fossa:
0) absent
1) present
Vintana = ?

275. Ventral border of masseteric fossa, extent:
0) low crest
1) well-defined crest
Vintana = ?

276. Crest of masseteric fossa along anterior border of coronoid process:
0) absent or weakly developed
1) present as distinct anterior border
Vintana = ?

277. Masseteric foramen:
0) absent
1) present
Vintana = ?

278. Mylohyoid process at level of anterior border of coronoid process:
0) absent
1) present
Vintana = ?

279. Dentary peduncle:
0) present
1) absent
Vintana = ?

280. Dentary condyle direction:
0) posteriorly directed, forms angle of ≤35º to alveolar margin
1) vertically directed, forms angle of >35º to alveolar margin
Vintana = ?

281. Shape and relative size of dentary articulation:
0) small, dorsoventrally compressed
1) condyle massive, bulbous, transversely broad in dorsal view
2) condyle mediolaterally narrow, vertically deep, forming broad arc in lateral outline, either ovoid or triangular in posterior view
Vintana = ?

282. Position of dentary condyle relative to vertical level of postcanine alveoli:
   0) below or about same level as postcanine alveoli
   1) above level of postcanine alveoli
   Vintana = ?

283. Tilting of coronoid process of dentary measured as angle between anterior border of coronoid process and horizontal alveolar line of all molars:
   0) coronoid process strongly reclined, forming obtuse angle greater than 145°
   1) coronoid process less reclined, 135–145°
   2) coronoid process less than vertical, 115–135°
   3) coronoid process near vertical, 95–115°
   Vintana = ?

284. Retromolar space at least half-length of ultimate molar:
   0) absent
   1) present
   Vintana = ?

285. Alignment of ultimate molar to anterior margin of coronoid process:
   0) ultimate molar medial to coronoid process (observation of ultimate molar completely obstructed by coronoid process in lateral view)
   1) ultimate molar in alignment with, or mesial to, anterior margin of coronoid process (some portion or all of ultimate molar visible anterior to coronoid process in lateral view)
   Vintana = ?

Dentition

286. Tooth implantation:
   0) subthecodont
   1) thecodont
   Vintana A = 1
   Vintana B = 1

287. Replacement of at least some distal postcanines:
   0) present
   1) absent
   Vintana A = ?
   Vintana B = ?

288. Distal migration of postcanines, loss of mesial and addition of distal postcanines:
   0) present
   1) absent
   Vintana A = ?
   Vintana B = ?

289. Diastema between I2 and I3 (applicable only if I3 present):
   0) absent
   1) present

Vintana A = inapplicable
Vintana B = inapplicable

290. Diastema distal to ultimate upper incisor:
0) absent
1) present
Vintana A = 1
Vintana B = 1

291. Diastema distal to upper canine (only applicable if canine present):
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

292. Diastema separating any upper premolars (distance equal or larger than half-length of mesial premolar):
0) absent
1) present
Vintana A = inapplicable
Vintana B = 0

293. Diastema distal to ultimate lower incisor:
0) absent
1) present
Vintana A = ?
Vintana B = ?

294. Diastema distal to lower canine (only applicable if canine present):
0) absent
1) present
Vintana A = ?
Vintana B = ?

Incisors

295. Number of lower incisors in each quadrant:
0) five
1) four
2) three
3) two
4) one
5) none
Vintana A = ?
Vintana B = ?

296. Number of upper incisors in each quadrant:
0) five

1) four
2) three
3) two
4) one
5) none
Vintana A = 3
Vintana B = 3

297. I1 gliriform:
0) absent
1) present
Vintana A = 1
Vintana B = 1

298. I2 gliriform:
0) absent
1) present
Vintana A = 1
Vintana B = 1

299. Position of upper incisors:
0) all implanted at or near margin of palate
1) distal incisor implanted medial to margin of palate
Vintana A = 0
Vintana B = 0

300. Enamel covering of I1:
0) covers whole crown
1) restricted to buccal surface of crown
Vintana A = ?
Vintana B = ?

301. Enamel covering of I2:
0) covers whole crown
1) restricted to buccal surface of crown
Vintana A = ?
Vintana B = ?

302. Number of cusps on I2:
0) multiple cusps
1) single cusp
Vintana A = ?
Vintana B = ?

303. Number of cusps on I3:
0) multiple cusps
1) single cusp
Vintana A = inapplicable
Vintana B = inapplicable

304. Staggered lower incisors (only applicable to taxa with more than one incisor):
0) absent
1) present
Vintana A = ?
Vintana B = ?

305. i1 gliriform:
0) absent
1) present
Vintana A = ?
Vintana B = ?

306. Enamel covering of i1 crown:
0) covers whole crown
1) restricted to buccal surface of crown
Vintana A = ?
Vintana B = ?

307. Position of distal end of root of lower mesial incisor relative to cheek teeth:
0) mesial to level of premolars
1) opposite level of premolars
2) opposite level of molars
Vintana A = ?
Vintana B = ?

Canines

308. Upper canine:
0) present
1) absent
Vintana A = 1
Vintana B = 1

309. Upper canine, size:
0) larger than neighboring teeth
1) reduced, similar to neighboring teeth in size
Vintana A = inapplicable
Vintana B = inapplicable

310. Roots of upper canine:
0) single
1) double
Vintana A = inapplicable
Vintana B = inapplicable

311. Number of cusps on upper canine:
0) single (peg-like)

1) two or more cusps
Vintana A = inapplicable
Vintana B = inapplicable

312. Lower canine:
0) present
1) absent
Vintana A = ?
Vintana B = ?

313. Lower canine, size:
0) larger than neighboring teeth
1) reduced, similar to neighboring teeth in size
2) absent
Vintana A = ?
Vintana B = ?

314. Roots of lower canine:
0) single
1) double
Vintana A = ?
Vintana B = ?

Postcanines

315. Total number of lower postcanine teeth in each quadrant:
0) ten or more
1) nine
2) eight
3) seven
4) six
5) five
6) four
7) three or fewer
Vintana A = ?
Vintana B = ?

316. Total number of upper postcanine teeth in each quadrant:
0) more than eight
1) eight
2) seven
3) six
4) five
5) four
6) three or fewer
Vintana A = 4
Vintana B = 4

317. Orientation of lower postcanine tooth row (dorsal view):
0) parallel or nearly parallel to major axis of dentary
1) markedly oblique to major axis of dentary
Vintana A = ?
Vintana B = ?

Premolars

318. Number of lower premolars in each quadrant:
0) five or more
1) four
2) three
3) two
4) one
5) none
Vintana A = ?
Vintana B = ?

319. Number of upper premolars in each quadrant:
0) five or more
1) four
2) three
3) two
4) one
5) none
Vintana A = 4
Vintana B = 2

320. Ultimate upper premolar (P5), protocone (not applicable to taxa with multi-rowed cheek teeth):
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

321. Ultimate upper premolar (P5), metacone (not applicable to taxa with multi-rowed cheek teeth):
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

322. Ultimate upper premolar (P5)/first upper molar (M1) length ratio:
0) >1.5
1) 1.5–0.8
2) <0.8
Vintana A = 2
Vintana B = 1

323. Ultimate upper premolar (P5)/first upper molar (M1) width ratio:

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0) >0.9
1) 0.9– 0.6
2) 0.59–0.45
3) <0.45
Vintana A = 3
Vintana B = 0

324. Ultimate upper premolar (P5), roots:
0) three or more
1) two
2) one
Vintana A = 1
Vintana B = 0

325. Ultimate upper premolar (P5) cusp formula (only applicable to taxa with multi-rowed cheek teeth) (in the form (w)x:y:z, designating cusps on the mesiobuccal bulge, the buccal row, the middle row, and the lingual row, respectively [see Krause, 1977]):
0) (0)0–5:2–5:4–5
1) (0)0–3:4–7:0–1
2) (0)0:1:0
3) (0–3)2–8:6–12:0
Vintana A = ?
Vintana B = ?

326. Penultimate lower premolar (p4) size:
0) small, subequal to other premolars
1) substantially larger than more mesial premolars but substantially smaller than ultimate lower premolar (p5 or dp5)
2) largest (longer and/or taller) tooth in premolar series
Vintana A = ?
Vintana B = ?

327. Penultimate lower premolar (p4), paraconid (cusp b):
0) absent or indistinct
1) present, distinct or well developed as important cusp
Vintana A = ?
Vintana B = ?

328. Penultimate lower premolar (p4), roots:
0) three or more
1) two
2) single
Vintana A = ?
Vintana B = ?

329. Penultimate lower premolar (p4), buccal basal cuspules (applicable to bladed lower premolars):
0) present
1) absent
Vintana A = ?

Vintana B = ?

330. Contact of penultimate (p4) and ultimate (p5) lower premolars:
0) juxtaposition
1) staged, p5 overhanging p4
Vintana A = ?
Vintana B = ?

331. Ultimate lower premolar (p5) size:
0) small, with area less than that of m1
1) large, with area greater than, or subequal to, that of m1
2) hypertrophied, with area 1.5 times greater than that of m1
Vintana A = ?
Vintana B = ?

332. Ultimate lower premolar (p5) cusp alignment:
0) principal cusps mesiodistally aligned
1) principal cusps arranged in triangle
Vintana A = ?
Vintana B = ?

333. Ultimate lower premolar (p5) outline:
0) buccolingually compressed, crown outline longer than wide
1) buccolingually broad, crown outline subequal or wider than long
2) buccolingually very compressed, blade–like (Rougier et al., 2007)
Vintana A = ?
Vintana B = ?

334. Ultimate lower premolar (p5), symmetry of protoconid (cusp a):
0) asymmetrical, mesial edge of protoconid more convex in outline than distal edge
1) symmetrical, mesial and distal cutting edges equal or subequal in length
Vintana A = ?
Vintana B = ?

335. Ultimate lower premolar (p5), paraconid (cusp b):
0) absent or indistinct
1) present as distinct or well-developed cusp
Vintana A = ?
Vintana B = ?

336. Ulitmate lower premolar (p5), relative height of protoconid (cusp a) to metaconid (cusp c); measured as height ratio of a and c from bottom of valley between two adjacent cusps:
0) metaconid absent or very small
1) metaconid distinctive but <30% of protoconid
2) metaconid and protoconid equal or subequal in height (40–100% of protoconid)
Vintana A = ?
Vintana B = ?

337. Ultimate lower premolar tooth (p5), hypoconid (= cusp d, following Davis, 2011):

0) absent
1) present
Vintana A = ?
Vintana B = ?

338. Ultimate lower premolar tooth (p5), distal cingulid:
0) absent
1) present
Vintana A = ?
Vintana B = ?

339. Ultimate lower premolar tooth (p5), buccal cingulid:
0) absent or vestigial
1) present
Vintana A = ?
Vintana B = ?

340. Ultimate lower premolar tooth (p5), buccal cingulid, extent:
0) extends one-half length of crown or less
1) extends more than one-half length of crown
Vintana A = ?
Vintana B = ?

341. Ultimate lower premolar tooth (p5), buccal cingulid cuspules:
0) absent
1) present
Vintana A = ?
Vintana B = ?

342. Ultimate lower premolar tooth (p5), lingual cingulid:
0) absent or vestigial
1) present
Vintana A = ?
Vintana B = ?

343. Ultimate lower premolar (p5), roots:
0) three or more
1) two
2) single
Vintana A = ?
Vintana B = ?

344. Ultimate lower premolar (P5), organization of multiple cusps and rows (only applicable to taxa with multi-rowed cheek teeth):
0) two rows
1) one row
Vintana A = ?
Vintana B = ?

345. Ultimate lower premolar (p5) serration count, only applicable to blade-like premolar:
    0) ≤7
    1) 8–10
    2) ≥11
    Vintana A = ?
    Vintana B = ?

346. Ultimate lower premolar (p5), mesiobuccal exodaenodont lobe:
    0) absent
    1) present
    Vintana A = ?
    Vintana B = ?

Molars–General

Upper molar characters refer to tooth positions M1 and/or M2, lower molar characters to m1 and/or m2, unless specified otherwise

347. Number of lower molars in each quadrant:
    0) six or more
    1) five
    2) four
    3) three
    4) two or fewer
    Vintana A = ?
    Vintana B = ?

348. Number of upper molars in each quadrant:
    0) six or more
    1) five
    2) four
    3) three
    4) two or fewer
    Vintana A = 2
    Vintana B = 4

349. Transverse widening of upper relative to lower molars (or distal cheek teeth):
    0) upper teeth not wider
    1) upper teeth wider, up to 1/3 wider than lowers
    2) upper teeth much wider than lowers (>1/3)
    Vintana A = ?
    Vintana B = ?

350. Hypsodont molars (or distal cheek teeth):
    0) absent
    1) present
    Vintana A = 1
    Vintana B = 1

351. Presence of islets/infundibula on molars (or distal cheek teeth):
    0) absent
    1) present
    Vintana A = 1
    Vintana B = 1

352. Infundibula penetrate deeply into molar crowns (or distal cheek tooth crowns):
    0) absent
    1) present
    Vintana A = 1
    Vintana B = 1

353. Presence of synclines/furrows on at least one side of molar crowns (or distal cheek tooth crowns):
    0) absent
    1) present
    Vintana A = 1
    Vintana B = 1

354. Furrows on molars (or distal cheek teeth) extend to base of crown and onto root:
    0) absent
    1) present
    Vintana A = 0
    Vintana B = 0

355. Molars (or distal cheek teeth) with transverse lophs:
    0) absent
    1) present
    Vintana A = 1
    Vintana B = 1

356. Number of transverse lophs/lobes on molars (or distal cheek teeth):
    0) three or fewer
    1) four or more
    Vintana A = 0
    Vintana B = 0

357. Enamel distribution on molars (or distal cheek teeth):
    0) present on all sides of molar cheek teeth
    1) absent on one side of crown on at least one molar cheek tooth
    Vintana A = 0
    Vintana B = 0

Lower Molars

358. Interlocking of m1-2:
    0) absent
    1) present
    Vintana A = ?

Vintana B = ?

359. Interlocking of m1-2, type:
   0) distal-most part of preceding molar fits in between mesial cingulid cuspules e and f of succeeding molar
   1) distal-most part of preceding molar fits between mesial cingulid cuspule e and paraconid (cusp b) of succeeding molars
   2) distal-most part of preceding molar fits into embayment or vertical groove of mesial aspect of paraconid (cusp b) of succeeding molars
   3) mesial-most part of succeeding lower molars overlapping distal-most part of preceding lower molars
   Vintana A = ?
   Vintana B = ?

360. m1-2 paraconid (cusp b) presence (not applicable to taxa with multi-row cheek teeth):
   0) present
   1) absent
   Vintana A = inapplicable
   Vintana B = inapplicable

361. m1-2 mesiolingual surface of paraconid (cusp b):
   0) rounded
   1) forms keel
   Vintana A = inapplicable
   Vintana B = inapplicable

362. m1-2, proximity between paraconid (cusp b) and metaconid (cusp c):
   0) bases widely separated
   1) bases approaching each other becoming confluent
   2) single cusp (amphyconid)
   Vintana A = inapplicable
   Vintana B = inapplicable

363. m2 (if possible), relative size/height of paraconid (cusp b) to metaconid (cusp c):
   0) c taller than b
   1) b and c subequal in height
   2) b taller than c
   Vintana A = inapplicable
   Vintana B = inapplicable

364. m1-2, orientation of paracristid relative to longitudinal axis of molars:
   0) longitudinal orientation
   1) oblique
   2) nearly transverse
   Vintana A = inapplicable
   Vintana B = inapplicable

365. m1-2 buccal curvature of protoconid (cusp a) at base level relative to curvature of paraconid (cusp b) and metaconid (cusp c):

0) cusps have same degree of buccal bulging
1) protoconid far more bulging than paraconid and metaconid
Vintana A = inapplicable
Vintana B = inapplicable

366. m1-2 orientation of metacristid (protocristid), crest between protoconid (cusp a) and metaconid (cusp c), relative to long axis of lower molars:
0) parallel to lower jaw axis
1) oblique
2) transverse
Vintana A = inapplicable
Vintana B = inapplicable

367. m1-2 distal metacristid:
0) present
1) absent
Vintana A = inapplicable
Vintana B = inapplicable

368. m1, alignment of main cusps of trigonid (not applicable to taxa with multi-row cheek teeth):
0) single longitudinal row
1) acute angle
2) obtuse angle
Vintana A = inapplicable
Vintana B = inapplicable

369. m1-2 labiolingual compression of primary functional cusps (at level of cusp base but above cingulid):
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

370. m1-2 hypoconid (cusp d = hypoconid in Luo et al., 2007a; Zheng et al., 2013 #86; Zhou et al., 2013 #97; = hypoconulid in Rougier et al., 2011); we designate the distal cingulid cuspule d as the homolog to the hypoconid in the teeth with linear alignment of the main cusps; we assume the cusp to be the hypoconid if there is only a single cusp on the talonid in the teeth with reversed triangulation:
0) small cusp at cingulid level
1) well-developed as important cusp of talonid
Vintana A = inapplicable
Vintana B = inapplicable

371. m1-2 cristid obliqua:
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

372. m1-2 cristid obliqua orientation:
0) oriented toward, or lingual to, metaconid-protoconid notch
1) directed toward distal part of metaconid
2) pointed mesially between metaconid-protoconid notch and protoconid
Vintana A = inapplicable
Vintana B = inapplicable

373. m1-2 hypoconulid; if there are only two functional cusps on talonid, we assume that second and more lingual cusp on talonid to be the hypoconulid, following rationale of Kielan-Jaworowska et al., 1987: (Rougier et al., 2011 #85 =hypoconid)
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

374. m1-2 hypoconulid orientation:
0) cusp tip erect or procumbent
1) cusp tip recumbent (reclined distally)
Vintana A = inapplicable
Vintana B = inapplicable

375. m1-2, mediolateral position of hypoconulid on talonid (character only applicable to taxa with multicuspidate talonid developed):
0) at median position
1) at more lingual position
Vintana A = inapplicable
Vintana B = inapplicable

376. m1-2 prehypoconulid, crest connecting metaconid with hypoconulid along lingual edge of tooth:
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

377. m1-2 entoconid (if there are three functional cusps on talonid, we assume that the third and lingual-most functional cusp on the talonid is the entoconid, following rationale given by Kielan-Jaworowska et al., 1987):
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

378. m1-2, height of entoconid as compared to other cusps of talonid:
0) lower than hypoconulid (or even vestigial)
1) subequal in height to hypoconulid, or taller
Vintana A = inapplicable
Vintana B = inapplicable

379. m1-2 alignment of paraconid, metaconid, and entoconid (applicable only to taxa with triangulation of trigonid cusps and entoconid present on talonid):
0) cusps not aligned
1) cusps aligned
Vintana A = inapplicable
Vintana B = inapplicable

380. m1-2 entocristid on talonid heel (can be scored without entoconid being present):
0) talonid lacks medial and longitudinal crest
1) pre-entoconid cristid of talonid in alignment with metaconid or with postmetacristid if latter present
2) pre-entocristid crest offset from metaconid, lingual to base of metaconid
Vintana A = inapplicable
Vintana B = inapplicable

381. m1-2 talonid basin:
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

382. m1-2 talonid/trigonid width ratio:
0) narrow (talonid width <40% of trigonid width)
1) wide (talonid width 40–70% of trigonid width)
2) very wide (talonid width >70% of trigonid width)
Vintana A = inapplicable
Vintana B = inapplicable

383. m1-2, aspect ratio in occlusal view (length versus width) of functional talonid basin at cingulid level:
0) longer than wide
1) length equals width
2) wider than long
Vintana A = inapplicable
Vintana B = inapplicable

384. m1-2, elevation of talonid:
0) hypoconid/protoconid height ratio ≤20%
1) hypoconid/protoconid height ratio 20–35%
2) hypoconid/protoconid height ratio 35–50%
3) hypoconid/protoconid height ratio: ≥50%
Vintana A = inapplicable
Vintana B = inapplicable

385. m1-2 cingular cuspule e:
0) present
1) absent
Vintana A = inapplicable
Vintana B = inapplicable

386. m1-2 cingular cuspule f:
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

387. m1-2 mesial cingulid:
0) absent
1) present
Vintana A = ?
Vintana B = ?

388. m1-2 development of mesial cingulid:
0) restricted to mesial aspect of paraconid base
1) extending along most of lingual base of paraconid
Vintana A = ?
Vintana B = ?

389. m1-2 buccal postcingulid:
0) absent
1) present
Vintana A = ?
Vintana B = ?

390. m1-2 orientation of postcingulid:
0) oblique, connected to hypoconid
1) horizontal above gum level
Vintana A = ?
Vintana B = ?

391. m1-2 distal lingual cingulid:
0) absent or weak
1) distinctive
2) strongly developed, crenulated with distinctive cuspules
Vintana A = ?
Vintana B = ?

392. Number of roots on each m1 and m2:
0) one
1) two
2) three or more
Vintana A = ?
Vintana B = ?

393. m1-2, root length
0) > three times crown height
1) ≤ three times crown height
Vintana A = ?

Vintana B = ?

394. m1-2, root orientation
 0) straight
 1) apical ends inclined or bent posteriorly
 Vintana A = ?
 Vintana B = ?

395. m1 cusp formula in taxa with multi-rowed cheek teeth:
 0) 2:2–3
 1) 3–4:2–3
 2) 4:4
 3) 5:4
 4) 6:4 or higher
 Vintana A = inapplicable
 Vintana B = inapplicable

396. m2 cusp formula in taxa with multi-rowed cheek teeth:
 0) 1:1 or fewer
 1) 2–3:2–3
 2) 4:2 or more
 Vintana A = inapplicable
 Vintana B = inapplicable

Upper Molars

397. M1-2 interlock:
 0) absent
 1) tongue-in-groove interlock
 Vintana A = 0
 Vintana B = 0

398. M1-2 with functional lingual protocone that grinds against basin on lowers:
 0) absent
 1) present
 Vintana A = inapplicable
 Vintana B = inapplicable

399. M1-2 transverse width of protocone:
 0) narrow (distance from protocone apex to paracone apex ≤0.60 of total tooth width)
 1) strongly transverse (distance from protocone apex >0.60 of total tooth width)
 Vintana A = inapplicable
 Vintana B = inapplicable

400. M1-2 mesiodistal development of lingual region (in taxa with M1-2 protocones):
 0) narrow (mesiodistal distance between paracone and metacone <0.3 of total tooth length)
 1) moderate development (distance between position of paracone and metacone equals 0.3–0.5 of total tooth length)

2) long (distance between position of paracone and metacone >0.5 of total tooth length)
Vintana A = inapplicable
Vintana B = inapplicable

401. M1-2, length of preprotocrista:
0) terminates midway between protocone and paracone apices
1) terminates mesial to paracone apex
2) terminates buccal to paracone apex
Vintana A = inapplicable
Vintana B = inapplicable

402. M1-2, development of postprotocrista (applicable only to molars with reversed triangulation of molar cusps):
0) postprotocrista short, does not extend buccally beyond metacone
1) postprotocrista long, extends buccally beyond metacone
Vintana A = inapplicable
Vintana B = inapplicable

403. M1-2 paraconules:
0) absent or very small
1) present
Vintana A = inapplicable
Vintana B = inapplicable

404. M1-2 metaconules:
0) absent or very small
1) present
Vintana A = inapplicable
Vintana B = inapplicable

405. M1-2, paracone (cusp A) orientation:
0) erect
1) recumbent
2) procumbent
Vintana A = inapplicable
Vintana B = inapplicable

406. M1-2, preparacrista (crest emerging from mesial face of paracone or cusp A):
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

407. M1-2, preparacrista orientation:
0) preparacrista oriented mesially, <30° from long axis passing through paracone and metacone apices
1) preparacrista oriented mesiobuccally, 30–60° from long axis passing through paracone and metacone apices

2) preparacrista oriented buccally, >60° from long axis passing through paracone and metacone apices
Vintana A = inapplicable
Vintana B = inapplicable

408. M1-2, metacone (cusp C):
0) present
1) absent
Vintana A = inapplicable
Vintana B = inapplicable

409. M1-2, position of metacone (cusp C):
0) distal to paracone
1) distolateral to paracone
Vintana A = inapplicable
Vintana B = inapplicable

410. M1-2 bases of paracone (cusp A) and metacone (cusp C):
0) merged
1) separated
Vintana A = inapplicable
Vintana B = inapplicable

411. M1-2, relative height and size of paracone (cusp A) and metacone (cusp C):
0) paracone higher and larger than metacone
1) metacone higher and larger than paracone
2) subequal
Vintana A = inapplicable
Vintana B = inapplicable

412. M1-2, continuous crest between paracone and metacone (postparacrista + premetacrista):
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

413. M1-2, orientation of postparacrista and premetacrista:
0) straight
1) V–shaped, with buccally directed postparacrista and premetacrista
Vintana A = inapplicable
Vintana B = inapplicable

414. M1-2, stylar shelf:
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

415. M1-2, width of stylar shelf:

0) broad
1) narrow
Vintana A = inapplicable
Vintana B = inapplicable

416. M1-2, stylocone (stylar cusp B):
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

417. M1-2, stylocone (stylar cusp B) size:
0) small stylar cusp, smaller than paracone
1) prominent cusp subequal to or larger than paracone
Vintana A = inapplicable
Vintana B = inapplicable

418. M1-2, position of stylocone (stylar cusp B):
0) along buccal edge
1) separated from buccal edge
Vintana A = inapplicable
Vintana B = inapplicable

419. M1-2, stylocone (stylar cusp B) relationship:
0) stylocone connected to paracrista or mesial to its end
1) stylocone distal to buccal end of paracrista
2) stylocone detached from preparacrista occupying central position on crown
Vintana A = inapplicable
Vintana B = inapplicable

420. M1-2, mesostyle (stylar cusp C, near the ectoflexus):
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

421. M1-2 metastyle (stylar cusp D, opposite metacone):
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

422. M1-2 position of metastyle (stylar cusp D):
0) buccal to metacone (cusp C)
1) distobuccal to metacone (cusp C)
Vintana A = inapplicable
Vintana B = inapplicable

423. M1-2, “twinning” of metastyle (stylar cusp D) with accessory cusp:

0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

424. M1-2, parastylar hook:
0) absent or poorly developed
1) present
Vintana A = inapplicable
Vintana B = inapplicable

425. M1, ectoflexus:
0) strongly reduced or absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

426. M2, ectoflexus:
0) strongly reduced or absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

427. M1-2, buccal cingulum:
0) absent or weak
1) present
Vintana A = 0
Vintana B = 0

428. M1-2, lingual cingulum:
0) present
1) vestigial or absent
Vintana A = 1
Vintana B = 1

429. M1-2, development of lingual cingulum:
0) continuous cingulum
1) discontinuous cingulum
Vintana A = inapplicable
Vintana B = inapplicable

430. M1-2 precingulum:
0) narrow and closely appressed to crown or absent
1) distinct, broad
Vintana A = ?
Vintana B = ?

431. M1-2 postcingulum:
0) narrow and closely appressed to crown or absent

1) distinct, broad
Vintana A = ?
Vintana B = ?

432. Number of roots on each M1 and M2:
0) one
1) two
2) three
3) more than three
Vintana A = 3
Vintana B = 3

433. M1-2, lingual root:
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

434. M1-2, position of lingual root:
0) under paracone
1) under protocone or trigon
Vintana A = inapplicable
Vintana B = inapplicable

435. M1 cusp formula in taxa with multi-rowed cheek teeth (only applicable to buccal and middle rows – i.e., cusps and cuspules on distolingual wing not included):
0) 2-3:2-4
1) 4-7:4-6
2) 6-11:7-11
Vintana A = inapplicable
Vintana B = inapplicable

436. M2 cusp formula in taxa with multi-rowed cheek teeth (only applicable to buccal and middle rows – i.e., cusps and cuspules on distolingual wing not included):
0) 2-3:2-4
1) 2-3:5
2) 4-5:4-6
Vintana A = inapplicable
Vintana B = inapplicable

437. M1, distolingual wing (only applicable to taxa with multi-rowed cheek teeth):
0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

438. M1, length of distolingual wing/total length of tooth (only applicable to taxa with multi-rowed cheek teeth):
0) <0.2

1) 0.2–0.5
2) >0.5
Vintana A = inapplicable
Vintana B = inapplicable

439. M1, shape of distolingual wing (only applicable to taxa with multi-rowed cheek teeth):
0) smooth
1) with cusps
Vintana A = inapplicable
Vintana B = inapplicable

440. M1-2, third row in taxa with multi-rowed cheek teeth:
0) present, equal in length to buccal rows
1) absent
Vintana A = inapplicable
Vintana B = inapplicable

Enamel Microstructure

441. Prism shape:
0) absent
1) arc
2) enclosed (circular)
Vintana A =2
Vintana B = 2

442. Prism packing:
0) hexagonal
1) erratic
2) in rows
Vintana A =2
Vintana B = 2

443. Interprismatic matrix:
0) on all sides, widely separated prisms
1) distinct inter–row sheets
2) prisms "shoulder to shoulder", little IPM
Vintana A =1
Vintana B = 1

444. Outer aprismatic zone on molar teeth:
0) present, distinct
1) absent or very thin
Vintana A =1
Vintana B = 1

Wear Features

445. Relationships between cusps of opposing upper and lower molar teeth:
  0) absent
  1) present, protoconid (cusp a) occludes in groove between paracone (cusp A) and stylocone (cusp B)
  2) present, protoconid (cusp a) occludes in front of stylocone (cusp B) and into embrasure between opposing and preceding upper teeth
  3) present, part of talonid occludes with lingual face (or any part) of upper molar
  4) lower multicuspate rows alternately occlude between upper multicuspate rows
  5) columnar tooth without cusps and with beveled wear across entire crown contact surface
  Vintana A = 5
  Vintana B = 5

446. Direction of dentary movement during power stroke of chewing cycle:
  0) essentially dorsal movement (orthal)
  1) essentially horizontal movement with pronounced anteromedial translation
  2) essentially horizontal movement with anterior translation (proal)
  3) dorsoposterior
  4) essentially horizontal movement with posterior translation (palinal)
  5) essentially horizontal movement with posterolateral translation
  Vintana A = 5
  Vintana B = 5

447. Molar, prevallum/postvallid shearing:
  0) absent
  1) present
  Vintana A = inapplicable
  Vintana B = inapplicable

448. Lower molars, development of wear facets 1 and 2:
  0) absent
  1) present
  Vintana A = inapplicable
  Vintana B = inapplicable

449. Molars, differentiation of wear facets 3 and 4:
  0) facets absent
  1) facet 3 present
  2) facets 3 and 4 present
  Vintana A = inapplicable
  Vintana B = inapplicable

450. Molars, orientation of facet 4:
  0) facet oriented obliquely with respect to long axis of tooth
  1) facet oriented transversely with respect to long axis of tooth
  Vintana A = inapplicable
  Vintana B = inapplicable

451. Molars, wear facets within talonid basin:

0) absent
1) present
Vintana A = inapplicable
Vintana B = inapplicable

452. Lower molars, presence of multiple ridges within talonid basin:
0) smooth surface on talonid (or on cusp d)
1) multiple ridges within talonid basin
Vintana A = inapplicable
Vintana B = inapplicable

453. Upper molar, worn occlusal surface with wide concave area buccally and narrow flat area lingually (only applicable to taxa with essentially flat occlusal surface):
0) absent
1) present
Vintana A = 1
Vintana B = 1

Phylogenetic Data Matrix (taxa listed alphabetically)

A = 0, 1; B = 0, 2; C = 0, 3; D = 1, 2; E = 2, 3; F = 2, 4; G = 3, 4; H = 4, 5; I = 0, 1, 2; J = 1, 2, 3; K = 2, 3, 4; L = 0, 1, 2, 3; M = 1, 2, 3, 4; N= 0, 1, 2, 3, 4

Adelobasileus

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Amphitherium

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Asfaltomylos

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Asiatherium

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Ausktribosphenos

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Dasypus

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Deltatheridium

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0-0-0-00-0 0021120101 1011001001 1101100-0- 0110--010A
101100-000 0101010000 01011011-0 0211------ 1000311120
10-
```

Diademodon

```
0?000?0??? 0?0000000? 0000000100 0000??00?0 0000000?00
0???00???? ???1000000 000101-020 0--00-00-- ?101100000
0000100000 -0-2310001 2011-01000 -0------0- 0000100000
200?????00 0-0??00?00 000010010- -000001-00 100-2000??
0-0????000 0-00100000 0000000000 G000001110 00??000?00
1?-0003110 00?1000000 --?0?100-- --100?0001 1-0121000?
?1100?000? 000?000--- ---------- ---------- --------00
0-0-0-0--- ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- 0????4----
---
```

Didelphis

```
11111011-- 1112101-11 2111012022 1111?11011 1111111101
2111110002 ??00002101 -----10011 0--1111200 21-1111000
0201110000 -0?1211010 -020130211 0112010011 0111011011
212310??11 1001-22112 101-1?0211 120100001- -100101111
0-1-01?1?? ??21201111 2012110010 13-0011011 011111??00
1001111111 1-11311110 --11010010 113A111101 0101100000
0111000000 000032022- -----001-- ---------- ------3320
0-0-0-00-0 1001121101 1211101111 1223110-0- 0110--0112
1011012001 1111011011 11010111-0 ?211------ 2211311111
10-
```

Dryolestes

```
?????????? ?????????? ???????111 100??????? ??????????
?????????? ???0?????? ?????????? ?????????? ??????????
???0?????? ?????????? ?????????? ?????????? ????????11
```

```
2122101111 10010??1?? ??01??1210 ????11??0? 01??101??0
??01?????? ?????????? ?????????0 1????????? ????????00
??01110111 0111110101 0001110001 1130111?0 0000110000
???0000001 000100014? 1001-001-0 1000011?0- -11---0010
0-0-0-00-0 0001121100 0-0---0--0 0000100-0- 0110--00--
--00112010 0101011110 10100001-? ?210------ 100021110?
0?-
```

Eomaia

```
11?11011-- 1112001-10 2111012022 1010011011 ?111211001
1?21111002 ??0?0??101 -----????0 0--????2?0 ??-1?1????
?????????0 -0?1???010 -?2??????11 ?????1??10 ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ?1????????
??01110121 0111110100 --11010?00 112111??01 0111100000
01100?0000 0000210001 0??1-111-0 000110100- -01---33?0
0-0-0-0100 00???1?101 10110?11?1 1?13010-0- 011?--01?1
A01101200? 01?10A0??0 0--?0111-0 01?1------ ????3?1120
??-
```

Erinaceus

```
11111A11-- 1112101-10 1111112022 1010111001 1111211012
2121111002 1100?02101 -----10111 0--111120? 21-1110000
0201121100 -02120-110 0020130211 0101010110 0110111011
21231?1111 1110-22112 011-1-0210 1201110001 1100101111
0-1-002111 1121201111 4113110020 1200111111 1211110100
1?01111111 1-11110110 --11010001 1131111100 0000320000
0110000011 0010440231 0110-00?-0 011110000- -01---3320
0-0-0-00-0 0011121101 121--01111 1223110-0- 0110--0101
1101011001 010110---0 0--00011-1 1211------ 2211311111
10-
```

Exaeretodon

```
0?000?00?1 ??0?0?000? 00?0000100 000??00??0 0000000100
000000???? ???1001000 00?100-000 0--???011- ?000100A00
0000100000 -0-0211001 2011-00000 -0------0- 0000110000
?00?????00 0-01000?00 000010010- -00000??00 100-2000??
0-0??????? ??00??1000 0000010000 0100001110 00??000?01
??-0010120 0011?0000? ??00??00-- --1001?000 1-01220001
111001000? 000?LL0--- ---------- ---------- --------00
0-0-0-0--- ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- 0????4----
---
```

Fergliotherium A

```
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????1???? ??????????
?????????? ?????????- -????????? ?????????? ?????????0
0-10100??- ---------- ---------- ------?-?- ????--?---
---------- ---------- ------??-- -?-------- ?02?44----
---
```

Feruglotherium B

```
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????1???? ??1?4?1??1
???-112??? ????7?4??- -???------ 202----00- -011104??0
0-10100??- ---------- ---------- ------?-?- ????--?---
---------- ---------- ------???- -?-------- ?02?44----
---
```

Gobiconodon

```
?????00??? ?1?21?1-1? 1110000110 000??000?0 0000100100
?????????? ??1010?000 1?????11?0 0--???12?1 000011??0?
?2?01101?? ?120?1?110 ?02??10100 101200?000 ?0101???11
211?????00 0-0?0111?1 0001?1120- -201000000 ???????11?
0-???????? ???1?????? ?????1?010 10?011???0 01????????
??01113?21 0010----11 010111A010 10111101-0 0000430000
01--000010 0010JA0D10 1131-202-0 000101?00? ?0D---DD10
0-0-0-0100 ?01000?010 ??0---0--? 0---010-0- 1110--00--
--002??000 00-0-----0 0--0??101? ?10?------ 110020010?
-?-
```

Gomphos

```
11111?11-? 1?12?01?10 21110?10?? ????01001 11?12?1?1?
1?2100-1?? ???0002101 ?????11001 0?????1210 ?1?1?11100
02100-0000 -01001?111 002??3011? 0101110010 01110?1111
212???1101 ??????2?12 01????0??? ?10???0??? ??1???110?
1????????? ???1?????? 4??221001? ???1?10001 12??????00
??0110---1 1-11210?11 0011000011 21301111-1 -01-331101
11-01121-- -1--530321 0101-?01-0 111102100- -01---3320
0-0-0-00-1 ---2121-01 10100011-1 1223100-0- 01??--011?
1011?0-011 21-0-0---1 0--00001-0 1211------ ????311121
100
```

Gondwanatherium

```
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????1???? ??????1??1
???-11???? ???????5?- -????----- -------?-? ?-----???1
1110100??- ---------- ---------- ------0-0- 0010--?---
---------- ---------- ------01-- -0-------- 100154----
--0
```

Greniodon

```
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????1???? ??????????
?????????? ?????????- -????????? ?????????? ?????????1
```

```
     1110110??- ---------- ---------- ------???? ????--?---
     ---------- ---------- ------???- -0-------- D02154----
     --0
```

Guimarota Paulchoffatiidae

```
     ?????????? ?????????? ?????????? ?????????? ??????????
     ?????????? ??????2101 -----01000 A00110?100 ?1-1100000
     0??0?????1 112?A???10 0?2???21??0 01?1?????1? ?0??1?1?11
     211????000 0-0101210? ????1?1??? ??011000?? ?10?A0??1?
     ??00?????? ?????????? ?1?????1?0 1????1???? ????????00
     0?01110111 1-10----01 1?01010010 2011A11?AA A01-420100
     000?102010 11--4EADA- -10101-100 102----011 1010004470
     0-0-0-00-- ---------- ---------- ------0-0- 01?0100---
     ---------- ---------- ------01-- -1--0?0--1 0???44----
     ---
```

Hadrocodium

```
     ?????????? ?????????? ?????????? ?????????? ??????????
     ?????????? ???000?000 11?10?1??0 0--???1100 200??1??00
     02?0???0?0 -0013??010 -0200???00 0100010000 ?12?1?1111
     212?????00 0-0?0111?1 0?0102020- -101001?01 01000?1100
     ??1??????? ?????????? 1??????020 1101111??? 111000??00
     1001?????? ???1010??0 --?0-00000 002??1?000 1001100000
     01?000000? 000?550330 ?101-0?1-0 100100000- ??1---44?0
     0-0-0-00-0 000000?010 ??0---0--? 0?--000-0- ?11?--00--
     --??0??0?? 00-0-----? ???0??0??? ?10?------ ????200?0?
     -?-
```

Haldanodon

```
     ?????????? ???100???? 00?00?0100 000??????0 ?000?0????
     ?????????? ???0101000 1101101020 11110-1100 2001010000
     0200120000 -000210010 -020000000 1010000000 012?1?1111
     2001000000 0-0101?100 000102020- -101000001 0100001100
     0-010000?? ???2?001??? ?000011010 1100011111 1????00?00
     0?01110110 0011000000 --00-00000 1020111100 000010000?
     ??00000001 0001D10220 0121-011-0 0000100010 011---A110
     0-0-0-0120 000001?110 ?????-0--? 0?--00100- 21??--00--
     --000??000 00-0-----0 0--0??11-0 0211------ 0??010000?
     0?-
```

Haramiyavia

```
     ?????????? ?????????? ?????????? ?????????? ??????????
     ?????????? ?????????? ?????????? ?????????? ??????????
     ?????????? ?????????? ?????????? ?????????? ??????????
     ?????????? ?????????? ?????????? ?????????? ??????????
     ?????????? ?????????? ?????????? ?????????? ??????????
     ??0111011? 001??????? ?????000?? ??0001??1? ??10220000
     011010???? ?0000??00?- -????1-2?0 000----00- -01?-03320
     0-0-0-00-- ---------- ---------- ------0-0- 01??220---
     ---------- ---------- ------01-- -?--010--1 ????43----
     ---
```

Henkelotherium

```
     0????01??? ?112011-1? ?1110?0011 1000??0011 1110111010
     1???11???? ??1??????? ?????????? ?????????? ?1?011????
     ????1????0 -0?1???0?? ????????1? 1?11000000 ????????11
```

```
    2122101171 1001?1?1?? ??011?02?? ??0111???? ?1??10???0
```

Henosferus

```
    ?????????? ?????????? ?????????? ?????????? ??????????
```

Jeholodens

```
    ??0??10??? ?112111-?0 1110??0110 100000?010 0000100000
```

Juramaia

```
    1111101??? ?11210??1? 21?1????22 100??????? ??????????
```

Kayentatherium

```
    0?000?00?0 ?101010001 0000000100 0000?00??0 0000000???
```

Kielantherium

```
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
?????????1  001???????  ?????110??  ???111????  ??????????
??????????  ????D?0???  ????-???-?  ??????????  ???---2??0
0-0-0-0100  0021120101  1010000--1  1101A10-0-  01?0--?100
?000011000  0101010000  111111?1-0  0211------  ????311110
10-
```

Kokopellia

```
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??01111111  011?????1?  ??????10??  ??3111????  ??0?1?????
???00?????  ?0003?01??  ????-10?-?  ??????????  ???---3?20
0-0-0-00-0  1011111101  1211001111  1203100-10  01?0--0101
2111012001  0101010010  0--1?111-0  0211------  ????311110
10-
```

Kryptobaatar

```
?0?00010?0  11111?1-1?  21?1000000  0?1??01111  ?110201110
1000110?02  1102112101  -----01020  1101101210  01-1110001
1000120111  112110-111  1121-11100  1111?00000  1021111111
2011?0??00  1001112102  0002121210  0101110101  0110211112
0-00012???  ??21211???  2???211020  2210111010  0112101100
0011010111  1-10----11  1?01110011  2010011111  -01-43-11-
110-1121--  -1--63131-  -11111-211  102----0??  ?001114410
0-0-0-00--  ----------  ----------  ------0-0-  0???1D0---
----------  ----------  ------01--  -?--101111  110?44----
---
```

Lambdopsalis

```
????01000  1??11?1-?0  2111000100  0??????1??  ??????????
??????????  ???1012101  -----1110?  120???120?  02-1111000
00000-0111  112120-010  0021-?1100  0110100000  0121111111
2?11000000  0-0?012102  0002111210  0101000101  ?110?1?11?
??00002211  2?21??1???  2????10120  221011??10  0???????01
??11010111  1-10----11  1?01110001  1120011111  -01-43-10-
?11-1121--  -1--76144-  -2322-----  0-2----00-  -021004410
0-0-0-00--  ----------  ----------  ------0-0-  01??320---
----------  ----------  ------01--  -?--201211  1???44----
---
```

Lavanify

```
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ?????1????  ??????????
??????????  ?????????-  -?????????  ??????????  ?????????1
```

```
1111101??- ---------- ---------- ------???? ????--?---
---------- ---------- ------???- -?-------- ?2115?----
--?
```

Maotherium

```
?1?0001??? ??121?1-1? 1111111111 1000011011 ?110210?00
1??0110002 1110102000 ???1111020 0--???11?1 010??1????
?2?0?????0 -011?1??10 -?200???00 111??00?00 ????????11
211?????11 100??1???2 000110111? ?20?00???? ??0???1???
?????????? ??2??????? ????1?1011 -0????1??? ??????????
??01113101 0010----?1 0101110011 110111??0? 1001220000
?100000010 0010D3?FG0 010?-??1-? 0001111?0? 011---0000
0-0-0-0130 001111?100 0-0---0--0 0---000-0- 1???--10--
--00012010 00-100---0 0--011?00? ????------ ???211?0?
-0-
```

Megazostrodon

```
?0000?1??? ?0?100000? 0000000000 00?00000?0 1000?00000
0000010?00 0-0010???? ??????1??0 ??????1??? 20010???0?
?1?0?????? ?0?13??01? ?02000010? ???????000 ??1???1?11
20010?0?00 0-0?0111?0 0001?1120- -101000000 0100011110
???????01? 0?21?????? 1?00????1? ?0001?1??? 0?????????
???11????0 0101000000 --00-00000 101001??00 0?00010000
0110000??0 0000000000 1??1-001-0 000001000- -01---1100
0-0-0-0110 000000?010 ??0---0--? 0?--00100- 2110--00--
--000??000 00-0-----0 0--0??100? ?10?------ 100120000?
-?-
```

Morganucodon

```
00000?10?1 ?0010?000? 0000000000 0000?000?0 100010?0?0
00000100?? ???0101000 11?1011010 12001010-- 1001010000
0100120100 -001311010 -020011100 1012000000 0010101011
2111000000 0-01011100 000101120- -101000000 0100011100
0-01000011 0?21001000 1000113010 10001?0010 0110100000
0??1111100 0101000000 --00-00000 A020011000 0001010000
0110000000 0000200000 1101-001-0 000011000- -01---JE00
0-0-0-0110 000000?010 ??0---0--? 0?--00110- 2110--00--
--000??000 00-0-----0 0--0??100? ?10?------ 110010000?
-?-
```

Nemegtbaatar

```
???00?1??? ????????1? ?1?110?0?? ??1?101??1 1110?0????
?????????? ???0002101 -----?1000 1211101210 01-0110001
1001120111 1121110010 1121-11100 1111100010 ?021111111
2111000?? 1001?12102 0002121210 010?110101 1110?1?0??
??00012??? ?????????? ????111020 1211111110 011?101100
0?11110111 1-10----11 1?01110011 2010011111 -01-43-11-
110-11?1-- -1--63131- -22111-211 ?02----010 1011014??0
0-0-0-00-- ---------- ---------- ------0-0- 0???310---
---------- ---------- ------01-- -?--201211 ???44----
---
```

Obdurodon

```
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ???0102000 11?0010101 1111??1110 22?111?000
02?00-0001 2121?1??10 0021-?0100 011100?000 0120101111
```

```
212?????00 0-0?110101 000112120- -101000001 0001000?0
??1??????? ??2??????? ?????1?020 1001111?1? 1212?11?00
000111???1 1011310 1?1 0001111101 112111???? ????55----
-------1-- -1--55?330 0110-???-0 0001001111 ?1?---3400
0-0-??00-1 0012121101 1110110--? 0223101011 021?--0???
??000??001 ???10100?0 0--000100? ?3??------ 221?3B1?21
00-
```

Oligokyphus

```
0?1?0?0??? ?010000000 0000000100 000??000?0 0100000000
0?000100?? ???010??0? ???????020 0--???1110 2101010100
0000120000 -1-0211010 -0???20?00 -0------0- 0?10?10?01
?00??0??00 0-00?00?10 000000010- -1010?1-00 0100201110
0-011-?001 1021??1000 ????112000 3000100100 10????0?00
1?-0110110 0011010?10 --110100-- --30011001 --1-220000
01000001-- -1--320--- ---------- ---------- ------0020
0-0-0-0??- ---------- ---------- ------A-0- 010101?---
---------- ---------- ------00-- -3--02---0 0??044----
---
```

Ornithorhynchus

```
?110111000 0000010100 0000000100 0000?11110 0000201000
0000010111 1010102000 11?0010101 10100-111? 22?0111?00
02?00-0001 2121?11110 0021-20100 0011000000 0120101111
2121100000 0-01110101 000112120- -101000001 0001000?0
111?012201 2?21111111 2201011020 1001111111 1212111100
00011121-1 1-1A010111 0001111101 11??1111-? ????55----
-------1-- -1--76?440 0??0------ ---------- ------4400
0-0-0-?0-1 ----?21-01 1-0---0--? 0-23??0-11 ?21?--0???
??00012001 20-10100?0 0--000100? ?310------ 0????B????
??-
```

Pappotherium

```
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????1???? ??????????
?????????? ?????????? ????-???-? ?????????? ???---?3?0
0-0-0-0??0 000111010? 12???????? ????110-?- ????--0100
2011012001 0101010000 1111?1?1-0 0211------ ????311?10
10-
```

Peramus

```
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
??0111I1A1 0011110111 0011010000 112111???? ??001?????
???00????? ????21011? ?111-001-0 110001100- -01---22?0
0-0-0-0100 A021110101 1011000--0 0001010-0- 0110--00--
--00A12000 0101010000 111111100? ?110------ ????311110
0?-
```

Plagiaulacidae
```
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ???????1?0  ??????????
??????????  ??2???????  ?0????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??11010101  1-10----11  1101110010  201001???1  ?01-42000-
000-10?1-?  ?1--H2?D0-  -00101-110  202----011  1010014410
0-0-0-00--  ----------  ----------  ------0-0-  01??0?0---
----------  ----------  ------01--  -1--001011  0???44----
---
```

Priacodon
```
??????????  ??????????  ???????110  100???????  ??????????
??????????  ??????????  ?????????1  ??????11?0  ????????0?
?0?10-0???  ????2?????  ??????20???  ??????????  ????????11
211100??00  0-0101?11?  ?00111?20-  -??1000000  01?00111?2
0-????0???  ??2???????  ?????????0  111???0???  ????????00
0?01111111  0010----11  0101111010  2021011???  10013?????
??-00?000?  ?000320220  1101-001-0  10000210??  ?01---2200
0-0-0-0120  001000?010  ??0---0--?  0---100-0-  1110--10--
--000??000  2??0-----0  0--000101?  ?10?------  110010000?
-?-
```

Probainognathus
```
00?00?0???  ?0?000000?  0000000000  0000?0???0  00000?0000
0???010???  0-?1000000  000101-020  0--00-00--  2001?00000
0000100000  -0-0311001  2000000000  -0------0-  0000110000
0??00??000  0-01000??0  ????11000-  -00?000001  000-0000??
??01??3000  0-0000?000  1000013000  000000011?  00??000?00
??-0003110  0001010000  --00-000--  --000?0?01  0-00210000
0110000000  0000320---  ----------  ----------  --------?0
0-0-0-0---  ----------  ----------  ----------  ----------
----------  ----------  ----------  ----------  0??000----
---
```

Prokennalestes
```
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ????????11
212?101111  11011??11?  ??1-110210  1??111??01  11??101??0
??1-??0???  ??2???????  ?????????0  ?1????????  ????????00
0?01111111  0011?1A101  0011011000  112111????  ??????????
??????????  ????210001  0D10-01?-0  000110100?  ?0?---3320
0-0-0-0100  0001110101  1011001111  1103010-0-  011?--0111
1110012000  0101010000  11110111-0  0211------  1000311110
10-
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Pseudotribos
```
????00000  0000010100  0000000100  0????0?110  ?000??????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??0??????0  ???1000???  ????????00  102011????  ?1????????
???0??????  ????21?00?  ????-0??-0  0101111?11  ?1?---3310
```

doi:10.1038/nature13922


```
0-0-0-00-0 0111111100 0?0---0--? 0?2?00110- 1?1?--00??
??000??000 0101010000 0--01111-0 0?11------ ????21110?
00-
```

Ptilodus

```
?????01??? ????????0? ???10?0000 0?????1?11 1111201110
1100110?02 ???0002101 -----11121 111???1200 0?-1112001
?0010-00?1 112110-110 002??11100 1111100000 1021111111
211??0???? 100??12102 0?02121210 0?01110101 110001?11?
??????0??? ?????????? ????210010 221011???0 0111101100
??11010111 1-10----11 1?01110011 2010011?1 -01-43-10-
01?-10?1-- -1--63131- -00131-211 202----010 0011214410
0-0-0-00-- ---------- ---------- ------0-0- 0110420---
---------- ---------- ------01-- -1--201111 210?44----
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Pucadelphys

```
11111011-- 1112101-11 2111012022 1111?11011 1111111101
2111110002 ??00002101 -----10011 0--1111200 01-1011000
020?120100 -0?1211010 0020130211 0112010011 011?111011
212310??11 100?-211?2 ?01-1?0210 121100001- -101101111
0-??00D??? ??21?????? 2???11301? ?3-0010011 0111101100
1101111111 1-11310110 --11010011 1131111101 000010000?
???1000000 000032011? ????-101-? ?????????? ???---3320
0-0-0-0100 1001121101 1211101111 12D?010-10 011?--0102
1011012001 11110110A1 1A010111-0 0211------ ????311120
10-
```

Repenomamus

```
?1??0100?? 1??21?1-?? 1110001110 0?0??0001? ??0?1?0?00
1000010??? 1000101000 110?011020 0--???12?1 0000?10000
?2?01101?0 -12021?110 ?0200101?0 1012000000 ?010????11
211????000 0-0?0111?1 00???1120- -201000000 010?1?11??
0-???????? ??21?????? ????0100A0 ?0?01????0 ?1????????
??01112101 0010----11 0101110010 101111??10 0000320000
0110000010 0010330330 1101-002-0 00110?000- -02---1210
0-0-0-0100 ?01000?0?0 ??0---0--? 0---01???? 01??--?0--
--00???000 00-0-----0 0--000101? ?10?------ ??????01??
-?-
```

Rugosodon

```
1111101000 1111001-10 110100?0?0 10100?0111 ?010201?00
1??0110111 111??????? ?????????? ???????1?? ?????????1
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ????1????? ?????????? ?????????? ??????????
??010????1 ??10----?0 ??0111?011 2010011100 001-420000
000-101010 11--42?10- -0?1?1-1?0 ?02----0?? ?0?00044?0
0-0-0-00-- ---------- ---------- ------0-0- 0110200---
---------- ---------- ------01-- -?--110--1 ???44----
---
```

Sinobaatar

```
11?1101000 1111001-10 1101002020 10100?A1?1 1110201?00
1??0110111 111??????? ?????????? 1?0????2?1 ??????????
1??0?????1 ?1??1????? ?0??????00 111210?000 ??????????
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??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??1????0??  ??????????  ??????????
??01010111  1-10----10  ?201110011  2010011111  -01-42?10-
000-1011--  -1--52120-  -1A101-110  202----010  00?1114400
0-0-0-00--  ----------  ----------  ------0-0-  01??110---
----------  ----------  ------01--  -?--A01101  ???44----
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```

Sinoconodon

```
000?00?000  0000000000  0000000000  0000?????0  00000??0??
??????????  ???0000000  00110?-020  10001010--  2001110000
?100120100  -001311010  -020011100  000200000?  0010111011
10010?0000  0-01011100  000000010-  -001000000  0100001100
0-01???000  0-11001000  1?00013000  1000100??0  00??0?00??
??011????0  0001000000  --00-00000  1010010000  1?01000000
?110?00000  0000320330  1??1-0??-0  000110000-  -01---1100
0-0-0-00-0  000000?010  ??0---0--?  0?--A00-0-  011?--00--
--00A??000  00-0-----0  0--0??01-?  ?10?------  110000000?
-?-
```

Sinodelphys

```
?????011--  1112101-11  2?11112?22  11111???11  ?1???10001
21??11000?  110???????  ?????????0  0--???1???  ??????????
?????????0  -0?1??????  ?02?????1?  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ?1????????
??01113101  ??113101?1  00010???10  113111???0  110011??00
0??0000000  0000?1?00?  ????-1??-?  ??????????  ???---?3?0
0-0-0-0100  ?011?201?1  10110010?1  11?1010-0-  011?--?1??
?1?????000  1??1010???  1???111???  ????------  ????311110
10-
```

Spalacotherium

```
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??0??????1  0010----?1  0101110011  112111????  ??????????
??????????  ????0??2??  ???1-001-0  0001111???  ?0?---0000
0-0-0-0130  001111?100  0-0---0--0  0---000-0-  111?--10--
--00112010  00-100---0  0--1111???  ?10?------  ????21110?
-0-
```

Steropodon

```
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??????????  ??????????  ??????????  ??????????
??????????  ??1???????  ??????????  ?????1????  ??????????
??????????  ??????????  ????-???-?  ??????????  ???---???0
0-0-0-00-0  0112120101  1110110--?  0223101011  011?--????
??????????  ??????????  ??????????  ????------  ????301?21
00?
```

Sudamerica A
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
???1010211 ??1??????? ?????????? ?????1???? ??1-4?????
???-112??? ?1--6?15?- -????----- ---------- ------2??1
10111A00-- ---------- ---------- ------0-0- 0010--?---
---------- ---------- ------01-- -0-------- 100154----
--0

Sudamerica B
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
???1010211 ??1??????? ?????????? ?????1???? ??1-4?????
???-112??? ?1--6?13?- -????2-210 1?1----00- -02---4??1
10111A0??- ---------- ---------- ------0-0- 0010--?---
---------- ---------- ------01-- -0-------- 100154----
--0

Taeniolabis
??10?????? ???10????? 2?0100??00 ?????????? ??????????
?????????? ???101?101 -----??10? 0--???1200 ?2-??11?00
00?0?????1 11202??010 102??1???? 0?10?000?0 ?????????1
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ????01011? ???001???0 0?????????
??11010101 1-10----11 1?01110001 1A20011111 -01-43-10-
110-1121-- -1--76144- -2211----- 002----00- -011004410
0-0-0-00-- ---------- ---------- ------0-0- 011?420---
---------- ---------- ------01-- -3--221211 110?44----

Tanzanian taxon A
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????10111 2-1??????? ???1110??? ??1001???? ??1-4?????
???-1?2??? ?1--6?1??- -????----- ?????--?-? ?-????2??1
?????????- ---------- ---------- ------???? ?0??--?---
---------- ---------- ------???- -?-------- ????5?----
--?

Tanzanian taxon B
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????10111 2-1??????? ???1110??? ??1001???? ??1-4?????
???-1?1??? ?1--6????- -?????-??0 ???----?-? ?-2???2??1

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?????????- ---------- ---------- ------???? ?0??--?---
---------- ---------- ------???- -?-------- ????5?----
--?
```

Teinolophos

```
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????1 1-112111?1 0001110101 112111???? ??????????
?????????? ?????????? ????-???-? ?????????? ???---???0
0-0-??00-0 0D12120101 1110110--? 0223001011 011?--????
?????????? ?????????? ?????????? ????------ ????301?21
00?
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Thomasia

```
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????1???? ?????201?0
00??10???? ???-?????- -2??0?-??0 ?00----?0- -0?0-0??10
0-0-0-00-- ---------- ---------- ------0-0- 0???120---
---------- ---------- ------01-- -D--??0--1 ????43----
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```

Thrinaxodon

```
00000?00?1 000000000? 0000000100 0000?00000 000?000000
000000???? ??00100000 000101-020 1200??00-- 2001000000
00100-0000 -0-030-001 2000000000 -0------?- 0000000?00
0??0?0?000 0-10-00??0 000010000- -000000001 000-0?01??
0-01??30?0 0-00000000 0000003000 40000000?0 ?0???0??00
1?-0010110 0000---000 --00-000-- --10100000 0-00210000
0110000000 0000MN0--- ---------- ---------- --------00
0-0-0-0--- ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- 0????0----
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```

Tinodon

```
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
??011????1 0110----01 01010??011 113111???? ???0??????
?????????? ?0114?02?? ????-01?-0 000111100- -0?---3??0
0-0-0-0100 0011110200 0-0---0--0 0---01110- 111?--00--
--00012010 00-1110000 11?000100? ?10?------ ????20110?
-?-
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Trapalcotherium

```
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
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?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????- -????????? ?????????? ?????????0
0-10100??- ---------- ---------- ------???? ????--?---
---------- ---------- ------???- -?-------- ????5?----
--?
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Tribosphenomys

```
?????????? ?????????? ?????????? ????????0? ??????11?1
1?21011??? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
??01110121 1-11110?11 00110000?? ?0301111-1 -?1-441--1
----1121-- -1--640431 0211------ 0100021?0- -01---3320
0-0-0000-A -102121101 1010001110 122?100-0- 0110--?11A
10110AD001 20-0-0---0 0--00011-0 0211------ ????3?1120
10?
```

Trioracodon

```
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ????????11
211?00??00 0-0101111? ?00111120- -1?1000000 01?0011??0
0-0?000??? ??2??????? ?????????0 111??????? ????101100
??011????1 0010----11 0101111010 202001???? 10002?????
???????001 0000320110 11?1-10?-0 10001110?? ?0?---3300
0-0-0-0120 001000?010 ??0---0--? 0---A00-0- 11??--10--
--000??000 2??0-----0 0--000101? ?10?------ ????10000?
-?-
```

Tritheledontidae

```
?0??0?00?1 101000000? 0000000000 0000?0???0 ?000???0??
?????????? ???A000A00 A??101-010 0--?0-10-- 2001010100
01A0100100 -0-0211010 -0100AA000 -0------0- 0000010000
0001??0000 0-00000?00 000010000- -00A000000 000000001?
0-01???000 0-1100???? ????A1C000 0001000??? 00??000000
1?-111A110 000A0?0000 --00-100-- --100?00?1 1-?1EK000?
?1?00?000? 000?ED0--- ---------- ---------- --------?0
0-0-??0--- ---------- ---------- ---------- ----------
---------- ---------- ---------- ---------- 100100----
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```

Ukhaatherium

```
?1??1?1??? ??12001-1? 21111?2022 101000?011 ?112110???
2121110002 ???0002101 -----???10 ???????2?? 2?-1010100
02?0??0100 -10131?010 -12??30??? ?10201011? 0????11111
2123?0111? 1110-21112 011-?-0?10 020110001- -10?1011A0
??????1??? ?????????? ?01??0?01? ???1?100?0 12??????00
0?01111111 1-?1110??1 --?10???10 113111??11 0001100000
01?0000000 0000320110 0100-111-0 000100100- -??---3320
0-0-0-00-0 ?0?????1?1 1?1??????? 1??3?10-0- ?11?--0111
211100-000 0101010010 11011111-0 0211------ ????311110
10-
```

Vincelestes
```
     01111?11-- 1112111-10 1111010011 1100001011 1100111010
     1100110l?? 0-?0002000 11?1111020 1111??1100 2100010000
     0100110000 -00A310010 0020020100 0110000000 00?0111111
     212201?111 100?011111 0001021210 0201110001 1100101110
     0-01000??? ??21?????? ????013000 111011??11 1111100100
     1001111111 1-11110101 0011010001 112111??01 0001310000
     0000000001 0001540330 0101-002-0 100000100- -11---3300
     0-0-0-00-0 0011110201 1000?-0--0 1101100-0- 01??--0100
     ?0000??000 0??1010000 0--00011-? ?211------ 1000311110
     00-
```

Vintana A
```
     ?????????? ?????????? ?????????? ?????????? ??????????
     ?????????? ???0001010 0110111100 1011101110 0011110110
     00000-1000 -012211010 0020000100 1111101000 200?110011
     1111111111 1011-12111 010112121? ?101000101 1100001112
     10????3??? ??21?????1 ????112000 2110001100 0100101101
     00???????? ?????????? ?????????? ?????1??-1 --???3110?
     ??-????1-- -????4??4- -231?????? ?????????? ???????2?1
     1110100??- ---------- ---------- ------???? ????--0---
     ---------- ---------- ------01-? ?3----0--- 221155----
     --1
```

Vintana B
```
     ?????????? ?????????? ?????????? ?????????? ??????????
     ?????????? ???0001010 0110111100 1011101110 0011110110
     00000-1000 -012211010 0020000100 1111101000 200?110011
     1111111111 1011-12111 010112121? ?101000101 1100001112
     10????3??? ??21?????1 ????112000 2110001100 0100101101
     00???????? ?????????? ?????????? ?????1??-1 -0???3110?
     ??-????1-- -????4??2- -100?????? ?????????? ???????4?1
     1110100??- ---------- ---------- ------???? ????--0---
     ---------- ---------- ------01-? ?3----0--- 221155----
     --1
```

Yanoconodon
```
     0000010000 1112111-10 1110000110 10000000?0 0000100000
     0??00101?0 0-0??????? ?????????? ?????????? ??????????
     ?????????0 -121?????? ?????????? 1?120000?0 ?0????????
     ?????????? ?????????? ?????????? ?????????? ??????????
     ???????21? 2221???110 2001?????? ?????????? ??????????
     ??011????1 0010----11 010????10 102001??-? 000033000?
     ??-00?0000 0000540330 0???-???-? 000?000??? ?01---33?0
     0-0-0-0120 00100??010 ??0---0--? 0---100-0- 0110--00--
     --???????? ?0-0-----0 0--?0001-? ????------ ????100?0?
     -?-
```

Yunnanodon
```
     ?????????? ?????????? ?????????? ?????????? ??????????
     ?????????? ????0??010 ???10???20 0--????0-- ?01??1????
     000????0?0 -0-0211010 002000?00? -0------0- ?00?1?1?01
     1000??0000 0-0??00?00 000000010- -101001-00 010020111?
     0-??????00 1-21?????? ???01300? ?010??0??0 00????????
     ??-??????? ?????????? ????????-- --3001??01 --???3-?0?
     ???????1-- -????40--- ---------- ---------- ------?1?0
```

```
0-0-0-0??- ---------- ---------- ------???? ?10101?---
---------- ---------- ------00-- -?--00---0 ????44----
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```

Zalambdalestes

```
??11111??? ????01-1? ?111112022 101001111? ?1112111?1
212110-002 ??00102101 -----010B0 0--???1200 11-1010000
1100110100 -011111111 0020030111 0101010111 0110111111
2123?01111 1110-21112 011-1-0210 02111?0001 1100111111
0-1-??D??? ??21?????? 3012110010 1200111010 021111????
??01111111 1-11110111 0011110011 1111111111 01012E000?
?11011D001 0010320111 11A0-111-0 1100121?0- -0?---3320
0-0-0-0120 0102121101 1211A?1111 1223110-0- 011?--0111
10110A2001 210100---0 0--11111-0 0211------ ????3?1120
10-
```

Zhangheotherium

```
?110001010 1112111-10 111101A111 1000000011 1110110000
1100111?1 111?10?0?? ?????????? ??????11?? ??????????
???????1?0 -011????10 -????????? 1112000000 ???0????1?
211?????11 100?0??1?? 0001121210 020100??01 01???1111?
0-???????? ??21?????? ?????????? ?????????? ??????????
??01111?01 0010----?1 0101110011 1101111??? ??0022000?
???0000??? ?0101?03?? ????-???-? 100???100- -01---0100
0-0-0-0130 001111?200 0-0---0--0 00--00110- 1110--??-?
?????????? ?????????? ?????????? ????------ ????21110?
-?-
```

Phylogenetic Methods and Datasets

The character matrix was analyzed under the assumption of parsimony using TNT v. 1.1 (Goloboff et al., 2008) and in a Bayesian context, using the Mk model for morphological data in MrBayes 3.2, a gamma parameter for rate variation, and uniform priors (Ronquist and Huelsenbeck, 2003). Trees were rooted along the branch leading to *Thrinaxodon*. All characters were treated as equally weighted and unordered. We used the New Technology search in TNT, implementing sectorial search, ratchet, drift, and tree fusing and allowing analyses to run until the same shortest tree length was recovered in 100 separate replications. These trees were then subjected to traditional search methods using TBR tree exploration. Bayesian analyses were run for 50 million Markov Chain Monte Carlo (MCMC) generations, with the first 25% discarded as "burn-in." Clade support was estimated using Bremer support (Bremer, 1994) calculated in TNT v. 1.1 (Goloboff et al., 2008) and posterior probabilities calculated in MrBayes. Separate analyses were performed for different treatments of gondwanatherian taxa:

1) Gondwanatheria scored as possessing four molars, *Ferugliotherium* scored based on molar material only (*Ferugliotherium* A);

2) Gondwanatheria scored as possessing two molars (Gurovich and Beck, 2009) and *Ferugliotherium* scored based on molars, premolars and incisors tentatively assigned to *Ferugliotherium* (Krause et al., 1992; Krause, 1993; Kielan-Jaworowska and Bonaparte, 1996) (*Ferugliotherium* B).

Results of Phylogenetic Analyses

The results of the four different analyses (two different datasets, parsimony and Bayesian analyses) generally show a similar pattern in placing Gondwanatheria nested within or as sister to Multituberculata. In this regard, our results are generally consistent with that presented in a phylogenetic analysis by Gurovich and Beck (2009), which was based only on data from the dentition and lower jaw and involved an important assumption, that gondwanatherians had only two molars in each quadrant. In a strict consensus of 36 most parsimonious trees and in a Bayesian analysis, their study recovered gondwanatherians in a polytomy with "plagiaulacidan" and cimolodontan multituberculates. As a result, Gurovich and Beck (2009) included gondwanatherians and multituberculates within Allotheria. Unlike the study by Gurovich and Beck (2009), however, we recovered both Gondwanatheria and Multituberculata as monophyletic taxa in the parsimony analysis of Dataset #1. It is important to note that Gurovich and Beck (2009:38) opined that "[c]onfident resolution of whether Gondwanatheria and Multituberculata form a clade will require more complete material of gondwanatherians," a prerequisite that is provided, at least in part, by the cranium of *Vintana*. More broadly, whereas Gurovich and Beck (2009) recovered *Haramiyavia* at a more basal level on the tree, as the sister group of Tritylodontidae and therefore outside of Allotheria, our analysis recovered *Haramiyavia* (and *Thomasia*) as basal allotherians. Furthermore, Gurovich and Beck's (2009) analysis placed the Gondwanatherian + Multituberculata clade outside of crown Mammalia, whereas our analysis clearly places Gondwanatheria and Multituberculata, along with *Haramiyavia*, *Thomasia*, and *Arboroharamiya*, in a monophyletic Allotheria within crown Mammalia.

Dataset #1–When scoring all four molariform teeth as molars in a parsimony analysis, Gondwanatheria + *Arboroharamiya* are resolved as sister to Multituberculata within Allotheria (Fig. S1; simplified in Fig. 3). Gondwanatheria and Multituberculata are each monophyletic and, as a combined group, are sister to *Thomasia* and *Haramiyavia*. Gondwanatheria is well supported (Bremer support of 3), whereas support for a Multituberculata + [Gondwanatheria + *Arboroharamiya*] clade as well as for Multituberculata itself is weak (Bremer support of 1). Haramiyida was not recovered as a monophyletic clade, *Thomasia* and *Haramiyavia* are placed at the base of Allotheria, and *Arboroharamiya* is sister to Gondwanatheria. Allotheria is, however, very well supported in the parsimony analysis with a Bremer value of 4, as is the node that includes *Thomasia* and all other allotherians (except the more basal *Haramiyavia*).

The Bayesian analysis of the same dataset likewise recovered a monophyletic Allotheria, with the paraphyletic Haramiyida at its base (Fig. S2). The monophyletic Gondwanatheria are nested within multituberculates (rather than sister to multituberculates as in the parsimony analysis). Support for Allotheria (.51), Multituberculata including Gondwanatheria (0.63), and Gondwanatheria nested within Multituberculata (.58) is, however, very low.

Dataset #2–When only scoring the penultimate and ultimate molariform teeth as molars (and the cheek teeth mesial to them as premolars), as a test of the Gurovich and Beck (2009) hypothesis, Gondwanatheria and Multituberculata are still united within Allotheria (Figs S3, S4), but, interestingly, relationships among and within these groups are much less resolved. In the parsimony analysis, a Gondwanatheria + *Arboroharamiya* clade is still recovered, but with low support (Bremer support of 1). The clade is placed in a polytomy with *Thomasia*, Paulchoffatiidae, Plagiaulacidae, Cimolodonta, and *Rugosodon* + *Sinobaatar*. In the Bayesian analysis, all gondwanatherians and multituberculates are still placed within Allotheria. However, Gondwanatheria are not necessarily monophyletic because *Ferugliotherium* is recovered in a polytomy with *Arboroharamiya*, Paulchoffatiidae, Plagiaulacidae, Djadochtatherioidea, Taeniolabidoidae, *Ptilodus*, *Rugosodon*, *Sinobaatar*, and a clade containing the remaining gondwanatherians.

Notable, but outside of the focus of this paper, is the contradictory position of *Hadrocodium* in the two analytical approaches. In the parsimony analyses of both datasets, *Hadrocodium* is recovered as sister to Mammaliaformes (Figs S1, S3), whereas it is placed in a polytomy with several other basal mammaliaform genera, australosphenidans, allotherians, and trechnotherians (Dataset #1; Fig. S2) or with *Haldanodon* and australosphenidans (Dataset #2; Fig. S4) in the two Bayesian analyses. Based on these conflicting topologies and generally low support for any of the nodes within basal mammaliaforms in both the parsimony and Bayesian analyses, we have little confidence in the placement of *Hadrocodium*.

Of further interest, but also beyond the scope of this paper, is the consistent placement of Henosferidae (composed of *Henosferus*, *Ambondro*, and *Asfaltomylos*) separate from Australosphenida and within Cladotheria. A more detailed analysis and description covering these findings will follow in a separate publication.

FIGURE S1. Strict consensus of 40 equally most parsimonious trees. Tree length = 2025, CI = 0.305, RI = 0.701. Node support given as Bremer values. Gondwanatherian genera scored as having four molars.

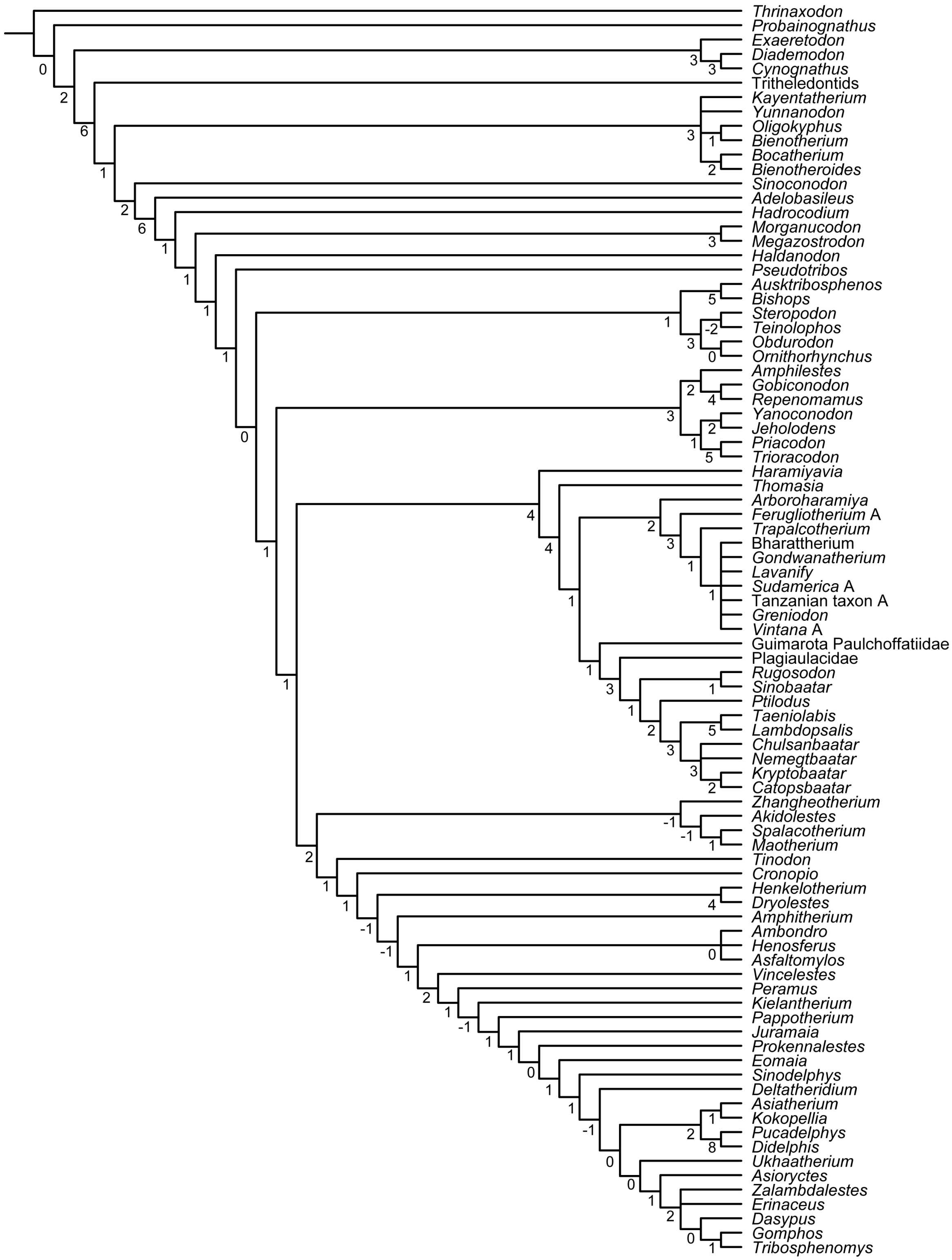

FIGURE S2. “Halfcompat" (50% majority-rule) consensus of 75,000 post-“burn-in” trees recovered by 50 million generations of Markov Chain Monte Carlo sampling in MrBayes 3.2 using Dataset #1. Node support given as posterior probabilities. Gondwanatherian genera scored as having four molars.

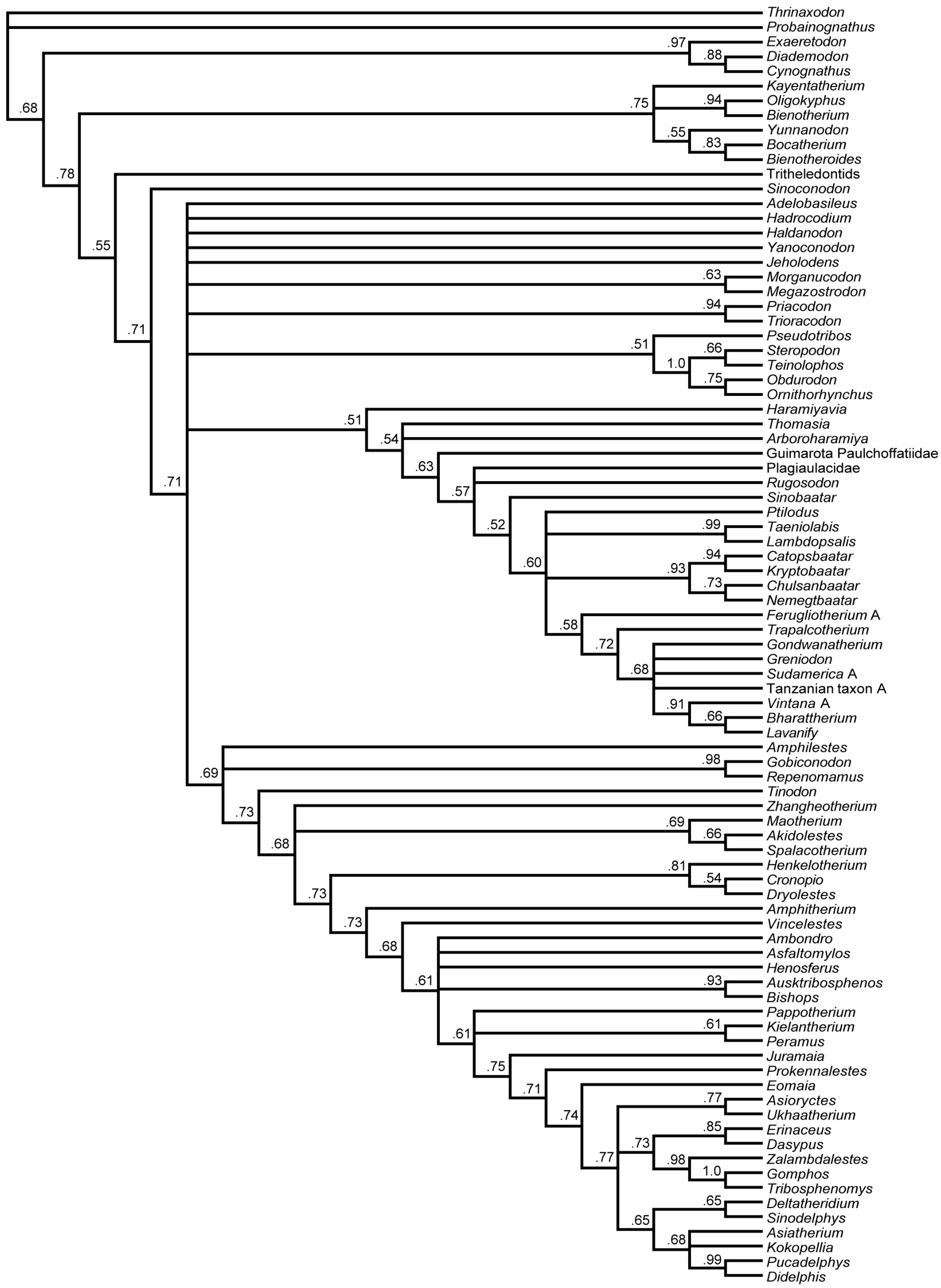

FIGURE S3. Strict consensus of 60 equally most parsimonious trees using Dataset #2. Tree length = 2034, CI = 0.303, RI = 0.609. Node support given as Bremer values. Gondwanatheria (*Vintana* B, *Sudamerica* B, Tanzanian Taxon B) scored as having two molars. *Ferugliotherium* scored based on molars, premolars, and incisors (*Ferugliotherium* B).

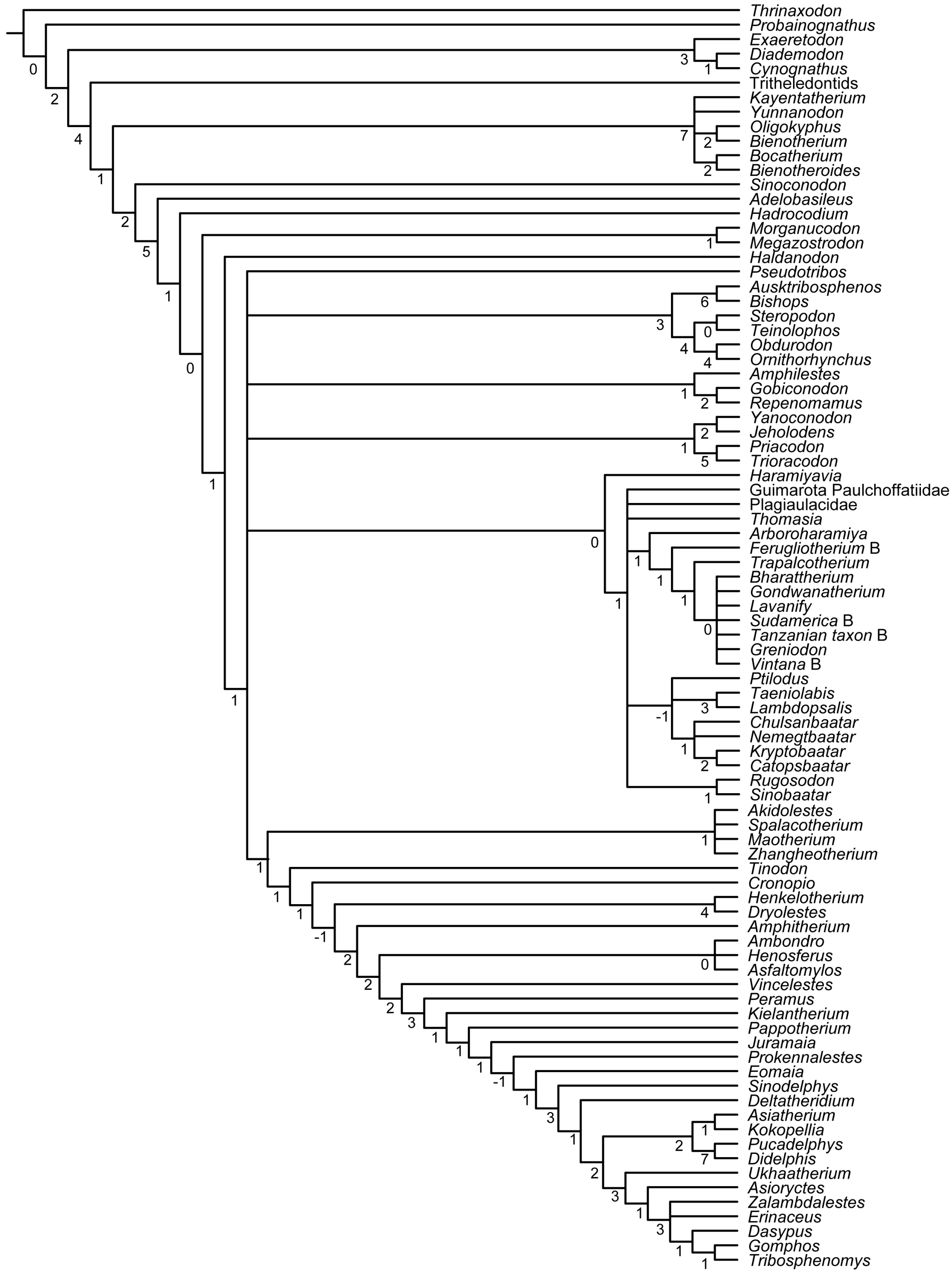
Thrinaxodon
Probainognathus
Exaeretodon
Diademodon
Cynognathus
Tritheledontids
Kayentatherium
Yunnanodon
Oligokyphus
Bienotherium
Bocatherium
Bienotheroides
Sinoconodon
Adelobasileus
Hadrocodium
Morganucodon
Megazostrodon
Haldanodon
Pseudotribos
Ausktribosphenos
Bishops
Steropodon
Teinolophos
Obdurodon
Ornithorhynchus
Amphilestes
Gobiconodon
Repenomamus
Yanoconodon
Jeholodens
Priacodon
Trioracodon
Haramiyavia
Guimarota Paulchoffatiidae
Plagiaulacidae
Thomasia
Arboroharamiya
Ferugliotherium B
Trapalcotherium
Bharattherium
Gondwanatherium
Lavanify
Sudamerica B
Tanzanian taxon B
Greniodon
Vintana B
Ptilodus
Taeniolabis
Lambdopsalis
Chulsanbaatar
Nemegtbaatar
Kryptobaatar
Catopsbaatar
Rugosodon
Sinobaatar
Akidolestes
Spalacotherium
Maotherium
Zhangheotherium
Tinodon
Cronopio
Henkelotherium
Dryolestes
Amphitherium
Ambondro
Henosferus
Asfaltomylos
Vincelestes
Peramus
Kielantherium
Pappotherium
Juramaia
Prokennalestes
Eomaia
Sinodelphys
Deltatheridium
Asiatherium
Kokopellia
Pucadelphys
Didelphis
Ukhaatherium
Asioryctes
Zalambdalestes
Erinaceus
Dasypus
Gomphos
Tribosphenomys

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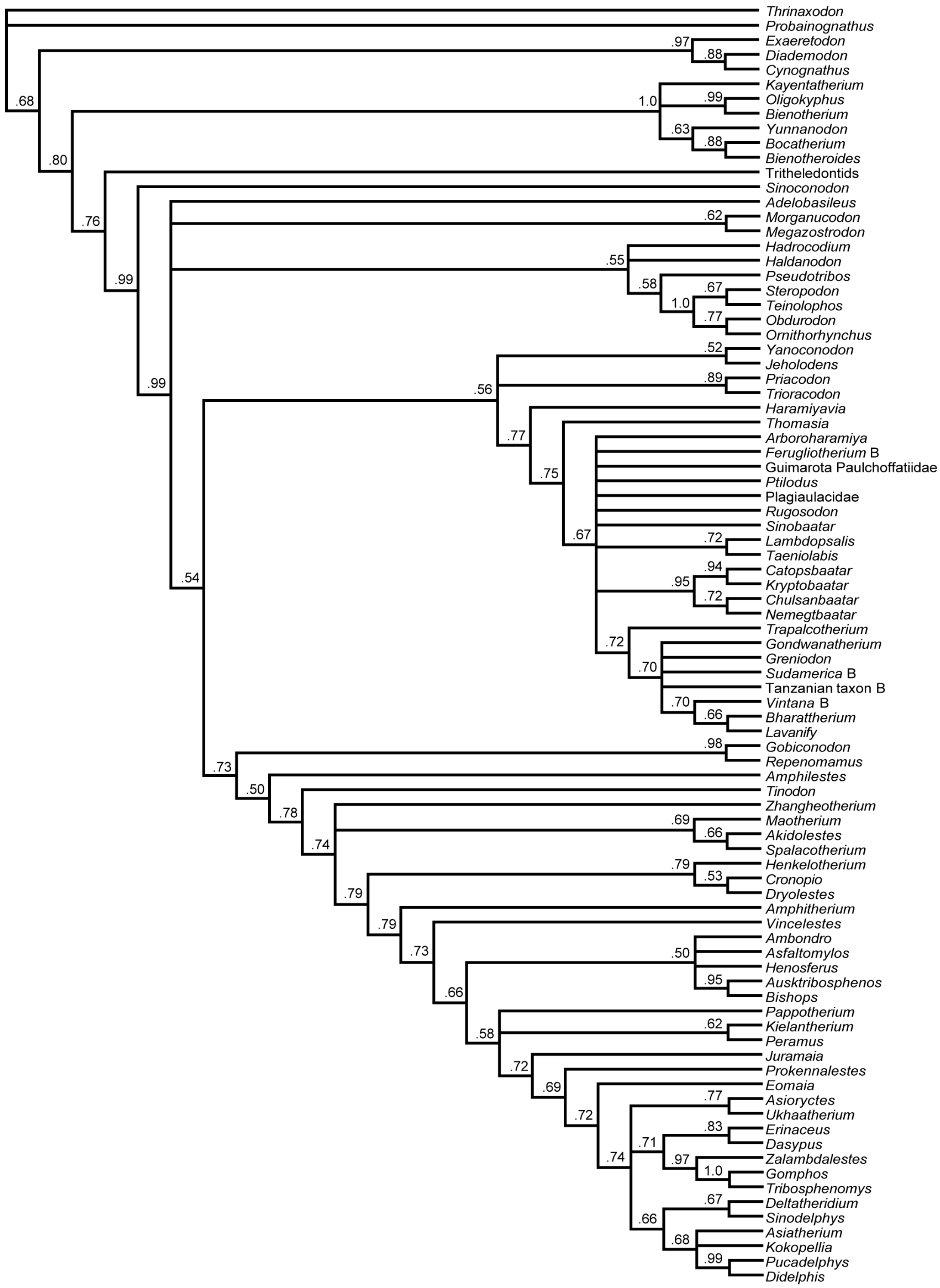
FIGURE S4. "Halfcompat" (50% majority-rule) consensus of 75,000 post-"burn-in" trees recovered by 50 million generations of Markov Chain Monte Carlo sampling in MrBayes 3.2 using Dataset #2. Node support given as posterior probabilities. Gondwanatheria (*Vintana* B, *Sudamerica* B, Tanzanian Taxon B) scored as having two molars. *Ferugliotherium* scored based on molars, premolars and incisors (*Ferugliotherium* B).



doi:10.1038/nature13922

Apomorphy List for Parsimony Analysis Dataset #1

```
P A U P *
Version 4.0a109 for Macintosh (X86)
Sunday, February 28, 2010  12:43 PM

Running on IA-32 architecture (64-bit word length)
SSE vectorization enabled
Multithreading enabled for likelihood using OpenMP

-----------------------------NOTICE-----------------------------
        This is an alpha-test version prepared for the exclusive
        use of course and workshop participants, as well as other
        authorized testers.  It will expire on 1 Jul 2010.

        Please report bugs to david.swofford@duke.edu
----------------------------------------------------------------

Processing of file "~/Desktop/tnt nature revision
8_25/Vintana_nature_8_25_paup.nex" begins...

Data matrix has 91 taxa, 453 characters
Valid character-state symbols: 0123456789
Missing data identified by '?'
Gaps identified by '-'

Processing of file "Vintana_nature_8_25_paup.nex" completed.

paup> GetTrees File=analysis1.trees;

Processing TREES block from file "analysis1.trees":
  Keeping: trees from file (replacing any trees already in memory)
  40 trees read from file
  Time used = 0.01 sec (CPU time = 0.00 sec)

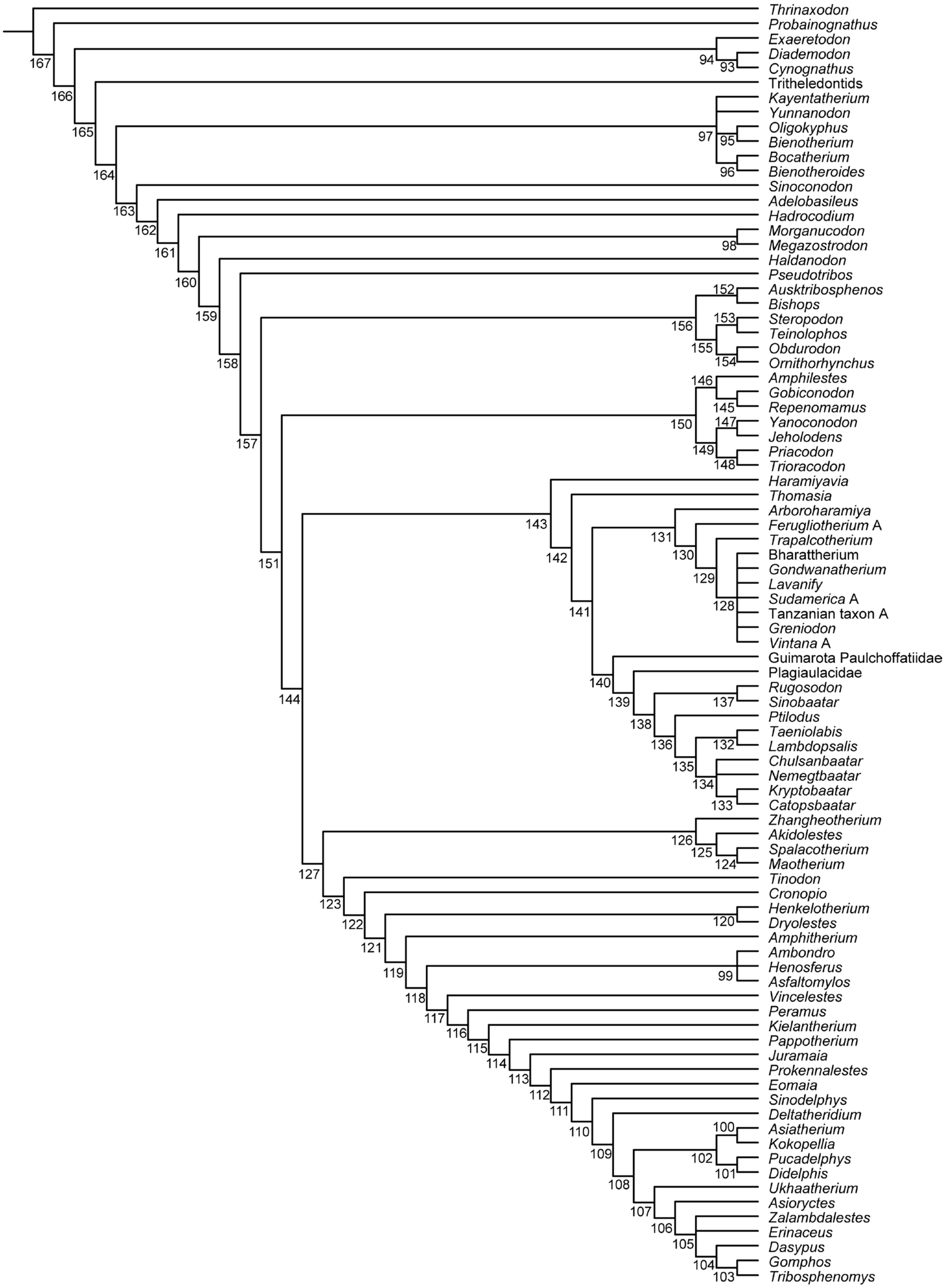
paup> DescribeTrees ApoList=yes;

Tree description:

  Unrooted tree(s) rooted using outgroup method

  Note: No outgroup has been defined; tree is (arbitrarily) rooted at first taxon.
  Optimality criterion = parsimony
    Character-status summary:
      Of 453 total characters:
        All characters are of type 'unord'
        All characters have equal weight
        10 characters are parsimony-uninformative
        Number of parsimony-informative characters = 443
    Gaps are treated as "missing"
    Character-state optimization: Accelerated transformation (ACCTRAN)

Tree number 1 ('tagged tree') (rooted using default outgroup)
```




```
Apomorphy lists:

                Branch                   Character  Steps     CI   Change
-------------------------------------------------------------------
```

Thrinaxodon <-> node_167	28	1	0.125	1 <-> 0
	39	1	0.333	0 <-> 1
	56	1	0.250	0 <-> 1
	64	1	0.400	0 <-> 1
	65	1	0.182	1 <=> 0
	81	1	0.300	1 <=> 0
	103	1	0.600	1 <=> 0
	105	1	0.143	0 <=> 1
	116	1	0.200	0 <=> 1
	145	1	0.286	0 <=> 1
	146	1	0.250	0 <=> 1
	163	1	0.333	1 <=> 0
	164	1	0.250	0 <-> 1
	198	1	0.200	1 <=> 0
	217	1	0.500	0 <-> 1
	226	1	0.333	0 <=> 1
	231	1	0.556	4 <=> 0
	238	1	0.143	0 <=> 1
	264	1	0.500	0 <=> 1
	285	1	0.400	1 <=> 0
	286	1	1.000	0 <-> 1
	290	1	0.222	0 <=> 1
node_167 --> *Probainognathus*	176	1	0.222	0 ==> 1
	221	1	0.667	0 ==> 1
	256	1	0.333	1 ==> 0
	257	1	0.435	0 ==> 3
	266	1	0.200	0 --> 1
	283	1	0.211	1 ==> 0
node_167 --> node_166	115	1	0.308	3 --> 2
	123	1	1.000	0 ==> 1
	154	1	0.750	0 --> 1
	178	1	0.400	0 --> 1
	190	1	0.250	1 ==> 0
	207	1	0.625	3 --> 0
	276	1	0.167	0 ==> 1
	291	1	0.286	0 ==> 1
	294	1	0.083	0 ==> 1
	296	1	0.367	1 --> 2
node_166 --> node_94	28	1	0.125	0 --> 1
	48	1	0.143	0 --> 1
	56	1	0.250	1 --> 0
	89	1	0.250	0 --> 1
	95	1	0.222	0 ==> 1
	124	1	0.333	0 ==> 1
	151	1	0.500	0 --> 2
	187	1	0.333	0 --> 1
	191	1	0.286	0 ==> 1
	195	1	0.500	0 ==> 2
	215	1	0.500	0 --> 1
	227	1	0.385	3 ==> 0
	237	1	0.200	0 ==> 1
	300	1	0.333	0 --> 1
	301	1	0.333	0 --> 1
	306	1	0.286	0 --> 1
	315	1	0.524	3 --> 0
	316	1	0.462	2 --> 0
	446	1	0.500	0 ==> 4
node_94 --> *Exaeretodon*	67	1	0.400	0 ==> 1
	76	1	0.200	1 ==> 0
	79	1	0.267	2 ==> 0
	88	1	0.333	0 ==> 1
	94	1	0.143	1 ==> 0
	98	1	0.286	0 --> (01)
	232	1	0.300	0 ==> 1
	250	1	0.333	0 ==> 1
	259	1	0.250	1 ==> 2
	263	1	0.333	0 ==> 1

	290	1	0.222	1 ==> 0
	315	3	0.524	0 --> (0123)
	316	3	0.462	0 --> (0123)
node_94 --> node_93	114	1	0.300	0 ==> 2
	115	1	0.308	2 --> 3
	117	1	0.250	1 ==> 0
	146	1	0.250	1 ==> 0
	217	1	0.500	1 --> 0
	226	1	0.333	1 ==> 0
	296	1	0.367	2 --> 1
node_93 --> *Diademodon*	92	1	0.375	0 ==> 1
	127	1	0.375	0 ==> 1
	231	2	0.556	0 ==> (34)
	256	1	0.333	1 ==> 0
	257	1	0.435	0 ==> 3
node_93 --> *Cynognathus*	64	1	0.400	1 --> 0
	65	1	0.182	0 ==> 1
	225	1	0.364	0 ==> 1
	294	1	0.083	1 ==> 0
node_166 --> node_165	13	1	0.400	0 --> 1
	64	1	0.400	1 --> 0
	72	1	0.500	0 --> 1
	87	1	0.500	0 --> 1
	96	1	0.500	0 ==> 1
	98	1	0.286	0 --> 1
	102	1	0.200	0 --> 1
	119	1	1.000	0 ==> 1
	120	1	0.250	1 ==> 0
	121	1	0.667	2 --> 0
	127	1	0.375	0 --> 1
	164	1	0.250	1 --> 0
	184	1	1.000	0 --> 1
	213	1	0.667	0 --> 1
	214	1	1.000	0 ==> 1
	235	1	0.200	0 ==> 1
	254	1	0.500	0 --> 1
	255	1	0.250	0 --> 1
	441	1	0.250	0 --> 1
node_165 --> node_164	10	1	0.500	1 --> 0
	14	1	0.429	0 --> 1
	85	1	0.333	0 --> 1
	106	1	0.400	0 ==> 2
	123	1	1.000	1 ==> 2
	147	1	0.333	0 ==> 1
	150	1	1.000	0 ==> 1
	151	1	0.500	0 --> 1
	175	1	0.250	1 ==> 0
	192	1	0.333	0 ==> 1
	197	1	0.333	0 ==> 1
	198	1	0.200	0 ==> 1
	210	1	0.500	0 --> 1
	213	1	0.667	1 --> 2
	287	1	0.333	0 --> 1
	295	1	0.333	2 --> 0
	442	1	0.222	0 --> 1
node_164 --> node_97	28	1	0.125	0 --> 1
	87	1	0.500	1 --> 0
	102	1	0.200	1 --> 0
	154	1	0.750	1 --> 0
	182	1	0.400	0 ==> 1
	187	1	0.333	0 ==> 1
	195	1	0.500	0 ==> 2
	205	1	1.000	0 --> 1
	233	1	0.400	0 ==> 1
	239	1	0.333	1 --> 0
	254	1	0.500	1 --> 0
	255	1	0.250	1 --> 0

	259	1	0.250	1 ==> 2
	263	1	0.333	0 ==> 1
	266	1	0.200	0 --> 1
	274	1	0.333	0 ==> 1
	283	1	0.211	1 ==> 3
	293	1	0.250	0 ==> 1
	295	1	0.333	0 --> 4
	303	1	0.167	1 --> 0
	308	1	0.167	0 ==> 1
	312	1	0.250	0 ==> 1
	349	1	0.273	0 ==> 2
	394	1	1.000	0 --> 1
	432	1	0.333	1 --> 3
	441	1	0.250	1 --> 0
	445	1	0.455	0 ==> 4
	446	1	0.500	0 ==> 4
node_97 --> node_95	3	1	0.500	0 --> 1
	14	1	0.429	1 --> 0
	74	1	0.500	1 --> 0
	88	1	0.333	0 ==> 1
	89	1	0.250	0 --> 1
	92	1	0.375	0 ==> 1
	112	1	0.333	0 --> 1
	127	1	0.375	1 ==> 0
	147	1	0.333	1 ==> 0
	169	1	0.500	0 --> 1
	211	1	0.600	0 ==> 1
	227	1	0.385	3 --> 2
	241	1	0.222	0 ==> 1
	255	1	0.250	0 --> 1
	269	1	0.200	0 --> 1
	273	1	0.400	0 ==> 1
	275	1	0.250	1 ==> 0
node_95 --> *Oligokyphus*	42	1	0.286	0 ==> 1
	65	1	0.182	0 ==> 1
	87	1	0.500	0 ==> 1
	126	1	0.455	0 ==> 2
	143	1	0.333	0 ==> 1
	225	1	0.364	0 ==> 1
	231	1	0.556	0 ==> 3
	233	1	0.400	1 ==> 0
	259	1	0.250	2 ==> 1
	295	1	0.333	4 ==> 2
	387	1	0.333	0 --> (01)
	436	1	0.600	0 ==> 2
node_95 --> *Bienotherium*	191	1	0.286	0 ==> 1
	262	1	0.222	0 ==> 1
	296	1	0.367	2 --> 3
node_97 --> *Kayentatherium*	12	1	0.667	0 ==> 1
	13	1	0.400	1 --> 0
	16	1	0.400	0 ==> 1
	20	1	0.500	0 ==> 1
	64	1	0.400	0 --> 1
	79	1	0.267	2 ==> 1
	91	1	0.333	2 ==> 1
	95	1	0.222	0 ==> 1
	145	1	0.286	1 ==> 0
	151	1	0.500	1 --> 0
	277	1	0.444	0 --> (01)
	296	1	0.367	2 ==> 4
	306	1	0.286	0 ==> 1
node_97 --> *Yunnanodon*	69	1	0.500	0 ==> 1
	93	1	0.667	0 ==> 1
	210	1	0.500	1 ==> 0
	211	1	0.600	0 ==> 1
	296	1	0.367	2 --> 3
	316	1	0.462	2 ==> 4

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	348	1	0.389	0 --> 1
node_97 --> node_96	10	1	0.500	0 --> 1
	66	1	0.500	0 --> 1
	68	1	0.500	0 ==> 1
	69	1	0.500	0 ==> 1
	75	1	0.500	0 ==> 1
	81	1	0.300	0 ==> 1
	90	1	0.333	0 --> 1
	99	1	0.667	0 ==> 1
	103	1	0.600	0 ==> 1
	114	1	0.300	0 --> 2
	125	1	0.500	0 --> 1
	191	1	0.286	0 --> 1
	237	1	0.200	0 --> 1
	307	1	0.571	0 --> 2
	315	1	0.524	3 --> 2
	316	1	0.462	2 --> 1
node_96 --> *Bocatherium*	258	1	0.400	1 ==> 2
	277	1	0.444	0 ==> 1
	316	1	0.462	1 --> 4
	348	1	0.389	0 --> 1
node_96 --> *Bienotheroides*	64	1	0.400	0 --> 1
	82	1	0.333	2 ==> 1
	88	1	0.333	0 ==> 1
	142	1	0.286	0 ==> 1
	147	1	0.333	1 ==> 0
	295	1	0.333	4 ==> 3
node_164 --> node_163	7	1	0.250	0 --> 1
	13	1	0.400	1 --> 0
	81	1	0.300	0 --> 1
	98	1	0.286	1 --> 0
	114	1	0.300	0 ==> 1
	115	1	0.308	2 --> 3
	126	1	0.455	0 --> 1
	128	1	0.400	0 ==> 1
	143	1	0.333	0 --> 1
	149	1	0.500	0 --> 1
	164	1	0.250	0 --> 1
	166	1	1.000	0 ==> 1
	167	1	0.286	0 ==> 1
	199	1	0.286	1 --> 0
	212	1	1.000	0 --> 2
	221	1	0.667	0 ==> 1
	231	1	0.556	0 ==> 1
	276	1	0.167	1 ==> 0
	290	1	0.222	1 ==> 0
	296	1	0.367	2 ==> 0
	347	1	0.444	0 --> 1
	348	1	0.389	0 --> 1
	393	1	1.000	0 --> 1
	395	1	0.400	0 --> 1
	396	1	0.500	1 --> 2
	428	1	0.143	0 --> 1
	440	1	1.000	0 --> 1
node_163 --> node_162	45	1	0.286	0 --> 1
	67	1	0.400	0 --> 1
	71	1	0.667	0 --> 1
	88	1	0.333	0 --> 1
	102	1	0.200	1 --> 2
	143	1	0.333	1 --> 2
	146	1	0.250	1 --> 0
	148	1	0.167	0 ==> 1
	152	1	0.250	0 ==> 1
	153	1	0.429	0 --> 1
	174	1	1.000	0 ==> 1
	176	1	0.222	0 --> 1
	178	1	0.400	1 --> 0

	190	1	0.250	0 ==> 1
	209	1	0.500	0 --> 1
	229	1	0.300	0 ==> 1
	232	1	0.300	0 ==> 1
	236	1	0.500	0 ==> 1
	237	1	0.200	0 ==> 1
	283	1	0.211	1 --> 2
	295	1	0.333	0 --> 1
	315	1	0.524	3 --> 2
	316	1	0.462	2 --> 0
	391	1	0.286	0 --> 2
	445	1	0.455	0 --> 2
node_162 --> *Adelobasileus*	145	1	0.286	1 ==> 0
	149	1	0.500	1 --> 0
	197	1	0.333	1 ==> 0
	199	1	0.286	0 --> 1
	231	1	0.556	1 ==> 2
node_162 --> node_161	126	1	0.455	1 --> 0
	127	1	0.375	1 --> 0
	142	1	0.286	0 --> 1
	151	1	0.500	1 ==> 2
	176	1	0.222	1 --> 2
	178	1	0.400	0 --> 2
	182	1	0.400	0 ==> 1
	241	1	0.222	0 --> 1
	242	1	0.500	0 ==> 1
node_161 --> node_160	65	1	0.182	0 ==> 1
	131	1	0.200	0 ==> 1
	133	1	0.500	0 ==> 1
	177	1	0.200	0 --> 1
	245	1	1.000	0 ==> 1
	251	1	0.250	1 ==> 0
	291	1	0.286	1 ==> 0
	294	1	0.083	1 --> 0
	318	1	0.310	3 ==> 0
	319	1	0.261	3 --> 0
	334	1	0.143	1 --> 0
	336	1	0.182	0 --> 1
	358	1	0.100	0 --> 1
	387	1	0.333	0 ==> 1
	427	1	0.143	0 ==> 1
node_160 --> node_98	10	1	0.500	0 --> 1
	41	1	0.500	0 ==> 1
	79	1	0.267	2 --> 1
	88	1	0.333	1 --> 0
	102	1	0.200	2 --> 1
	108	1	0.111	0 --> 1
	142	1	0.286	1 --> 0
	143	1	0.333	2 --> 1
	148	1	0.167	1 --> 0
	176	1	0.222	2 --> 1
	190	1	0.250	1 ==> 0
	196	1	0.167	0 ==> 1
	225	1	0.364	0 --> 1
	232	1	0.300	1 ==> 0
	238	1	0.143	1 --> 0
	241	1	0.222	1 --> 0
	257	1	0.435	0 --> 1
	259	1	0.250	1 --> 0
	262	1	0.222	0 ==> 1
	295	1	0.333	1 --> 0
	296	1	0.367	0 ==> 1
	359	1	0.500	0 --> 1
	428	1	0.143	1 --> 0
node_98 --> *Morganucodon*	91	1	0.333	2 ==> 1
	126	1	0.455	0 --> 1
	127	1	0.375	0 --> 1

	237	1	0.200	1 ==> 0
	281	1	0.429	1 --> (01)
	294	1	0.083	0 --> 1
	347	2	0.444	1 --> (123)
	348	2	0.389	1 ==> (23)
	388	1	0.333	0 --> 1
	445	1	0.455	2 ==> 1
node_98 --> *Megazostrodon*	152	1	0.250	1 ==> 0
	153	1	0.429	1 --> 0
	199	1	0.286	0 --> 1
	283	1	0.211	2 ==> 1
	315	1	0.524	2 ==> 0
	335	1	0.100	1 ==> 0
	442	1	0.222	1 --> 0
	444	1	0.200	0 ==> 1
node_160 --> node_159	2	1	0.333	0 --> 1
	3	1	0.500	0 --> 1
	18	1	1.000	0 --> 1
	28	1	0.125	0 --> 1
	38	1	0.167	0 --> 1
	58	1	0.250	0 --> 1
	59	1	0.333	0 --> 1
	61	1	0.250	0 --> 1
	63	1	0.200	0 --> 1
	82	1	0.333	2 ==> 1
	83	1	0.250	0 ==> 1
	84	1	0.500	0 ==> 1
	85	1	0.333	1 --> 0
	115	1	0.308	3 ==> 2
	211	1	0.600	0 --> 2
	218	1	1.000	0 --> 1
	219	1	1.000	0 --> 1
	220	1	0.500	0 --> 1
	221	1	0.667	1 --> 2
	227	1	0.385	3 ==> 1
	240	1	0.200	0 --> 1
	244	1	0.400	0 --> 1
	248	1	1.000	0 --> 1
	263	1	0.333	0 ==> 1
	285	1	0.400	0 ==> 1
	288	1	1.000	0 ==> 1
	303	1	0.167	1 --> 0
	316	1	0.462	0 --> 1
	321	1	0.167	1 ==> 0
	327	1	0.125	0 --> 1
	339	1	0.200	0 ==> 1
	342	1	0.167	0 ==> 1
	349	1	0.273	0 --> 1
	366	1	0.250	0 ==> 1
	368	1	0.400	0 ==> 1
	433	1	0.250	0 ==> 1
	441	1	0.250	1 --> 0
node_159 --> *Haldanodon*	75	1	0.500	0 ==> 1
	76	1	0.200	1 ==> 0
	114	1	0.300	1 ==> 0
	117	1	0.250	1 ==> 0
	128	1	0.400	1 ==> 0
	134	1	0.182	2 ==> 0
	152	1	0.250	1 ==> 0
	153	1	0.429	1 --> 0
	177	1	0.200	1 --> 0
	235	1	0.200	1 ==> 0
	310	1	0.200	0 ==> 1
	314	1	0.250	0 ==> 1
	315	1	0.524	2 --> (12)
	318	1	0.310	0 ==> 2
	319	1	0.261	0 ==> 2

	323	1	0.312	0 ==> 2
	336	1	0.182	1 --> 0
	347	1	0.444	1 --> (01)
	359	1	0.500	0 --> 2
	432	1	0.333	1 ==> 2
	445	1	0.455	2 ==> 1
node_159 --> node_158	14	1	0.429	1 --> 0
	16	1	0.400	0 ==> 1
	67	1	0.400	1 --> 2
	74	1	0.500	1 --> 0
	78	1	0.143	0 --> 1
	89	1	0.250	0 --> 1
	94	1	0.143	1 --> 0
	95	1	0.222	0 --> 1
	105	1	0.143	1 --> 0
	112	1	0.333	0 --> 1
	113	1	0.375	0 --> 2
	118	1	0.167	0 --> 1
	126	1	0.455	0 --> 2
	155	1	0.250	0 --> 1
	170	1	0.400	0 --> 1
	175	1	0.250	0 --> 1
	199	1	0.286	0 --> 1
	208	1	1.000	0 --> 2
	215	1	0.500	0 --> 1
	216	1	0.500	0 --> 1
	224	1	0.750	0 --> 1
	247	1	0.250	0 --> 1
	257	1	0.435	0 --> 2
	268	1	0.500	0 --> 1
	269	1	0.200	0 --> 1
	270	1	0.167	0 --> 1
	274	1	0.333	0 --> 1
	276	1	0.167	0 --> 1
	289	1	0.333	0 --> 1
	295	1	0.333	1 --> 2
	296	1	0.367	0 --> 2
	309	1	0.250	0 --> 1
	334	1	0.143	0 --> 1
	337	1	0.250	0 ==> 1
	340	1	0.333	0 --> 1
	347	1	0.444	1 ==> 3
	348	1	0.389	1 ==> 3
	358	1	0.100	1 --> 0
	363	1	0.200	0 ==> 1
	364	1	0.250	0 --> 1
	365	1	0.500	0 ==> 1
	369	1	0.500	1 ==> 0
	388	1	0.333	0 --> 1
	391	1	0.286	2 ==> 1
	414	1	0.333	0 ==> 1
	446	1	0.500	0 --> 1
	447	1	0.500	0 ==> 1
	448	1	0.500	0 ==> 1
node_158 --> *Pseudotribos*	7	1	0.250	1 --> 0
	292	1	0.167	0 ==> 1
	332	1	0.200	0 ==> 1
	362	1	0.333	0 ==> 1
	412	1	0.333	0 ==> 1
	425	1	0.125	0 --> 1
	426	1	0.167	0 --> 1
node_158 --> node_157	6	1	0.400	0 --> 1
	260	1	0.500	0 ==> 1
	266	1	0.200	0 ==> 1
	284	1	0.222	0 --> 1
	315	1	0.524	2 ==> 0
	316	1	0.462	1 --> 0

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	319	1	0.261	0 --> 3
	349	1	0.273	1 --> 0
	428	1	0.143	1 --> 0
	434	1	0.333	1 --> 0
node_157 --> node_151	11	1	0.500	0 ==> 1
	12	1	0.667	0 ==> 1
	13	1	0.400	0 ==> 1
	14	1	0.429	0 ==> 2
	15	1	0.167	0 ==> 1
	17	1	1.000	0 ==> 1
	19	1	0.500	0 ==> 1
	21	1	0.500	0 ==> 1
	22	1	1.000	0 ==> 1
	23	1	0.333	0 --> 1
	29	1	0.667	0 --> 1
	31	1	0.333	0 --> 1
	38	1	0.167	1 --> 0
	51	1	0.500	0 ==> 1
	81	1	0.300	1 --> 0
	85	1	0.333	0 --> 1
	91	1	0.333	2 ==> 0
	142	1	0.286	1 --> 0
	143	1	0.333	2 --> 1
	146	1	0.250	0 --> 1
	157	1	0.500	0 --> 1
	169	1	0.500	0 ==> 1
	196	1	0.167	0 --> 1
	215	1	0.500	1 --> 2
	227	1	0.385	1 --> 0
	233	1	0.400	0 ==> 1
	240	1	0.200	1 --> 0
	241	1	0.222	1 --> 0
	264	1	0.500	1 ==> 0
	272	1	0.500	0 --> 1
	279	1	0.200	0 ==> 1
	339	1	0.200	1 ==> 0
	342	1	0.167	1 ==> 0
	358	1	0.100	0 --> 1
	383	1	0.444	2 --> 0
	387	1	0.333	1 ==> 0
	433	1	0.250	1 ==> 0
	441	1	0.250	0 --> 1
node_151 --> node_144	6	1	0.400	1 --> 0
	24	1	1.000	0 ==> 1
	28	1	0.125	1 --> 0
	40	1	1.000	0 ==> 1
	41	1	0.500	0 ==> 1
	42	1	0.286	0 --> 1
	43	1	0.333	0 ==> 1
	52	1	0.500	0 --> 1
	55	1	0.500	0 ==> 1
	59	1	0.333	1 --> 0
	60	1	0.500	0 ==> 2
	62	1	1.000	0 ==> 1
	73	1	0.500	0 --> 1
	75	1	0.500	0 ==> 1
	92	1	0.375	0 --> 1
	112	1	0.333	1 --> 0
	113	1	0.375	2 --> 1
	118	1	0.167	1 --> 0
	132	1	0.333	0 ==> 1
	158	1	0.500	0 --> 1
	159	1	0.333	0 --> 1
	160	1	0.500	0 --> 1
	161	1	0.333	0 ==> 1
	170	1	0.400	1 --> 2
	179	1	1.000	0 ==> 1

	223	1	1.000	0 ==> 1
	224	1	0.750	1 --> 2
	225	1	0.364	0 ==> 1
	257	1	0.435	2 --> 0
	283	1	0.211	2 ==> 0
	290	1	0.222	0 ==> 1
	409	1	0.333	0 --> 1
	442	1	0.222	1 --> 0
node_144 --> node_127	9	1	1.000	0 --> 1
	26	1	1.000	0 ==> 1
	30	1	1.000	0 ==> 1
	46	1	0.500	0 ==> 1
	74	1	0.500	0 --> 1
	78	1	0.143	1 ==> 0
	86	1	0.500	0 --> 1
	105	1	0.143	0 --> 1
	115	1	0.308	2 --> 3
	154	1	0.750	1 --> 2
	182	1	0.400	1 ==> 2
	195	1	0.500	0 --> 1
	208	1	1.000	2 --> 1
	216	1	0.500	1 --> 0
	227	1	0.385	0 --> 1
	238	1	0.143	1 --> 0
	240	1	0.200	0 --> 1
	247	1	0.250	1 --> 0
	251	1	0.250	0 --> 1
	265	1	0.375	0 --> 1
	269	1	0.200	1 --> 0
	280	1	0.125	0 ==> 1
	282	1	0.400	0 ==> 1
	289	1	0.333	1 --> 0
	291	1	0.286	0 --> 1
	313	1	0.250	0 --> 1
node_127 --> node_123	4	1	0.500	0 --> 1
	5	1	0.333	0 --> 1
	8	1	1.000	0 --> 1
	47	1	0.200	0 --> 1
	49	1	0.400	0 --> 1
	113	1	0.375	1 --> 0
	129	1	0.500	0 --> 1
	134	1	0.182	2 --> 0
	153	1	0.429	1 --> 2
	176	1	0.222	2 --> 1
	177	1	0.200	1 --> 0
	185	1	0.167	0 --> 1
	186	1	0.200	0 --> 1
	227	1	0.385	1 --> 3
	237	1	0.200	1 --> 0
	262	1	0.222	0 ==> 1
	283	1	0.211	0 ==> 3
	295	1	0.333	2 --> 1
	296	1	0.367	2 --> 1
	309	1	0.250	1 --> 0
	314	1	0.250	0 ==> 1
	319	1	0.261	3 --> 1
	323	1	0.312	0 --> 1
	421	1	0.167	0 ==> 1
node_123 --> node_122	264	1	0.500	0 ==> 1
	272	1	0.500	1 --> 0
	279	1	0.200	1 ==> 0
	313	1	0.250	1 --> 0
	334	1	0.143	1 --> 0
	335	1	0.100	1 --> 0
	358	1	0.100	1 --> 0
	363	1	0.200	1 ==> 0
	366	1	0.250	1 --> 2

	385	1	0.333	0 ==> 1
	391	1	0.286	1 ==> 0
	405	1	0.714	0 --> 1
	412	1	0.333	0 --> 1
	427	1	0.143	1 --> 0
	428	1	0.143	0 ==> 1
	432	1	0.333	1 --> 0
node_122 --> node_121	65	1	0.182	1 --> 0
	89	1	0.250	1 --> 0
	196	1	0.167	1 --> 0
	291	1	0.286	1 --> 0
	310	1	0.200	0 ==> 1
	327	1	0.125	1 ==> 0
	342	1	0.167	0 ==> 1
	347	1	0.444	3 --> 0
	432	1	0.333	0 --> 2
	433	1	0.250	0 ==> 1
node_121 --> node_119	37	1	0.333	0 --> 1
	63	1	0.200	1 --> 0
	95	1	0.222	1 --> 0
	131	1	0.200	1 --> 0
	191	1	0.286	0 --> 1
	283	1	0.211	3 ==> 2
	316	1	0.462	0 --> 1
	336	1	0.182	1 ==> 0
	366	1	0.250	2 --> 1
	367	1	0.250	1 ==> 0
	370	1	0.500	0 ==> 1
	371	1	0.500	0 ==> 1
	373	1	0.250	0 ==> 1
	384	1	0.500	0 ==> 1
	398	1	0.500	0 --> 1
	405	1	0.714	1 --> 0
	409	1	0.333	1 --> 0
	427	1	0.143	0 --> 1
	434	1	0.333	0 --> 1
	445	1	0.455	2 ==> 3
	449	1	0.250	0 ==> 1
node_119 --> node_118	294	1	0.083	0 ==> 1
	315	1	0.524	0 ==> 2
	347	1	0.444	0 --> 3
	363	1	0.200	0 ==> 2
	381	1	0.333	0 ==> 1
	382	1	0.333	0 --> 1
	386	1	0.143	0 --> 1
node_118 --> node_99	260	1	0.500	1 ==> 0
	265	1	0.375	1 ==> 2
	268	1	0.500	1 --> 0
	281	1	0.429	1 --> 0
	338	1	0.500	0 --> 1
	377	1	0.333	0 ==> 1
	378	1	0.500	1 ==> 0
	380	1	0.250	0 ==> 1
	382	1	0.333	1 --> 2
	383	1	0.444	0 ==> 2
	441	1	0.250	1 --> 0
	444	1	0.200	0 --> 1
node_99 --> *Ambondro*	336	1	0.182	0 ==> 1
	383	1	0.444	2 --> (12)
	385	1	0.333	1 ==> 0
	387	1	0.333	0 ==> 1
	450	1	0.200	0 ==> 1
node_99 --> *Henosferus*	257	1	0.435	0 ==> 2
	259	1	0.250	1 ==> 0
	266	1	0.200	1 ==> 0
	280	1	0.125	1 ==> 0
	342	1	0.167	1 ==> 0

	378	1	0.500	0 --> (01)
	379	1	0.333	1 ==> 0
node_99 --> *Asfaltomylos*	283	1	0.211	2 ==> 3
	372	1	0.286	0 ==> 2
node_118 --> node_117	257	1	0.435	0 ==> 1
	262	1	0.222	1 --> 0
	273	1	0.400	0 ==> 1
	275	1	0.250	1 ==> 0
	331	1	0.143	0 --> 1
node_117 --> node_116	1	1	0.333	0 --> 1
	16	1	0.400	1 --> 0
	21	1	0.500	1 --> 2
	27	1	0.500	0 --> 2
	29	1	0.667	1 --> 2
	30	1	1.000	1 --> 2
	36	1	0.167	0 --> 1
	44	1	0.333	0 --> 1
	45	1	0.286	1 --> 2
	49	1	0.400	1 --> 0
	50	1	0.500	0 --> 1
	53	1	0.500	0 --> 1
	54	1	0.500	0 --> 1
	58	1	0.250	1 --> 0
	68	1	0.500	0 --> 1
	70	1	0.500	0 --> 1
	77	1	0.200	1 --> 0
	88	1	0.333	1 --> 2
	94	1	0.143	0 --> 1
	125	1	0.500	0 --> 1
	126	1	0.455	2 --> 3
	128	1	0.400	1 --> 2
	130	1	1.000	0 --> 1
	134	1	0.182	0 --> 2
	136	1	0.333	0 --> 1
	139	1	0.333	0 --> 1
	142	1	0.286	0 --> 1
	148	1	0.167	1 --> 0
	154	1	0.750	2 --> 3
	166	1	1.000	1 --> 2
	171	1	0.500	0 --> 1
	173	1	1.000	0 --> 1
	181	1	0.333	0 --> 1
	203	1	0.333	0 --> 1
	233	1	0.400	1 --> 0
	246	1	0.333	0 --> 1
	280	1	0.125	1 ==> 0
	296	1	0.367	1 --> 0
	303	1	0.167	0 --> 1
	314	1	0.250	1 --> 0
	320	1	0.500	0 --> 1
	342	1	0.167	1 ==> 0
	347	1	0.444	3 --> 2
	349	1	0.273	0 --> 2
	358	1	0.100	0 ==> 1
	374	1	0.250	0 --> 1
	385	1	0.333	1 --> 0
	424	1	0.250	0 ==> 1
	425	1	0.125	0 ==> 1
	426	1	0.167	0 ==> 1
node_116 --> *Peramus*	257	2	0.435	1 --> (012)
	259	1	0.250	1 --> (01)
	269	1	0.200	0 ==> 1
	294	1	0.083	1 ==> 0
	318	1	0.310	0 ==> 1
	332	1	0.200	0 ==> 1
	336	1	0.182	0 ==> 1
	348	1	0.389	3 ==> 2

	361	1	1.000	0 --> (01)
	381	1	0.333	1 ==> 0
	382	1	0.333	1 --> 0
	398	1	0.500	1 --> 0
	405	1	0.714	0 --> (01)
	428	1	0.143	1 ==> 0
	432	1	0.333	2 ==> 1
	434	1	0.333	1 --> 0
node_116 --> node_115	277	1	0.444	0 ==> 1
	319	1	0.261	1 --> 0
	324	1	0.333	1 --> 0
	327	1	0.125	0 --> 1
	331	1	0.143	1 --> 0
	334	1	0.143	0 --> 1
	380	1	0.250	0 ==> 1
	451	1	1.000	0 ==> 1
node_115 --> *Kielantherium*	315	1	0.524	2 --> (12)
	366	1	0.250	1 ==> 2
	374	1	0.250	1 --> 0
	385	1	0.333	0 --> (01)
	407	1	0.750	2 ==> 1
node_115 --> node_114	347	1	0.444	2 --> 3
	363	1	0.200	2 ==> 0
	377	1	0.333	0 --> 1
	384	1	0.500	1 --> 3
	403	1	0.500	0 ==> 1
node_114 --> node_113	400	1	1.000	0 ==> 1
	402	1	0.167	0 ==> 1
	423	1	0.333	1 --> 0
node_113 --> node_112	33	1	0.500	0 --> 1
	292	1	0.167	0 --> 1
	310	1	0.200	1 --> 0
	335	1	0.100	0 ==> 1
	399	1	0.200	0 --> 1
	401	1	0.500	2 ==> 1
	425	1	0.125	1 --> 0
node_112 --> node_111	185	1	0.167	1 --> 0
	186	1	0.200	1 --> 0
	189	1	0.333	0 --> 1
	200	1	0.500	0 --> 1
	207	1	0.625	0 --> 1
	232	1	0.300	1 --> 2
	262	1	0.222	0 ==> 1
	277	1	0.444	1 ==> 0
	326	1	0.222	0 ==> 1
	383	1	0.444	0 --> 1
	404	1	0.333	0 ==> 1
node_111 --> node_110	20	1	0.500	0 --> 1
	25	1	0.200	0 ==> 1
	32	1	0.250	0 --> 1
	34	1	0.500	0 --> 1
	51	1	0.500	1 ==> 2
	261	1	0.250	0 --> 1
	265	1	0.375	1 ==> 3
	269	1	0.200	0 --> 1
	279	1	0.200	0 ==> 1
	283	1	0.211	2 ==> 3
	294	1	0.083	1 ==> 0
	296	1	0.367	0 --> 1
	315	1	0.524	2 --> 3
	327	1	0.125	1 --> 0
	366	1	0.250	1 ==> 2
	378	1	0.500	1 --> 0
	384	1	0.500	3 --> 1
	406	1	0.600	1 --> 0
	425	1	0.125	0 --> 1
node_110 --> *Sinodelphys*	35	1	0.250	0 ==> 1

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	47	1	0.200	1 ==> 0
	257	1	0.435	1 ==> 3
	259	1	0.250	1 ==> 0
	273	1	0.400	1 ==> 0
	290	1	0.222	1 ==> 0
	291	1	0.286	0 ==> 1
	363	1	0.200	0 ==> 1
	411	1	0.333	0 ==> 1
node_110 --> node_109	292	1	0.167	1 --> 0
	316	1	0.462	1 ==> 2
	318	1	0.310	0 ==> 1
	319	1	0.261	0 ==> 1
	358	1	0.100	1 ==> 0
	385	1	0.333	0 ==> 1
node_109 --> *Deltatheridium*	113	1	0.375	0 --> (01)
	115	1	0.308	3 ==> 2
	167	1	0.286	1 ==> 2
	284	1	0.222	1 ==> 0
	295	1	0.333	1 ==> 2
	304	1	0.500	0 ==> 1
	363	1	0.200	0 ==> 2
	379	1	0.333	1 ==> 0
	383	1	0.444	1 --> 0
	386	1	0.143	1 ==> 0
	399	1	0.200	1 --> 0
	400	1	1.000	1 --> (01)
	402	1	0.167	1 ==> 0
	421	1	0.167	1 ==> 0
	426	1	0.167	1 ==> 0
	449	1	0.250	1 ==> 2
node_109 --> node_108	79	1	0.267	2 ==> 1
	242	1	0.500	1 --> 2
	296	1	0.367	1 --> 0
	367	1	0.250	0 ==> 1
	372	1	0.286	0 --> 2
	378	1	0.500	0 --> 1
	382	1	0.333	1 --> 2
	384	1	0.500	1 --> 3
	419	1	0.600	0 ==> 1
	441	1	0.250	1 ==> 2
	442	1	0.222	0 ==> 2
	443	1	0.286	0 ==> 1
	444	1	0.200	0 ==> 1
node_108 --> node_102	45	1	0.286	2 --> 1
	48	1	0.143	0 ==> 1
	97	1	0.333	0 --> 1
	104	1	0.200	0 ==> 1
	144	1	0.333	0 --> 1
	183	1	0.333	0 --> 1
	232	1	0.300	2 --> 3
	235	1	0.200	1 --> 0
	247	1	0.250	0 --> 1
	280	1	0.125	0 --> 1
	361	1	1.000	0 ==> 1
	389	1	0.333	0 --> 1
	406	1	0.600	0 --> 1
	410	1	0.250	0 ==> 1
	425	1	0.125	1 ==> 0
node_102 --> node_100	36	1	0.167	1 --> 0
	261	1	0.250	1 --> 0
	386	1	0.143	1 ==> 0
node_100 --> *Asiatherium*	326	1	0.222	1 ==> 0
	387	1	0.333	0 ==> 1
	407	1	0.750	2 ==> 0
	419	1	0.600	1 ==> 0
	430	1	0.500	0 ==> 1
	431	1	0.333	0 ==> 1

node_100 --> *Kokopellia*	277	1	0.444	0 ==> 1
	363	1	0.200	0 ==> 1
	366	1	0.250	2 ==> 1
	383	1	0.444	1 --> 0
	399	1	0.200	1 --> 0
	401	1	0.500	1 ==> 2
	421	1	0.167	1 ==> 0
node_102 --> node_101	25	1	0.200	1 ==> 0
	80	1	0.167	0 ==> 1
	115	1	0.308	3 ==> 2
	140	1	0.500	0 ==> 1
	242	1	0.500	2 --> 1
	270	1	0.167	1 ==> 0
	304	1	0.500	0 ==> 1
	375	1	0.667	0 ==> 1
	383	1	0.444	1 --> 2
	400	1	1.000	1 ==> 2
	402	1	0.167	1 ==> 0
	411	1	0.333	0 ==> 1
	413	1	1.000	0 ==> 1
	417	1	0.333	0 ==> 1
	420	1	0.500	0 ==> 1
node_101 --> *Pucadelphys*	108	1	0.111	0 ==> 1
	194	1	0.333	0 ==> 1
	207	1	0.625	1 --> (12)
	246	1	0.333	1 --> 0
	252	1	1.000	0 ==> 1
	358	1	0.100	0 ==> 1
	383	1	0.444	2 --> (12)
	385	1	0.333	1 ==> 0
	399	1	0.200	1 --> 0
	419	1	0.600	1 --> (01)
	422	1	1.000	1 --> (01)
	449	1	0.250	1 ==> 2
node_101 --> *Didelphis*	91	1	0.333	0 ==> 2
	95	1	0.222	0 ==> 1
	106	1	0.400	2 ==> 1
	145	1	0.286	1 ==> 0
	167	1	0.286	1 ==> 2
	180	1	1.000	0 ==> 1
	183	1	0.333	1 --> 0
	206	1	0.333	0 ==> 1
	227	1	0.385	3 ==> 0
	237	1	0.200	0 --> 1
	267	1	0.600	0 ==> 1
	280	1	0.125	1 --> 0
	284	1	0.222	1 --> (01)
	292	1	0.167	0 ==> 1
	294	1	0.083	0 ==> 1
	318	1	0.310	1 ==> 2
	319	1	0.261	1 ==> 2
	326	1	0.222	1 ==> 0
	389	1	0.333	1 --> 0
	450	1	0.200	0 ==> 1
node_108 --> node_107	20	1	0.500	1 --> 0
	32	1	0.250	1 --> 0
	34	1	0.500	1 --> 0
	49	1	0.400	0 --> 1
	50	1	0.500	1 --> 2
	53	1	0.500	1 --> 2
	91	1	0.333	0 ==> 2
	108	1	0.111	0 ==> 1
	122	1	0.333	0 --> 1
	133	1	0.500	1 ==> 0
	138	1	0.500	0 ==> 1
	148	1	0.167	0 --> 1
	162	1	0.333	0 ==> 1

	163	1	0.333	0 ==> 1
	164	1	0.250	1 ==> 0
	171	1	0.500	1 --> 0
	172	1	0.333	0 ==> 1
	185	1	0.167	0 --> 1
	221	1	0.667	2 --> 3
	234	1	0.143	0 --> 1
	241	1	0.222	0 ==> 1
	265	1	0.375	3 ==> 1
	359	1	0.500	0 --> 2
	364	1	0.250	1 --> 2
node_107 --> node_106	39	1	0.333	1 --> 0
	57	1	0.250	0 ==> 1
	79	1	0.267	1 --> 0
	95	1	0.222	0 ==> 1
	189	1	0.333	1 --> 0
	307	1	0.571	0 --> 2
	310	1	0.200	0 ==> 1
	313	1	0.250	0 ==> 1
	362	1	0.333	0 ==> 1
	423	1	0.333	0 --> 1
node_106 --> *Asioryctes*	1	1	0.333	1 ==> 0
	35	1	0.250	0 ==> 1
	199	1	0.286	1 ==> 0
	224	1	0.750	2 ==> 3
	230	1	0.500	0 ==> 1
	257	3	0.435	1 ==> (234)
	267	1	0.600	0 --> (01)
	269	1	0.200	1 ==> 0
	314	1	0.250	0 ==> 1
	321	1	0.167	0 ==> 1
	372	1	0.286	2 --> 0
	379	1	0.333	1 ==> 0
	382	1	0.333	2 --> 1
	384	1	0.500	3 ==> 2
	404	1	0.333	1 ==> 0
node_106 --> node_105	48	1	0.143	0 --> 1
	65	1	0.182	0 --> 1
	80	1	0.167	0 --> 1
	113	1	0.375	0 ==> 1
	115	1	0.308	3 --> 0
	118	1	0.167	0 ==> 1
	122	1	0.333	1 --> 0
	128	1	0.400	2 --> 1
	134	1	0.182	2 ==> 1
	186	1	0.200	0 --> 1
	207	1	0.625	1 ==> 2
	222	1	0.500	0 --> 1
	227	1	0.385	3 ==> 0
	234	1	0.143	1 --> 0
	237	1	0.200	0 --> 1
	280	1	0.125	0 ==> 1
	295	1	0.333	1 ==> 3
	296	1	0.367	0 ==> 2
	305	1	0.333	0 --> 1
	306	1	0.286	0 --> 1
	316	1	0.462	2 --> 4
	319	1	0.261	1 --> 3
	326	1	0.222	1 --> 0
	332	1	0.200	0 ==> 1
	333	1	0.286	0 --> 1
	336	1	0.182	0 --> 2
	383	1	0.444	1 --> 2
	402	1	0.167	1 --> 0
	410	1	0.250	0 ==> 1
	411	1	0.333	0 --> 2
	416	1	0.667	1 ==> 0

	421	1	0.167	1 ==> 0
	424	1	0.250	1 --> 0
	425	1	0.125	1 --> 0
	426	1	0.167	1 --> 0
	449	1	0.250	1 --> 2
node_105 --> *Zalambdalestes*	6	1	0.400	0 ==> 1
	38	1	0.167	0 ==> 1
	39	1	0.333	0 --> 1
	50	1	0.500	2 --> 1
	56	1	0.250	1 ==> 0
	76	1	0.200	1 ==> 0
	77	1	0.200	0 --> 1
	79	1	0.267	0 --> (02)
	80	1	0.167	1 --> 0
	91	1	0.333	2 ==> 1
	95	1	0.222	1 ==> 0
	101	1	0.333	0 ==> 1
	102	1	0.200	2 ==> 1
	106	1	0.400	2 ==> 1
	115	1	0.308	0 --> 1
	120	1	0.250	0 ==> 1
	125	1	0.500	1 ==> 0
	140	1	0.500	0 ==> 1
	181	1	0.333	1 ==> 0
	183	1	0.333	0 ==> 1
	196	1	0.167	0 ==> 1
	207	1	0.625	2 --> (12)
	222	1	0.500	1 --> 0
	240	1	0.200	1 ==> 0
	241	1	0.222	1 ==> 0
	275	1	0.250	0 ==> 1
	283	1	0.211	3 ==> 1
	289	1	0.333	0 ==> 1
	292	1	0.167	0 ==> 1
	294	1	0.083	0 ==> 1
	295	1	0.333	3 ==> 2
	296	1	0.367	2 --> (23)
	307	1	0.571	2 --> (12)
	316	1	0.462	4 --> 2
	319	1	0.261	3 --> 1
	321	1	0.167	0 ==> 1
	323	1	0.312	1 --> (01)
	326	1	0.222	0 --> 1
	327	1	0.125	0 ==> 1
	331	1	0.143	0 ==> 1
	333	1	0.286	1 --> 0
	334	1	0.143	1 ==> 0
	358	1	0.100	0 ==> 1
	375	1	0.667	0 --> (01)
	406	1	0.600	0 --> (01)
	424	1	0.250	0 --> 1
	425	1	0.125	0 --> 1
	426	1	0.167	0 --> 1
node_105 --> node_104	32	1	0.250	0 --> 1
	86	1	0.500	1 --> 0
	89	1	0.250	0 ==> 1
	91	1	0.333	2 --> 0
	98	1	0.286	0 ==> 1
	105	1	0.143	1 ==> 0
	108	1	0.111	1 ==> 0
	135	1	0.500	0 ==> 1
	144	1	0.333	0 ==> 1
	162	1	0.333	1 --> 0
	182	1	0.400	2 ==> 1
	185	1	0.167	1 --> 0
	188	1	0.333	0 --> 1
	189	1	0.333	0 --> 1

	194	1	0.333	0 --> 1
	199	1	0.286	1 ==> 0
	225	1	0.364	1 ==> 2
	232	1	0.300	2 --> 3
	244	1	0.400	1 --> 0
	247	1	0.250	0 --> 1
	259	1	0.250	1 --> 2
	276	1	0.167	1 ==> 0
	293	1	0.250	0 --> 1
	296	1	0.367	2 --> 3
	297	1	0.500	0 --> 1
	298	1	0.250	0 --> 1
	300	1	0.333	0 --> 1
	301	1	0.333	0 --> 1
	308	1	0.167	0 --> 1
	312	1	0.250	0 --> 1
	315	1	0.524	3 --> 5
	318	1	0.310	1 --> 3
	323	1	0.312	1 --> 0
	324	1	0.333	0 ==> 1
	335	1	0.100	1 --> 0
	360	1	0.667	0 --> 1
	372	1	0.286	2 --> 0
	374	1	0.250	1 --> 0
	386	1	0.143	1 --> 0
	414	1	0.333	1 --> 0
	427	1	0.143	1 --> 0
node_104 --> node_103	25	1	0.200	1 --> 0
	27	1	0.500	2 --> 1
	36	1	0.167	1 --> 0
	50	1	0.500	2 --> 1
	51	1	0.500	2 ==> 1
	55	1	0.500	1 ==> 0
	58	1	0.250	0 ==> 1
	65	1	0.182	1 --> 0
	77	1	0.200	0 --> 1
	97	1	0.333	0 --> 1
	103	1	0.600	0 --> 1
	114	1	0.300	1 --> 0
	120	1	0.250	0 --> 1
	138	1	0.500	1 --> 0
	145	1	0.286	1 --> 0
	159	1	0.333	1 --> 0
	167	1	0.286	1 --> 2
	193	1	0.500	0 --> 1
	201	1	0.333	0 --> 1
	221	1	0.667	3 --> 4
	234	1	0.143	0 --> 1
	237	1	0.200	1 --> 0
	239	1	0.333	1 --> 0
	257	1	0.435	1 --> 0
	281	1	0.429	1 --> 2
	284	1	0.222	1 ==> 0
node_103 --> *Gomphos*	56	1	0.250	1 ==> 0
	256	1	0.333	1 ==> 0
	265	1	0.375	1 ==> 2
	316	1	0.462	4 --> 3
	319	1	0.261	3 --> 2
	331	1	0.143	0 ==> 1
	409	1	0.333	0 ==> 1
	420	1	0.500	0 ==> 1
	431	1	0.333	0 ==> 1
	450	1	0.200	0 ==> 1
node_103 --> *Tribosphenomys*	282	1	0.400	1 ==> 0
	295	1	0.333	3 ==> 4
	296	1	0.367	3 --> 4
	315	1	0.524	5 --> 6

	318	1	0.310	3 --> 4
	322	1	0.333	1 ==> 2
	323	1	0.312	0 --> 1
	333	1	0.286	1 --> 0
	334	1	0.143	1 ==> 0
	360	1	0.667	1 --> (01)
	380	1	0.250	1 ==> 0
	400	1	1.000	1 --> (01)
	406	1	0.600	0 --> (01)
	407	1	0.750	2 --> (12)
	412	1	0.333	1 ==> 0
	427	1	0.143	0 --> 1
node_104 --> *Dasypus*	38	1	0.167	0 ==> 1
	42	1	0.286	1 ==> 0
	45	1	0.286	2 ==> 1
	47	1	0.200	1 ==> 0
	49	1	0.400	1 ==> 2
	57	1	0.250	1 ==> 0
	64	1	0.400	0 ==> 2
	78	1	0.143	0 ==> 1
	90	1	0.333	0 ==> 1
	92	1	0.375	1 ==> 0
	94	1	0.143	1 ==> 0
	107	1	0.333	0 ==> 1
	113	1	0.375	1 --> 2
	116	1	0.200	1 ==> 0
	118	1	0.167	1 ==> 0
	134	1	0.182	1 ==> 0
	143	1	0.333	1 ==> 2
	168	1	1.000	1 --> (01)
	172	1	0.333	1 ==> 0
	227	1	0.385	0 ==> 3
	229	1	0.300	1 ==> 2
	238	1	0.143	0 ==> 1
	241	1	0.222	1 ==> 0
	249	1	1.000	0 ==> 1
	257	2	0.435	1 --> (123)
	270	1	0.167	1 ==> 0
	273	1	0.400	1 ==> 0
	274	1	0.333	1 ==> 0
	283	2	0.211	3 ==> (01)
	295	1	0.333	3 ==> 5
	296	1	0.367	3 --> 5
	349	1	0.273	2 ==> 0
	350	1	0.500	0 ==> 1
	432	1	0.333	2 ==> 1
	433	1	0.250	1 ==> 0
	445	1	0.455	3 ==> 5
node_105 --> *Erinaceus*	6	1	0.400	0 --> (01)
	21	1	0.500	2 ==> 1
	35	1	0.250	0 ==> 1
	48	1	0.143	1 --> 0
	78	1	0.143	0 ==> 1
	79	1	0.267	0 --> 1
	104	1	0.200	0 ==> 1
	107	1	0.333	0 ==> 1
	113	1	0.375	1 --> 2
	115	1	0.308	0 --> 2
	116	1	0.200	1 ==> 0
	128	1	0.400	1 --> 2
	148	1	0.167	1 ==> 0
	167	1	0.286	1 ==> 2
	211	1	0.600	2 ==> 1
	212	1	1.000	2 ==> 1
	221	1	0.667	3 ==> 4
	224	1	0.750	2 ==> 3
	229	1	0.300	1 ==> 2

	238	1	0.143	0	==>	1
	270	1	0.167	1	==>	0
	279	1	0.200	1	==>	0
	290	1	0.222	1	==>	0
	305	1	0.333	1	-->	0
	306	1	0.286	1	-->	0
	307	1	0.571	2	-->	0
	309	1	0.250	0	==>	1
	315	1	0.524	3	==>	4
	318	1	0.310	1	==>	2
	336	1	0.182	2	-->	0
	337	1	0.250	1	==>	0
	362	1	0.333	1	==>	0
	363	1	0.200	0	==>	1
	364	1	0.250	2	==>	1
	399	1	0.200	1	==>	0
	402	1	0.167	0	-->	1
	403	1	0.500	1	==>	0
	406	1	0.600	0	==>	1
	407	1	0.750	2	==>	1
	411	1	0.333	2	-->	0
	415	1	0.500	0	==>	1
	430	1	0.500	0	==>	1
	431	1	0.333	0	==>	1
	449	1	0.250	2	-->	1
	450	1	0.200	0	==>	1
node_107 --> *Ukhaatherium*	15	1	0.167	1	==>	0
	36	1	0.167	1	-->	0
	98	1	0.286	0	==>	1
	112	1	0.333	0	==>	1
	181	1	0.333	1	==>	0
	199	1	0.286	1	-->	(01)
	200	1	0.500	1	-->	0
	226	1	0.333	1	==>	0
	240	1	0.200	1	==>	0
	251	1	0.250	1	-->	0
	289	1	0.333	0	==>	1
	294	1	0.083	0	==>	1
	320	1	0.500	1	==>	0
	323	1	0.312	1	==>	0
	327	1	0.125	0	==>	1
	335	1	0.100	1	==>	0
	401	1	0.500	1	==>	2
node_111 --> *Eomaia*	15	1	0.167	1	==>	0
	53	1	0.500	1	-->	2
	57	1	0.250	0	==>	1
	257	1	0.435	1	==>	0
	259	1	0.250	1	==>	2
	270	1	0.167	1	==>	0
	293	1	0.250	0	==>	1
	324	1	0.333	0	-->	1
	401	1	0.500	1	-->	(01)
	402	1	0.167	1	==>	0
	416	1	0.667	1	-->	(01)
	421	1	0.167	1	==>	0
	432	1	0.333	2	==>	1
	449	1	0.250	1	==>	2
node_112 --> *Prokennalestes*	162	1	0.333	0	==>	1
	165	1	0.500	0	==>	1
	251	1	0.250	1	-->	0
	267	1	0.600	0	-->	(01)
	322	1	0.333	1	-->	(12)
	423	1	0.333	0	-->	1
node_113 --> *Juramaia*	283	1	0.211	2	==>	1
	449	1	0.250	1	==>	2
node_114 --> *Pappotherium*	372	1	0.286	0	==>	2
	385	1	0.333	0	-->	1

	404	1	0.333	0 ==> 1
	410	1	0.250	0 ==> 1
node_117 --> *Vincelestes*	32	1	0.250	0 ==> 1
	43	1	0.333	1 ==> 0
	61	1	0.250	1 ==> 0
	81	1	0.300	0 --> 1
	91	1	0.333	0 ==> 2
	102	1	0.200	2 ==> 1
	106	1	0.400	2 ==> 1
	114	1	0.300	1 --> (01)
	117	1	0.250	1 ==> 0
	129	1	0.500	1 --> 0
	155	1	0.250	1 --> 0
	156	1	0.500	0 ==> 1
	170	1	0.400	2 --> 1
	175	1	0.250	1 ==> 0
	176	1	0.222	1 --> 2
	177	1	0.200	0 --> 1
	225	1	0.364	1 ==> 0
	229	1	0.300	1 ==> 0
	241	1	0.222	0 ==> 1
	261	1	0.250	0 ==> 1
	295	1	0.333	1 ==> 3
	302	1	0.333	1 ==> 0
	315	1	0.524	2 ==> 5
	316	1	0.462	1 --> 4
	318	1	0.310	0 ==> 3
	319	1	0.261	1 ==> 3
	323	1	0.312	1 --> 0
	328	1	0.250	1 ==> 2
	363	1	0.200	2 ==> 1
	368	1	0.400	1 ==> 2
	373	1	0.250	1 ==> 0
	386	1	0.143	1 --> 0
	421	1	0.167	1 ==> 0
node_119 --> *Amphitherium*	374	1	0.250	0 ==> 1
node_121 --> node_120	15	1	0.167	1 --> 0
	134	1	0.182	0 --> 1
	284	1	0.222	1 ==> 0
	290	1	0.222	1 --> 0
	318	1	0.310	0 ==> 1
	321	1	0.167	0 ==> 1
	348	1	0.389	3 ==> 0
	349	1	0.273	0 ==> 1
	359	1	0.500	0 --> 3
	422	1	1.000	1 ==> 0
node_120 --> *Henkelotherium*	257	1	0.435	0 ==> 1
	259	1	0.250	1 ==> 0
	262	1	0.222	1 ==> 0
	358	1	0.100	0 ==> 1
node_120 --> *Dryolestes*	28	1	0.125	0 --> 1
	177	1	0.200	0 --> 1
	319	1	0.261	1 ==> 4
	322	1	0.333	1 ==> 0
	323	1	0.312	1 --> 0
	331	1	0.143	0 ==> 1
	417	1	0.333	0 ==> 1
	418	1	1.000	0 ==> 1
	419	1	0.600	0 ==> 1
node_122 --> *Cronopio*	79	1	0.267	2 ==> 0
	97	1	0.333	0 ==> 1
	102	1	0.200	2 ==> 0
	136	1	0.333	0 ==> 1
	147	1	0.333	1 ==> 0
	165	1	0.500	0 --> (01)
	175	1	0.250	1 ==> 0
	215	2	0.500	2 --> (03)

	261	1	0.250	0 ==> 1
	269	1	0.200	0 --> 1
	283	1	0.211	3 ==> 1
	292	1	0.167	0 ==> 1
	296	1	0.367	1 --> 3
	316	1	0.462	0 --> 2
	331	1	0.143	0 ==> 1
	332	1	0.200	0 ==> 1
	333	1	0.286	0 ==> 1
	336	1	0.182	1 ==> 2
	362	1	0.333	0 ==> 1
	364	1	0.250	1 ==> 2
	392	1	0.667	1 ==> 0
	408	1	1.000	0 ==> 1
	417	1	0.333	0 ==> 1
	419	1	0.600	0 ==> 2
node_123 --> *Tinodon*	275	1	0.250	1 ==> 0
	315	1	0.524	0 ==> 4
	318	1	0.310	0 ==> 2
	367	1	0.250	1 ==> 0
	368	1	0.400	1 ==> 2
	386	1	0.143	0 ==> 1
	387	1	0.333	0 ==> 1
	415	1	0.500	0 ==> 1
	446	1	0.500	1 --> 0
node_127 --> node_126	27	1	0.500	0 --> 1
	28	1	0.125	0 --> 1
	90	1	0.333	0 --> 1
	108	1	0.111	0 --> 1
	230	1	0.500	0 --> 1
	232	1	0.300	1 --> 0
	257	1	0.435	0 --> 1
	259	1	0.250	1 ==> 0
	331	1	0.143	0 --> 1
	347	1	0.444	3 ==> 0
	348	1	0.389	3 --> 0
	359	1	0.500	0 --> 3
	397	1	0.500	0 --> 1
	416	1	0.667	1 --> 0
	425	1	0.125	0 --> 1
	426	1	0.167	0 --> 1
node_126 --> node_125	25	1	0.200	0 ==> 1
	37	1	0.333	0 ==> 1
	45	1	0.286	1 ==> 2
	48	1	0.143	0 --> 1
	58	1	0.250	1 ==> 0
	176	1	0.222	2 --> 0
	178	1	0.400	2 --> 1
	257	1	0.435	1 --> 3
node_125 --> *Akidolestes*	7	1	0.250	1 ==> 0
	38	1	0.167	0 ==> 1
	42	1	0.286	1 ==> 0
	43	1	0.333	1 ==> 0
	295	1	0.333	2 --> 1
	296	1	0.367	2 ==> 1
	326	1	0.222	0 ==> 1
	364	1	0.250	1 ==> 2
node_125 --> node_124	36	1	0.167	0 --> 1
	294	1	0.083	0 --> 1
	316	1	0.462	0 --> 3
	318	1	0.310	0 ==> 2
	327	1	0.125	1 --> 0
	331	1	0.143	1 --> 0
node_124 --> *Spalacotherium*	283	1	0.211	0 ==> 2
	405	1	0.714	0 ==> 1
	424	1	0.250	0 ==> 1
node_124 --> *Maotherium*	315	2	0.524	0 ==> (12)

	318	1	0.310	2 --> (24)
	319	1	0.261	3 --> (34)
	342	1	0.167	0 ==> 1
node_126 --> *Zhangheotherium*	27	1	0.500	1 --> (01)
	57	1	0.250	0 ==> 1
	60	1	0.500	2 ==> 1
	315	1	0.524	0 ==> 1
	318	1	0.310	0 ==> 3
	348	1	0.389	0 --> 1
	368	1	0.400	1 ==> 2
	387	1	0.333	0 ==> 1
node_144 --> node_143	1	1	0.333	0 --> 1
	14	1	0.429	2 --> 1
	16	1	0.400	1 --> 0
	23	1	0.333	1 --> 0
	29	1	0.667	1 --> 0
	65	1	0.182	1 --> 0
	71	1	0.667	1 --> 0
	79	1	0.267	2 --> 0
	81	1	0.300	0 --> 1
	82	1	0.333	1 --> 0
	93	1	0.667	0 --> 1
	94	1	0.143	0 --> 1
	102	1	0.200	2 --> 0
	134	1	0.182	2 --> 1
	135	1	0.500	0 --> 1
	141	1	0.667	0 --> 1
	143	1	0.333	1 --> 0
	144	1	0.333	0 --> 1
	167	1	0.286	1 --> 2
	188	1	0.333	0 --> 1
	191	1	0.286	0 --> 1
	196	1	0.167	1 --> 0
	200	1	0.500	0 --> 2
	204	1	1.000	1 --> 0
	222	1	0.500	0 --> 1
	231	1	0.556	1 --> 2
	271	1	1.000	0 --> 1
	281	1	0.429	1 --> 2
	284	1	0.222	1 --> 0
	285	1	0.400	1 ==> 0
	293	1	0.250	0 ==> 1
	305	1	0.333	0 ==> 1
	307	1	0.571	0 --> 2
	308	1	0.167	0 --> 1
	311	1	1.000	0 --> 1
	315	1	0.524	0 --> 4
	316	1	0.462	0 --> 2
	326	1	0.222	0 ==> 1
	341	1	0.333	0 --> 1
	349	1	0.273	0 --> 1
	358	1	0.100	1 --> 0
	391	1	0.286	1 ==> 0
	427	1	0.143	1 ==> 0
	428	1	0.143	0 ==> 1
	444	1	0.200	0 --> 1
	445	1	0.455	2 ==> 4
	446	1	0.500	1 --> 3
node_143 --> node_142	253	1	0.333	0 --> 1
	255	1	0.250	1 --> 0
	261	1	0.250	0 --> 1
	283	1	0.211	0 --> 1
	295	1	0.333	2 --> 4
	298	1	0.250	0 ==> 1
	302	1	0.333	1 ==> 0
	312	1	0.250	0 --> 1
	317	1	1.000	0 --> 1

	318	1	0.310	0 --> 1
	331	1	0.143	0 --> 1
	347	1	0.444	3 --> 4
	348	1	0.389	3 --> 4
node_142 --> node_141	339	1	0.200	0 ==> 1
	446	1	0.500	3 --> 4
node_141 --> node_131	42	1	0.286	1 --> 0
	61	1	0.250	1 --> 0
	67	1	0.400	2 --> 1
	69	1	0.500	0 --> 1
	92	1	0.375	1 --> 0
	98	1	0.286	0 --> 1
	99	1	0.667	0 --> 1
	107	1	0.333	0 --> 1
	114	1	0.300	1 --> 2
	126	1	0.455	2 --> 0
	137	1	1.000	0 --> 1
	141	1	0.667	1 --> 2
	147	1	0.333	1 --> 0
	148	1	0.167	1 --> 0
	151	1	0.500	2 --> 1
	156	1	0.500	0 --> 1
	163	1	0.333	0 --> 1
	170	1	0.400	2 --> 1
	172	1	0.333	0 --> 1
	201	1	0.333	0 --> 1
	207	1	0.625	0 --> 3
	227	1	0.385	0 --> 2
	229	1	0.300	1 --> 0
	235	1	0.200	1 --> 0
	236	1	0.500	1 --> 0
	239	1	0.333	1 --> 0
	243	1	1.000	1 --> 0
	244	1	0.400	1 --> 0
	250	1	0.333	0 --> 1
	264	1	0.500	0 --> 1
	272	1	0.500	1 --> 0
	296	1	0.367	2 ==> 3
	297	1	0.500	0 --> 1
	300	1	0.333	0 --> 1
	315	1	0.524	4 --> 6
	316	1	0.462	2 --> 4
	318	1	0.310	1 --> 4
	340	1	0.333	1 --> 0
	392	1	0.667	1 ==> 0
	395	1	0.400	1 --> 4
	432	1	0.333	1 ==> 0
	435	1	0.500	0 --> 2
	443	1	0.286	0 --> 1
node_131 --> node_130	261	1	0.250	1 --> 2
	306	1	0.286	0 --> 1
	318	1	0.310	4 --> 5
	319	1	0.261	3 --> 4
	322	1	0.333	1 --> 2
	323	1	0.312	0 --> 3
	347	1	0.444	4 --> 2
	348	1	0.389	4 --> 2
	353	1	1.000	0 ==> 1
	355	1	1.000	0 ==> 1
node_130 --> *Ferugliotherium* A	443	1	0.286	1 --> 2
node_130 --> node_129	445	1	0.455	4 ==> 5
node_129 --> node_128	350	1	0.500	0 ==> 1
	351	1	1.000	0 ==> 1
node_128 --> *Bharattherium*	357	1	0.500	0 ==> 1
	442	1	0.222	0 ==> 2
node_128 --> *Gondwanatherium*	443	1	0.286	1 --> 0
node_128 --> *Lavanify*	354	1	0.500	0 ==> 1

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	357	1	0.500	0 ==> 1
	442	1	0.222	0 ==> 2
node_128 --> *Sudamerica* A	258	1	0.400	1 ==> 2
	352	1	1.000	1 ==> 0
	354	1	0.500	0 ==> 1
	356	1	1.000	0 --> (01)
	443	1	0.286	1 --> 0
node_128 --> *Greniodon*	356	1	1.000	0 ==> 1
	441	1	0.250	1 --> (12)
	443	1	0.286	1 ==> 2
node_128 --> *Vintana* A	432	1	0.333	0 ==> 3
	441	1	0.250	1 ==> 2
	442	1	0.222	0 ==> 2
	446	1	0.500	4 ==> 5
	453	1	1.000	0 ==> 1
node_131 --> *Arboroharamiya*	275	1	0.250	1 ==> 0
	276	1	0.167	1 ==> 0
	296	1	0.367	3 --> (34)
	315	1	0.524	6 --> 7
	316	1	0.462	4 --> 5
	324	1	0.333	1 ==> 0
	446	1	0.500	4 --> 3
node_141 --> node_140	33	1	0.500	0 --> 1
	38	1	0.167	0 --> 1
	45	1	0.286	1 --> 2
	47	1	0.200	0 --> 1
	48	1	0.143	0 --> 1
	68	1	0.500	0 ==> 1
	70	1	0.500	0 ==> 1
	83	1	0.250	1 ==> 0
	89	1	0.250	1 --> 0
	109	1	1.000	0 --> 1
	110	1	0.500	0 ==> 1
	112	1	0.333	0 --> 1
	113	1	0.375	1 --> 2
	115	1	0.308	2 ==> 1
	116	1	0.200	1 --> 0
	117	1	0.250	1 --> 0
	124	1	0.333	0 --> 1
	127	1	0.375	0 ==> 1
	143	1	0.333	0 --> 2
	155	1	0.250	1 --> 0
	157	1	0.500	1 --> 0
	158	1	0.500	1 --> 0
	159	1	0.333	1 --> 0
	160	1	0.500	1 --> 0
	169	1	0.500	1 ==> 0
	174	1	1.000	1 --> 2
	185	1	0.167	0 ==> 1
	225	1	0.364	1 --> 2
	232	1	0.300	1 --> 2
	319	1	0.261	3 ==> 0
	333	1	0.286	0 ==> 2
	396	1	0.500	2 --> 0
	441	1	0.250	1 --> 0
	442	1	0.222	0 --> 1
node_140 --> Guimarota Paulchoffatidae	76	1	0.200	1 ==> 0
	78	1	0.143	1 ==> 0
	81	1	0.300	1 --> (01)
	96	1	0.500	1 ==> 0
	115	1	0.308	1 --> (01)
	131	1	0.200	1 ==> 0
	139	1	0.333	0 ==> 1
	161	1	0.333	1 ==> 0
	188	1	0.333	1 --> 0
	195	1	0.500	0 --> (01)
	228	1	0.500	0 ==> 1

	231	1	0.556	2 --> 1
	253	1	0.333	1 --> 0
	255	1	0.250	0 --> 1
	269	1	0.200	1 ==> 0
	275	1	0.250	1 ==> 0
	284	1	0.222	0 ==> 1
	285	1	0.400	0 --> (01)
	289	1	0.333	1 --> (01)
	290	1	0.222	1 --> (01)
	291	1	0.286	0 --> (01)
	308	1	0.167	1 --> 0
	316	1	0.462	2 --> (23)
	317	1	1.000	1 --> (01)
	318	1	0.310	1 --> (12)
	319	1	0.261	0 --> (01)
node_140 --> node_139	82	1	0.333	0 --> 1
	100	1	0.500	0 --> 1
	101	1	0.333	0 --> 1
	126	1	0.455	2 --> 1
	186	1	0.200	0 --> 1
	196	1	0.167	0 --> 1
	322	1	0.333	1 ==> 0
	329	1	1.000	0 --> 1
	331	1	0.143	1 ==> 2
	346	1	0.250	0 ==> 1
	437	1	0.500	0 ==> 1
node_139 --> Plagiaulacidae	259	1	0.250	1 ==> 0
	298	1	0.250	1 ==> 0
	315	1	0.524	4 --> (45)
	318	1	0.310	1 --> (12)
	395	1	0.400	1 ==> 0
node_139 --> node_138	88	1	0.333	1 --> 2
	272	1	0.500	1 --> 2
	280	1	0.125	0 ==> 1
	340	1	0.333	1 ==> 0
	341	1	0.333	1 --> 0
	344	1	0.500	0 --> 1
	435	1	0.500	0 --> 1
	438	1	0.500	0 --> 1
	441	1	0.250	0 --> 1
node_138 --> node_136	2	1	0.333	1 --> 0
	21	1	0.500	1 --> 2
	31	1	0.333	1 --> 0
	35	1	0.250	0 --> 1
	37	1	0.333	0 ==> 1
	49	1	0.400	0 ==> 1
	63	1	0.200	1 --> 0
	296	1	0.367	2 ==> 3
	302	1	0.333	0 ==> 1
	315	1	0.524	4 ==> 6
	316	1	0.462	2 ==> 3
	318	1	0.310	1 ==> 3
	319	1	0.261	0 ==> 1
	325	1	1.000	0 --> 1
	328	1	0.250	1 ==> 2
	330	1	1.000	0 ==> 1
	395	1	0.400	1 --> 4
	396	1	0.500	0 --> 2
	435	1	0.500	1 --> 2
node_136 --> *Ptilodus*	19	1	0.500	1 ==> 0
	44	1	0.333	0 ==> 1
	79	1	0.267	0 ==> 2
	80	1	0.167	0 ==> 1
	83	1	0.250	0 ==> 1
	97	1	0.333	0 ==> 2
	104	1	0.200	0 ==> 1
	118	1	0.167	0 ==> 1

	325	1	1.000	1 -->	3
	345	1	0.667	0 ==>	2
	441	1	0.250	1 -->	2
node_136 --> node_135	52	1	0.500	1 -->	0
	108	1	0.111	0 ==>	1
	121	1	0.667	0 -->	1
	193	1	0.500	0 ==>	1
	195	1	0.500	0 -->	2
	207	1	0.625	0 ==>	2
	229	1	0.300	1 -->	2
	244	1	0.400	1 -->	2
	301	1	0.333	0 ==>	1
	306	1	0.286	0 ==>	1
	322	1	0.333	0 ==>	2
	323	1	0.312	0 ==>	2
	331	1	0.143	2 ==>	0
	341	1	0.333	0 -->	1
	432	1	0.333	1 -->	3
	438	1	0.500	1 -->	2
node_135 --> node_132	28	1	0.125	0 -->	1
	64	1	0.400	0 ==>	1
	66	1	0.500	0 ==>	1
	82	1	0.333	1 -->	2
	92	1	0.375	1 ==>	2
	97	1	0.333	0 ==>	1
	100	1	0.500	1 ==>	0
	101	1	0.333	1 -->	0
	115	1	0.308	1 ==>	2
	131	1	0.200	1 ==>	0
	134	1	0.182	1 ==>	0
	141	1	0.667	1 -->	0
	142	1	0.286	0 -->	1
	161	1	0.333	1 -->	0
	176	1	0.222	2 -->	1
	185	1	0.167	1 -->	0
	186	1	0.200	1 -->	0
	225	1	0.364	2 -->	0
	228	1	0.500	0 ==>	1
	250	1	0.333	0 -->	1
	279	1	0.200	1 ==>	0
	281	1	0.429	2 ==>	1
	282	1	0.400	0 -->	1
	283	1	0.211	1 ==>	2
	315	1	0.524	6 ==>	7
	316	1	0.462	3 ==>	6
	318	1	0.310	3 ==>	4
	319	1	0.261	1 ==>	4
	339	1	0.200	1 ==>	0
	346	1	0.250	1 ==>	0
node_132 --> *Taeniolabis*	15	1	0.167	1 ==>	0
	81	1	0.300	1 ==>	0
	114	1	0.300	1 ==>	0
	229	1	0.300	2 -->	1
	235	1	0.200	1 ==>	0
	259	1	0.250	1 ==>	0
	282	1	0.400	1 -->	(01)
	436	1	0.600	0 ==>	2
node_132 --> *Lambdopsalis*	23	1	0.333	0 -->	1
	121	1	0.667	1 -->	0
	303	1	0.167	0 ==>	1
	323	1	0.312	2 ==>	3
	324	1	0.333	1 ==>	2
	325	1	1.000	1 ==>	2
	343	1	0.750	1 ==>	2
	395	1	0.400	4 -->	3
node_135 --> node_134	76	1	0.200	1 -->	0
	78	1	0.143	1 ==>	0

	89	1	0.250	0 ==> 1
	105	1	0.143	0 ==> 1
	122	1	0.333	0 ==> 1
	198	1	0.200	1 ==> 0
	206	1	0.333	0 ==> 1
	227	1	0.385	0 --> 1
	234	1	0.143	0 ==> 1
	255	1	0.250	0 --> 1
	299	1	1.000	0 ==> 1
	395	1	0.400	4 --> 1
	396	1	0.500	2 ==> 1
	435	1	0.500	2 --> 1
node_134 --> node_133	64	1	0.400	0 ==> 2
	65	1	0.182	0 ==> 1
	66	1	0.500	0 ==> 1
	79	1	0.267	0 ==> 2
	118	1	0.167	0 ==> 1
	120	1	0.250	0 ==> 1
	165	1	0.500	0 --> 1
	238	1	0.143	1 --> 0
	255	1	0.250	1 --> 0
	323	1	0.312	2 --> 1
node_133 --> *Kryptobaatar*	152	1	0.250	1 ==> 0
	191	1	0.286	1 ==> 0
	198	1	0.200	0 ==> 1
	234	1	0.143	1 ==> 0
	322	1	0.333	2 ==> 1
	331	1	0.143	0 ==> 1
	343	1	0.750	1 ==> 0
	345	1	0.667	0 ==> 1
	396	1	0.500	1 --> (12)
	438	1	0.500	2 --> 1
node_133 --> *Catopsbaatar*	37	1	0.333	1 ==> 0
	44	1	0.333	0 ==> 1
	46	1	0.500	0 ==> 1
	53	1	0.500	0 ==> 1
	54	1	0.500	0 ==> 1
	88	1	0.333	2 --> (12)
	98	1	0.286	0 ==> 1
	105	1	0.143	1 ==> 0
	114	1	0.300	1 ==> 0
	192	1	0.333	1 ==> 0
	258	1	0.400	1 ==> 2
	316	1	0.462	3 ==> 4
	319	1	0.261	1 ==> 2
	323	1	0.312	1 --> 3
	346	1	0.250	1 ==> 0
	395	1	0.400	1 ==> 2
node_134 --> *Chulsanbaatar*	102	1	0.200	0 ==> 1
	258	1	0.400	1 ==> 2
	349	1	0.273	1 --> (12)
	438	1	0.500	2 --> 1
	439	1	0.500	1 ==> 0
node_134 --> *Nemegtbaatar*	25	1	0.200	0 ==> 1
	82	1	0.333	1 ==> 2
	83	1	0.250	0 ==> 1
	94	1	0.143	1 ==> 0
	104	1	0.200	0 ==> 1
	116	1	0.200	0 ==> 1
	139	1	0.333	0 ==> 1
	225	1	0.364	2 ==> 1
	231	1	0.556	2 ==> 1
	395	1	0.400	1 ==> 3
	435	1	0.500	1 --> 2
node_138 --> node_137	4	1	0.500	0 ==> 1
	5	1	0.333	0 ==> 1
	15	1	0.167	1 ==> 0

	27	1	0.500	0 --> 2
	59	1	0.333	0 --> 1
	60	1	0.500	2 ==> 1
	90	1	0.333	0 --> 1
	134	1	0.182	1 --> 2
	215	1	0.500	2 --> 1
	253	1	0.333	1 --> 0
	270	1	0.167	1 ==> 0
	307	1	0.571	2 ==> 1
	349	1	0.273	1 --> 0
	439	1	0.500	1 --> 0
node_137 --> *Rugosodon*	42	1	0.286	1 --> 0
	88	1	0.333	2 --> 1
	289	1	0.333	1 ==> 0
	290	1	0.222	1 ==> 0
	298	1	0.250	1 ==> 0
	308	1	0.167	1 ==> 0
	344	1	0.500	1 --> 0
	346	1	0.250	1 ==> 0
	395	1	0.400	1 ==> 2
	436	1	0.600	0 ==> 1
	437	1	0.500	1 ==> 0
node_137 --> *Sinobaatar*	37	1	0.333	0 --> (01)
	315	1	0.524	4 ==> 5
	318	1	0.310	1 --> 2
	322	1	0.333	0 ==> 1
	323	1	0.312	0 --> (01)
	345	1	0.667	0 ==> 1
	396	1	0.500	0 --> 1
	435	1	0.500	1 --> (01)
node_142 --> *Thomasia*	322	1	0.333	1 ==> 2
	432	1	0.333	1 --> (12)
node_143 --> *Haramiyavia*	276	1	0.167	1 ==> 0
	303	1	0.167	0 --> 1
	328	1	0.250	1 ==> 2
	349	1	0.273	1 --> 2
	395	1	0.400	1 --> 2
	436	1	0.600	0 ==> 1
node_151 --> node_150	3	1	0.500	1 --> 0
	7	1	0.250	1 --> 0
	63	1	0.200	1 --> 0
	67	1	0.400	2 --> 1
	88	1	0.333	1 --> 2
	106	1	0.400	2 --> 1
	108	1	0.111	0 --> 1
	155	1	0.250	1 --> 0
	176	1	0.222	2 ==> 1
	190	1	0.250	1 ==> 0
	220	1	0.500	1 --> 0
	237	1	0.200	1 --> 0
	295	1	0.333	2 --> 3
	296	1	0.367	2 --> 3
	303	1	0.167	0 --> 1
	315	1	0.524	0 ==> 3
	318	1	0.310	0 ==> 1
	321	1	0.167	0 --> 1
	327	1	0.125	1 ==> 0
	337	1	0.250	1 --> 0
	364	1	0.250	1 --> 0
	365	1	0.500	1 ==> 0
	366	1	0.250	1 ==> 0
	368	1	0.400	1 ==> 0
	369	1	0.500	0 ==> 1
	414	1	0.333	1 ==> 0
	429	1	1.000	0 ==> 1
	446	1	0.500	1 --> 0
	447	1	0.500	1 ==> 0

node_150 --> node_146	31	1	0.333	1 --> 0
	48	1	0.143	0 --> 1
	90	1	0.333	0 --> 1
	105	1	0.143	0 --> 1
	114	1	0.300	1 --> 0
	126	1	0.455	2 --> 1
	182	1	0.400	1 --> 2
	195	1	0.500	0 --> 1
	232	1	0.300	1 --> 0
	259	1	0.250	1 --> 0
	287	1	0.333	1 --> 0
	313	1	0.250	0 --> 1
	343	1	0.750	1 --> 2
	347	1	0.444	3 ==> 1
	348	1	0.389	3 --> 2
	349	1	0.273	0 --> 1
	386	1	0.143	0 ==> 1
	405	1	0.714	0 --> 2
node_146 --> node_145	283	1	0.211	2 ==> 1
	328	1	0.250	1 ==> 2
	335	1	0.100	1 ==> 0
node_145 --> *Gobiconodon*	6	1	0.400	1 --> 0
	63	1	0.200	0 --> 1
	257	1	0.435	2 --> 3
	259	1	0.250	0 --> 2
	277	1	0.444	0 --> (01)
	295	1	0.333	3 ==> 4
	315	2	0.524	3 --> (123)
	316	1	0.462	0 --> (01)
	318	1	0.310	1 --> (12)
	319	1	0.261	3 ==> 1
	323	1	0.312	0 ==> 3
	326	1	0.222	0 ==> 2
	343	1	0.750	2 --> (12)
	347	1	0.444	1 --> (12)
	348	1	0.389	2 --> (12)
node_145 --> *Repenomamus*	27	1	0.500	0 ==> 1
	78	1	0.143	1 ==> 0
	229	1	0.300	1 --> (01)
	296	1	0.367	3 --> 2
	316	1	0.462	0 --> 3
	318	1	0.310	1 ==> 3
	333	1	0.286	0 ==> 1
	391	1	0.286	1 ==> 0
node_146 --> *Amphilestes*	262	1	0.222	0 ==> 1
	315	1	0.524	3 ==> 1
node_150 --> node_149	2	1	0.333	1 --> 0
	61	1	0.250	1 --> 0
	65	1	0.182	1 --> 0
	68	1	0.500	0 --> 1
	77	1	0.200	1 --> 0
	79	1	0.267	2 --> 1
	80	1	0.167	0 ==> 1
	102	1	0.200	2 --> 0
	104	1	0.200	0 --> 1
	257	1	0.435	2 --> 1
	277	1	0.444	0 --> 1
	284	1	0.222	1 --> 0
	285	1	0.400	1 ==> 0
	309	1	0.250	1 --> 0
	316	1	0.462	0 --> 2
	359	1	0.500	0 --> 2
	385	1	0.333	0 ==> 1
	445	1	0.455	2 --> 1
	448	1	0.500	1 --> 0
node_149 --> node_147	315	1	0.524	3 --> 4
	316	1	0.462	2 --> 4

	318	1	0.310	1 ==> 3
	321	1	0.167	1 --> 0
	391	1	0.286	1 ==> 0
	427	1	0.143	1 ==> 0
node_147 --> *Yanoconodon*	51	1	0.500	1 ==> 0
	315	1	0.524	4 --> 5
	335	1	0.100	1 ==> 0
	336	1	0.182	1 ==> 0
	428	1	0.143	0 ==> 1
node_147 --> *Jeholodens*	153	1	0.429	1 --> (01)
	295	1	0.333	3 ==> 1
	296	1	0.367	3 --> 1
	347	1	0.444	3 ==> 2
	405	1	0.714	0 --> (02)
	445	1	0.455	1 --> 2
node_149 --> node_148	88	1	0.333	2 --> 1
	281	1	0.429	1 ==> 2
	291	1	0.286	0 ==> 1
	310	1	0.200	0 --> 1
	319	1	0.261	3 --> 1
	331	1	0.143	0 ==> 1
	334	1	0.143	1 ==> 0
	337	1	0.250	0 --> 1
	397	1	0.500	0 ==> 1
	411	1	0.333	0 ==> 2
node_148 --> *Priacodon*	200	1	0.500	0 ==> 2
	284	1	0.222	0 --> 1
	294	1	0.083	0 ==> 1
	318	1	0.310	1 ==> 2
	319	1	0.261	1 --> 2
	335	1	0.100	1 ==> 0
	336	1	0.182	1 ==> 2
	347	1	0.444	3 ==> 2
	348	1	0.389	3 ==> 2
node_148 --> *Trioracodon*	295	1	0.333	3 ==> 2
	326	1	0.222	0 ==> 1
	385	1	0.333	1 --> (01)
node_157 --> node_156	5	1	0.333	0 --> 1
	36	1	0.167	0 --> 1
	37	1	0.333	0 --> 1
	45	1	0.286	1 --> 2
	47	1	0.200	0 --> 1
	60	1	0.500	0 --> 1
	77	1	0.200	1 --> 0
	79	1	0.267	2 --> 0
	80	1	0.167	0 --> 1
	92	1	0.375	0 --> 2
	97	1	0.333	0 --> 1
	110	1	0.500	0 --> 1
	111	1	1.000	1 --> 2
	124	1	0.333	0 --> 1
	131	1	0.200	1 --> 0
	134	1	0.182	2 --> 1
	153	1	0.429	1 --> 2
	165	1	0.500	0 --> 1
	167	1	0.286	1 --> 0
	192	1	0.333	1 --> 0
	194	1	0.333	0 --> 1
	197	1	0.333	1 --> 0
	198	1	0.200	1 --> 0
	201	1	0.333	0 --> 1
	202	1	1.000	0 --> 1
	203	1	0.333	0 --> 1
	206	1	0.333	0 --> 1
	207	1	0.625	0 --> 2
	209	1	0.500	1 --> 0
	222	1	0.500	0 --> 2

	229	1	0.300	1 --> 2
	232	1	0.300	1 --> 0
	234	1	0.143	0 --> 1
	242	1	0.500	1 --> 2
	244	1	0.400	1 --> 2
	246	1	0.333	0 --> 1
	261	1	0.250	0 --> 1
	265	1	0.375	0 --> 2
	267	1	0.600	0 --> 1
	280	1	0.125	0 ==> 1
	282	1	0.400	0 ==> 1
	295	1	0.333	2 --> 5
	296	1	0.367	2 --> 5
	308	1	0.167	0 --> 1
	312	1	0.250	0 --> 1
	316	1	0.462	0 --> 5
	323	1	0.312	0 --> 1
	324	1	0.333	1 --> 0
	338	1	0.500	0 ==> 1
	348	1	0.389	3 --> 4
	364	1	0.250	1 --> 2
	370	1	0.500	0 ==> 1
	371	1	0.500	0 ==> 1
	372	1	0.286	0 --> 1
	373	1	0.250	0 ==> 1
	375	1	0.667	0 --> 1
	380	1	0.250	0 --> 1
	382	1	0.333	0 --> 2
	384	1	0.500	0 --> 3
	390	1	1.000	0 --> 1
	391	1	0.286	1 ==> 0
	410	1	0.250	0 --> 1
	411	1	0.333	0 --> 2
	432	1	0.333	1 --> 3
	442	1	0.222	1 --> 2
	443	1	0.286	0 --> 1
	445	1	0.455	2 ==> 3
	449	1	0.250	0 --> 2
	450	1	0.200	0 --> 1
node_156 --> node_152	262	1	0.222	0 --> 1
	275	1	0.250	1 ==> 0
	332	1	0.200	0 ==> 1
	333	1	0.286	0 ==> 1
	363	1	0.200	1 ==> 0
	372	1	0.286	1 --> 2
	377	1	0.333	0 ==> 1
	381	1	0.333	0 ==> 1
	452	1	1.000	0 ==> 1
node_152 --> *Ausktribosphenos*	261	1	0.250	1 --> 0
	269	1	0.200	1 ==> 0
node_152 --> *Bishops*	283	1	0.211	2 ==> 3
	315	1	0.524	0 --> (01)
	339	1	0.200	1 ==> 0
	364	1	0.250	2 --> 1
node_156 --> node_155	278	1	1.000	0 ==> 1
	315	1	0.524	0 --> 5
	318	1	0.310	0 --> 3
	335	1	0.100	1 --> 0
	336	1	0.182	1 --> 0
	366	1	0.250	1 ==> 2
	376	1	1.000	0 ==> 1
	385	1	0.333	0 --> 1
	388	1	0.333	1 ==> 0
	389	1	0.333	0 ==> 1
	446	1	0.500	1 --> 0
node_155 --> node_153	362	1	0.333	0 ==> 1
	367	1	0.250	1 ==> 0

node_153 --> *Teinolophos*	362	1	0.333	1 --> (12)
	385	1	0.333	1 --> 0
node_155 --> node_154	265	1	0.375	2 --> 0
	267	1	0.600	1 --> 0
	277	1	0.444	0 ==> 1
	360	1	0.667	0 ==> 1
	392	1	0.667	1 ==> 2
node_154 --> *Obdurodon*	94	1	0.143	0 --> 1
	132	1	0.333	0 ==> 1
	265	1	0.375	0 --> 3
	441	1	0.250	0 --> 2
	446	1	0.500	0 --> (02)
node_154 --> *Ornithorhynchus*	82	1	0.333	1 ==> 0
	84	1	0.500	1 ==> 0
	264	1	0.500	1 --> (01)
	315	1	0.524	5 --> 7
	316	1	0.462	5 --> 6
	318	1	0.310	3 --> 4
	319	1	0.261	3 ==> 4
	347	1	0.444	3 ==> 4
	373	1	0.250	1 ==> 0
	387	1	0.333	1 ==> 0
	446	1	0.500	0 --> (02)
node_161 --> *Hadrocodium*	81	1	0.300	1 --> 0
	132	1	0.333	0 ==> 1
	134	1	0.182	2 ==> 0
	136	1	0.333	0 ==> 1
	153	1	0.429	1 ==> 2
	170	1	0.400	0 ==> 1
	187	1	0.333	0 ==> 1
	203	1	0.333	0 ==> 1
	229	1	0.300	1 ==> 2
	234	1	0.143	0 ==> 1
	266	1	0.200	0 --> 1
	281	1	0.429	1 ==> 0
	315	1	0.524	2 --> 5
	316	1	0.462	0 --> 5
	331	1	0.143	0 ==> 1
	335	1	0.100	1 ==> 0
	347	1	0.444	1 ==> 4
	348	1	0.389	1 ==> 4
node_163 --> *Sinoconodon*	14	1	0.429	1 --> 0
	72	1	0.500	1 --> 0
	73	1	0.500	0 ==> 1
	82	1	0.333	2 ==> 0
	95	1	0.222	0 ==> 1
	108	1	0.111	0 ==> 1
	210	1	0.500	1 --> 0
	213	1	0.667	2 --> 1
	287	1	0.333	1 --> 0
	385	1	0.333	0 --> (01)
	405	1	0.714	0 --> (01)
node_165 --> *Tritheledontids*	11	1	0.500	0 ==> 1
	64	1	0.400	0 --> (01)
	68	1	0.500	0 --> (01)
	71	1	0.667	0 --> (01)
	79	1	0.267	2 ==> 1
	103	1	0.600	0 --> (01)
	108	1	0.111	0 ==> 1
	126	1	0.455	0 --> (01)
	127	1	0.375	1 --> (01)
	145	1	0.286	1 ==> 0
	178	1	0.400	1 --> 0
	184	1	1.000	1 --> (01)
	225	1	0.364	0 --> (01)
	227	1	0.385	3 --> (03)
	238	1	0.143	1 ==> 0

```
257             1  0.435  0 --> (01)
264             1  0.500  1 --> (01)
295             1  0.333  2 --> (23)
296             2  0.367  2 --> (234)
315             1  0.524  3 --> (23)
316             1  0.462  2 --> (12)
444             1  0.200  0 ==> 1
```

Apomorphy List for Parsimony Analysis Dataset #2

```
P A U P *
Version 4.0a109 for Macintosh (X86)
Sunday, February 28, 2010  12:46 PM

Running on IA-32 architecture (64-bit word length)
SSE vectorization enabled
Multithreading enabled for likelihood using OpenMP

-----------------------------NOTICE-----------------------------
        This is an alpha-test version prepared for the exclusive
        use of course and workshop participants, as well as other
        authorized testers.  It will expire on 1 Jul 2010.

        Please report bugs to david.swofford@duke.edu
----------------------------------------------------------------

Processing of file "~/Desktop/tnt nature revision
8_25/Vintana_nature_8_25_paup.nex" begins...

Data matrix has 91 taxa, 453 characters
Valid character-state symbols: 0123456789
Missing data identified by '?'
Gaps identified by '-'

Processing of file "Vintana_nature_8_25_paup.nex" completed.

paup> GetTrees File=analysis3.trees;

Processing TREES block from file "analysis3.trees":
  Keeping: trees from file (replacing any trees already in memory)
  60 trees read from file
  Time used = 0.01 sec (CPU time = 0.01 sec)

paup> DescribeTrees ApoList=yes;

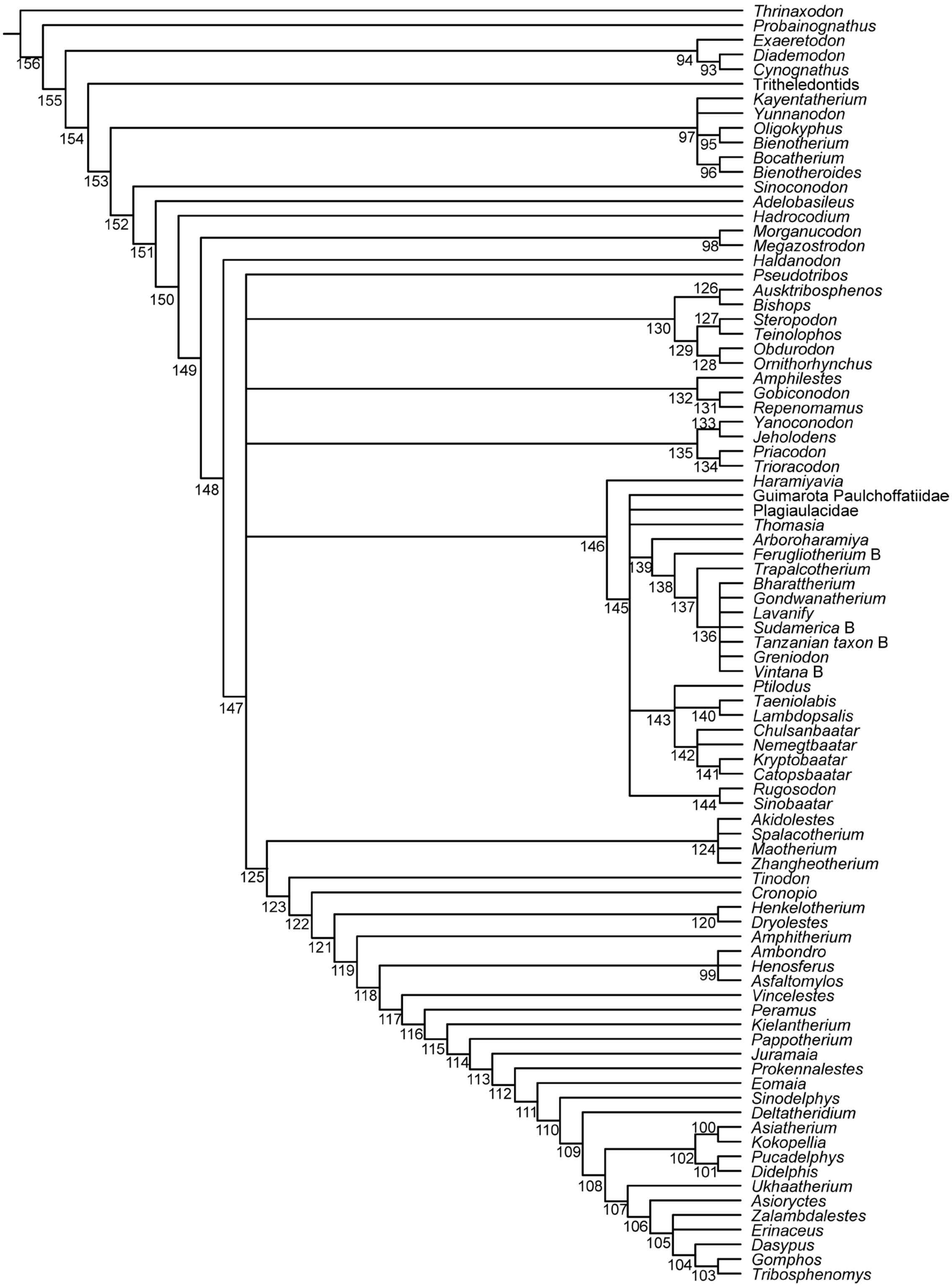
Tree description:

  Unrooted tree(s) rooted using outgroup method

  Note: No outgroup has been defined; tree is (arbitrarily) rooted at first taxon.
  Optimality criterion = parsimony
    Character-status summary:
      Of 453 total characters:
        All characters are of type 'unord'
        All characters have equal weight
        10 characters are parsimony-uninformative
        Number of parsimony-informative characters = 443
    Gaps are treated as "missing"
    Character-state optimization: Accelerated transformation (ACCTRAN)

Tree number 1 ('tagged tree') (rooted using default outgroup)
```

doi:10.1038/nature13922




```
Apomorphy lists:

               Branch                  Character  Steps     CI    Change
----------------------------------------------------------------
```

Thrinaxodon <-> node_156	28	1	0.125	1 <-> 0
	39	1	0.333	0 <-> 1
	56	1	0.250	0 <-> 1
	64	1	0.400	0 <-> 1
	65	1	0.182	1 <=> 0
	81	1	0.273	1 <=> 0
	103	1	0.600	1 <=> 0
	105	1	0.143	0 <=> 1
	116	1	0.200	0 <=> 1
	145	1	0.286	0 <=> 1
	146	1	0.250	0 <=> 1
	163	1	0.333	1 <=> 0
	164	1	0.250	0 <-> 1
	198	1	0.200	1 <=> 0
	217	1	0.500	0 <-> 1
	226	1	0.333	0 <=> 1
	231	1	0.556	4 <=> 0
	238	1	0.143	0 <=> 1
	264	1	0.375	0 <=> 1
	285	1	0.400	1 <=> 0
	286	1	1.000	0 <-> 1
	290	1	0.200	0 <=> 1
node_156 --> *Probainognathus*	176	1	0.200	0 ==> 1
	221	1	0.667	0 ==> 1
	256	1	0.333	1 ==> 0
	257	1	0.435	0 ==> 3
	266	1	0.167	0 --> 1
	283	1	0.200	1 ==> 0
node_156 --> node_155	115	1	0.286	3 --> 2
	123	1	1.000	0 ==> 1
	154	1	0.750	0 --> 1
	178	1	0.400	0 --> 1
	190	1	0.200	1 ==> 0
	207	1	0.556	3 --> 0
	276	1	0.167	0 ==> 1
	291	1	0.286	0 ==> 1
	294	1	0.083	0 ==> 1
	296	1	0.367	1 --> 2
node_155 --> node_94	28	1	0.125	0 --> 1
	48	1	0.143	0 --> 1
	56	1	0.250	1 --> 0
	89	1	0.250	0 --> 1
	95	1	0.222	0 ==> 1
	124	1	0.333	0 ==> 1
	151	1	0.500	0 --> 2
	187	1	0.333	0 --> 1
	191	1	0.286	0 ==> 1
	195	1	0.500	0 ==> 2
	215	1	0.500	0 --> 1
	227	1	0.385	3 ==> 0
	237	1	0.200	0 ==> 1
	300	1	0.333	0 --> 1
	301	1	0.250	0 --> 1
	306	1	0.250	0 --> 1
	315	1	0.500	3 --> 0
	316	1	0.462	2 --> 0
	446	1	0.462	0 ==> 4
node_94 --> *Exaeretodon*	67	1	0.400	0 ==> 1
	76	1	0.200	1 ==> 0
	79	1	0.267	2 ==> 0
	88	1	0.333	0 ==> 1
	94	1	0.143	1 ==> 0
	98	1	0.286	0 --> (01)
	232	1	0.300	0 ==> 1
	250	1	0.333	0 ==> 1
	259	1	0.250	1 ==> 2
	263	1	0.333	0 ==> 1

	290	1	0.200	1 ==> 0
	315	3	0.500	0 --> (0123)
	316	3	0.462	0 --> (0123)
node_94 --> node_93	114	1	0.300	0 ==> 2
	115	1	0.286	2 --> 3
	117	1	0.250	1 ==> 0
	146	1	0.250	1 ==> 0
	217	1	0.500	1 --> 0
	226	1	0.333	1 ==> 0
	296	1	0.367	2 --> 1
node_93 --> *Diademodon*	92	1	0.333	0 ==> 1
	127	1	0.333	0 ==> 1
	231	2	0.556	0 ==> (34)
	256	1	0.333	1 ==> 0
	257	1	0.435	0 ==> 3
node_93 --> *Cynognathus*	64	1	0.400	1 --> 0
	65	1	0.182	0 ==> 1
	225	1	0.333	0 ==> 1
	294	1	0.083	1 ==> 0
node_155 --> node_154	11	1	0.250	0 --> 1
	13	1	0.286	0 --> 1
	64	1	0.400	1 --> 0
	72	1	0.500	0 --> 1
	87	1	0.500	0 --> 1
	96	1	0.500	0 ==> 1
	98	1	0.286	0 --> 1
	102	1	0.200	0 --> 1
	119	1	1.000	0 ==> 1
	120	1	0.250	1 ==> 0
	121	1	0.667	2 --> 0
	127	1	0.333	0 --> 1
	164	1	0.250	1 --> 0
	184	1	1.000	0 --> 1
	213	1	0.667	0 --> 1
	214	1	1.000	0 ==> 1
	235	1	0.200	0 ==> 1
	254	1	0.500	0 --> 1
	255	1	0.250	0 --> 1
	441	1	0.250	0 --> 1
node_154 --> node_153	10	1	0.500	1 --> 0
	14	1	0.375	0 --> 1
	85	1	0.333	0 --> 1
	106	1	0.400	0 ==> 2
	123	1	1.000	1 ==> 2
	147	1	0.333	0 ==> 1
	150	1	1.000	0 ==> 1
	151	1	0.500	0 --> 1
	175	1	0.250	1 ==> 0
	192	1	0.333	0 ==> 1
	197	1	0.333	0 ==> 1
	198	1	0.200	0 ==> 1
	210	1	0.500	0 --> 1
	213	1	0.667	1 --> 2
	287	1	0.333	0 --> 1
	295	1	0.320	2 --> 0
	442	1	0.222	0 --> 1
node_153 --> node_97	28	1	0.125	0 --> 1
	87	1	0.500	1 --> 0
	102	1	0.200	1 --> 0
	154	1	0.750	1 --> 0
	182	1	0.400	0 ==> 1
	187	1	0.333	0 ==> 1
	195	1	0.500	0 ==> 2
	205	1	1.000	0 --> 1
	233	1	0.333	0 ==> 1
	239	1	0.333	1 --> 0
	254	1	0.500	1 --> 0

doi:10.1038/nature13922

	255	1	0.250	1 --> 0
	259	1	0.250	1 ==> 2
	263	1	0.333	0 ==> 1
	266	1	0.167	0 --> 1
	274	1	0.333	0 ==> 1
	283	1	0.200	1 ==> 3
	293	1	0.250	0 ==> 1
	295	1	0.320	0 --> 4
	303	1	0.167	1 --> 0
	308	1	0.167	0 ==> 1
	312	1	0.250	0 ==> 1
	349	1	0.273	0 ==> 2
	394	1	1.000	0 --> 1
	432	1	0.333	1 --> 3
	441	1	0.250	1 --> 0
	445	1	0.455	0 ==> 4
	446	1	0.462	0 ==> 4
node_97 --> node_95	3	1	0.500	0 --> 1
	14	1	0.375	1 --> 0
	74	1	0.500	1 --> 0
	88	1	0.333	0 ==> 1
	89	1	0.250	0 --> 1
	92	1	0.333	0 ==> 1
	112	1	0.333	0 --> 1
	127	1	0.333	1 ==> 0
	147	1	0.333	1 ==> 0
	169	1	0.400	0 --> 1
	211	1	0.600	0 ==> 1
	227	1	0.385	3 --> 2
	241	1	0.222	0 ==> 1
	255	1	0.250	0 --> 1
	269	1	0.200	0 --> 1
	273	1	0.400	0 ==> 1
	275	1	0.250	1 ==> 0
node_95 --> *Oligokyphus*	42	1	0.286	0 ==> 1
	65	1	0.182	0 ==> 1
	87	1	0.500	0 ==> 1
	126	1	0.455	0 ==> 2
	143	1	0.333	0 ==> 1
	225	1	0.333	0 ==> 1
	231	1	0.556	0 ==> 3
	233	1	0.333	1 ==> 0
	259	1	0.250	2 ==> 1
	295	1	0.320	4 ==> 2
	387	1	0.273	0 --> (01)
	436	1	0.600	0 ==> 2
node_95 --> *Bienotherium*	191	1	0.286	0 ==> 1
	262	1	0.222	0 ==> 1
	296	1	0.367	2 --> 3
node_97 --> *Kayentatherium*	12	1	0.400	0 ==> 1
	13	1	0.286	1 --> 0
	16	1	0.400	0 ==> 1
	20	1	0.500	0 ==> 1
	64	1	0.400	0 --> 1
	79	1	0.267	2 ==> 1
	91	1	0.300	2 ==> 1
	95	1	0.222	0 ==> 1
	145	1	0.286	1 ==> 0
	151	1	0.500	1 --> 0
	277	1	0.444	0 --> (01)
	296	1	0.367	2 ==> 4
	306	1	0.250	0 ==> 1
node_97 --> *Yunnanodon*	69	1	0.500	0 ==> 1
	93	1	0.667	0 ==> 1
	210	1	0.500	1 ==> 0
	211	1	0.600	0 ==> 1
	296	1	0.367	2 --> 3

	316	1	0.462	2	==>	4
	348	1	0.412	0	-->	1
node_97 --> node_96	10	1	0.500	0	-->	1
	66	1	0.500	0	-->	1
	68	1	0.429	0	==>	1
	69	1	0.500	0	==>	1
	75	1	0.400	0	==>	1
	81	1	0.273	0	==>	1
	90	1	0.333	0	-->	1
	99	1	0.667	0	==>	1
	103	1	0.600	0	==>	1
	114	1	0.300	0	-->	2
	125	1	0.500	0	-->	1
	191	1	0.286	0	-->	1
	237	1	0.200	0	-->	1
	307	1	0.500	0	-->	2
	315	1	0.500	3	-->	2
	316	1	0.462	2	-->	1
node_96 --> *Bocatherium*	258	1	0.400	1	==>	2
	277	1	0.444	0	==>	1
	316	1	0.462	1	-->	4
	348	1	0.412	0	-->	1
node_96 --> *Bienotheroides*	64	1	0.400	0	-->	1
	82	1	0.333	2	==>	1
	88	1	0.333	0	==>	1
	142	1	0.286	0	==>	1
	147	1	0.333	1	==>	0
	295	1	0.320	4	==>	3
node_153 --> node_152	7	1	0.200	0	-->	1
	13	1	0.286	1	-->	0
	81	1	0.273	0	-->	1
	98	1	0.286	1	-->	0
	114	1	0.300	0	==>	1
	115	1	0.286	2	-->	3
	126	1	0.455	0	-->	1
	128	1	0.400	0	==>	1
	143	1	0.333	0	-->	1
	149	1	0.500	0	-->	1
	164	1	0.250	0	-->	1
	166	1	1.000	0	==>	1
	167	1	0.286	0	==>	1
	199	1	0.286	1	-->	0
	212	1	1.000	0	-->	2
	221	1	0.667	0	==>	1
	231	1	0.556	0	==>	1
	276	1	0.167	1	==>	0
	290	1	0.200	1	==>	0
	296	1	0.367	2	==>	0
	347	1	0.444	0	-->	1
	348	1	0.412	0	-->	1
	393	1	1.000	0	-->	1
	395	1	0.400	0	-->	1
	396	1	0.500	1	-->	2
	440	1	1.000	0	-->	1
node_152 --> node_151	45	1	0.222	0	-->	1
	67	1	0.400	0	-->	1
	71	1	0.667	0	-->	1
	88	1	0.333	0	-->	1
	102	1	0.200	1	-->	2
	143	1	0.333	1	-->	2
	148	1	0.167	0	==>	1
	152	1	0.250	0	==>	1
	153	1	0.429	0	-->	1
	174	1	1.000	0	==>	1
	176	1	0.200	0	-->	1
	178	1	0.400	1	-->	0
	190	1	0.200	0	==>	1

	209	1	0.500	0 --> 1
	229	1	0.300	0 ==> 1
	232	1	0.300	0 ==> 1
	236	1	0.500	0 ==> 1
	237	1	0.200	0 ==> 1
	283	1	0.200	1 --> 2
	295	1	0.320	0 --> 1
	315	1	0.500	3 --> 0
	316	1	0.462	2 --> 0
	391	1	0.286	0 --> 2
	445	1	0.455	0 --> 2
node_151 --> *Adelobasileus*	145	1	0.286	1 ==> 0
	149	1	0.500	1 --> 0
	197	1	0.333	1 ==> 0
	199	1	0.286	0 --> 1
	231	1	0.556	1 ==> 2
node_151 --> node_150	126	1	0.455	1 --> 0
	127	1	0.333	1 --> 0
	151	1	0.500	1 ==> 2
	176	1	0.200	1 --> 2
	178	1	0.400	0 --> 2
	182	1	0.400	0 ==> 1
	242	1	0.500	0 ==> 1
node_150 --> node_149	65	1	0.182	0 ==> 1
	131	1	0.200	0 ==> 1
	133	1	0.500	0 ==> 1
	177	1	0.200	0 --> 1
	245	1	1.000	0 ==> 1
	251	1	0.250	1 ==> 0
	291	1	0.286	1 ==> 0
	294	1	0.083	1 --> 0
	318	1	0.281	3 --> 0
	334	1	0.143	1 --> 0
	336	1	0.182	0 --> 1
	358	1	0.100	0 ==> 1
	387	1	0.273	0 --> 1
	427	1	0.143	0 ==> 1
node_149 --> node_98	10	1	0.500	0 --> 1
	41	1	0.333	0 ==> 1
	79	1	0.267	2 --> 1
	88	1	0.333	1 --> 0
	102	1	0.200	2 --> 1
	108	1	0.100	0 --> 1
	143	1	0.333	2 --> 1
	146	1	0.250	1 --> 0
	148	1	0.167	1 --> 0
	176	1	0.200	2 --> 1
	190	1	0.200	1 ==> 0
	196	1	0.167	0 ==> 1
	225	1	0.333	0 --> 1
	232	1	0.300	1 ==> 0
	238	1	0.143	1 --> 0
	257	1	0.435	0 --> 1
	259	1	0.250	1 --> 0
	262	1	0.222	0 ==> 1
	295	1	0.320	1 --> 0
	296	1	0.367	0 ==> 1
	319	1	0.250	3 ==> 0
	359	1	0.500	0 --> 1
node_98 --> *Morganucodon*	91	1	0.300	2 ==> 1
	126	1	0.455	0 --> 1
	127	1	0.333	0 --> 1
	237	1	0.200	1 ==> 0
	281	1	0.429	1 --> (01)
	294	1	0.083	0 --> 1
	315	1	0.500	0 --> 2
	347	2	0.444	1 --> (123)

	348	2	0.412	1 ==> (23)
	388	1	0.333	0 --> 1
	445	1	0.455	2 ==> 1
node_98 --> *Megazostrodon*	152	1	0.250	1 ==> 0
	153	1	0.429	1 --> 0
	199	1	0.286	0 --> 1
	283	1	0.200	2 ==> 1
	335	1	0.100	1 ==> 0
	442	1	0.222	1 ==> 0
	444	1	0.200	0 ==> 1
node_149 --> node_148	2	1	0.333	0 --> 1
	3	1	0.500	0 --> 1
	12	1	0.400	0 --> 1
	13	1	0.286	0 --> 1
	17	1	0.333	0 --> 1
	18	1	1.000	0 --> 1
	19	1	0.250	0 --> 1
	28	1	0.125	0 --> 1
	51	1	0.400	0 --> 1
	58	1	0.200	0 --> 1
	59	1	0.333	0 --> 1
	60	1	0.400	0 --> 1
	61	1	0.250	0 --> 1
	63	1	0.200	0 --> 1
	75	1	0.400	0 --> 1
	82	1	0.333	2 ==> 1
	83	1	0.200	0 ==> 1
	84	1	0.500	0 ==> 1
	115	1	0.286	3 ==> 2
	211	1	0.600	0 --> 2
	218	1	1.000	0 --> 1
	219	1	1.000	0 --> 1
	220	1	0.500	0 --> 1
	221	1	0.667	1 --> 2
	227	1	0.385	3 ==> 1
	240	1	0.200	0 --> 1
	244	1	0.400	0 --> 1
	248	1	1.000	0 --> 1
	263	1	0.333	0 ==> 1
	285	1	0.400	0 ==> 1
	288	1	1.000	0 ==> 1
	303	1	0.167	1 --> 0
	315	1	0.500	0 --> 1
	316	1	0.462	0 --> 1
	318	1	0.281	0 --> 2
	321	1	0.167	1 ==> 0
	327	1	0.111	0 --> 1
	339	1	0.125	0 --> 1
	349	1	0.273	0 --> 1
	366	1	0.222	0 ==> 1
	368	1	0.333	0 ==> 1
node_148 --> *Haldanodon*	76	1	0.200	1 ==> 0
	85	1	0.333	1 ==> 0
	114	1	0.300	1 ==> 0
	117	1	0.250	1 ==> 0
	128	1	0.400	1 ==> 0
	134	1	0.182	2 ==> 0
	142	1	0.286	0 ==> 1
	152	1	0.250	1 ==> 0
	153	1	0.429	1 --> 0
	177	1	0.200	1 --> 0
	235	1	0.200	1 ==> 0
	241	1	0.222	0 ==> 1
	310	1	0.200	0 ==> 1
	314	1	0.250	0 ==> 1
	315	1	0.500	1 --> (12)
	319	1	0.250	3 ==> 2

	323	1	0.312	0 ==> 2
	336	1	0.182	1 --> 0
	342	1	0.143	0 ==> 1
	347	1	0.444	1 --> (01)
	359	1	0.500	0 --> 2
	428	1	0.143	0 ==> 1
	432	1	0.333	1 ==> 2
	433	1	0.200	0 ==> 1
	441	1	0.250	1 ==> 0
	445	1	0.455	2 ==> 1
node_148 --> node_147	14	1	0.375	1 ==> 2
	15	1	0.125	0 --> 1
	16	1	0.400	0 ==> 1
	21	1	0.333	0 ==> 1
	22	1	0.333	0 ==> 1
	67	1	0.400	1 ==> 2
	74	1	0.500	1 --> 0
	78	1	0.143	0 ==> 1
	81	1	0.273	1 --> 0
	91	1	0.300	2 ==> 0
	94	1	0.143	1 --> 0
	95	1	0.222	0 ==> 1
	105	1	0.143	1 --> 0
	112	1	0.333	0 ==> 1
	113	1	0.375	0 ==> 2
	126	1	0.455	0 --> 2
	155	1	0.250	0 --> 1
	170	1	0.400	0 ==> 1
	175	1	0.250	0 ==> 1
	199	1	0.286	0 --> 1
	208	1	1.000	0 ==> 2
	215	1	0.500	0 --> 1
	216	1	0.500	0 --> 1
	224	1	0.750	0 ==> 1
	233	1	0.333	0 --> 1
	247	1	0.250	0 ==> 1
	260	1	0.333	0 ==> 1
	264	1	0.375	1 ==> 0
	266	1	0.167	0 --> 1
	268	1	0.500	0 ==> 1
	269	1	0.200	0 ==> 1
	270	1	0.167	0 ==> 1
	274	1	0.333	0 ==> 1
	276	1	0.167	0 ==> 1
	279	1	0.143	0 ==> 1
	289	1	0.333	0 --> 1
	290	1	0.200	0 --> 1
	295	1	0.320	1 --> 2
	296	1	0.367	0 ==> 2
	309	1	0.250	0 --> 1
	334	1	0.143	0 --> 1
	337	1	0.250	0 ==> 1
	340	1	0.250	0 --> 1
	347	1	0.444	1 ==> 3
	348	1	0.412	1 ==> 3
	363	1	0.200	0 ==> 1
	365	1	0.333	0 --> 1
	369	1	0.333	1 --> 0
	387	1	0.273	1 --> 0
	388	1	0.333	0 --> 1
	391	1	0.286	2 ==> 1
	414	1	0.250	0 --> 1
	447	1	0.333	0 --> 1
	448	1	0.500	0 ==> 1
node_147 --> *Pseudotribos*	7	1	0.200	1 --> 0
	11	1	0.250	1 ==> 0
	12	1	0.400	1 ==> 0

	13	1	0.286	1 --> 0
	14	1	0.375	2 ==> 0
	15	1	0.125	1 --> 0
	17	1	0.333	1 ==> 0
	19	1	0.250	1 ==> 0
	21	1	0.333	1 ==> 0
	22	1	0.333	1 ==> 0
	38	1	0.143	0 ==> 1
	260	1	0.333	1 ==> 0
	264	1	0.375	0 ==> 1
	266	1	0.167	1 ==> 0
	279	1	0.143	1 ==> 0
	292	1	0.167	0 ==> 1
	315	1	0.500	1 --> 2
	318	1	0.281	2 --> 0
	319	1	0.250	3 ==> 0
	332	1	0.200	0 ==> 1
	342	1	0.143	0 ==> 1
	358	1	0.100	1 ==> 0
	362	1	0.333	0 ==> 1
	364	1	0.250	0 ==> 1
	387	1	0.273	0 ==> 1
	412	1	0.333	0 ==> 1
	425	1	0.125	0 ==> 1
	426	1	0.167	0 ==> 1
	428	1	0.143	0 ==> 1
	433	1	0.200	0 ==> 1
	446	1	0.462	0 ==> 1
node_147 --> node_125	9	1	1.000	0 --> 1
	23	1	0.250	0 ==> 1
	24	1	0.500	0 ==> 1
	26	1	1.000	0 ==> 1
	29	1	0.500	0 ==> 1
	30	1	1.000	0 ==> 1
	31	1	0.333	0 ==> 1
	37	1	0.286	0 --> 1
	40	1	0.500	0 ==> 1
	41	1	0.333	0 ==> 1
	42	1	0.286	0 ==> 1
	43	1	0.250	0 ==> 1
	46	1	0.500	0 ==> 1
	52	1	0.500	0 ==> 1
	55	1	0.333	0 ==> 1
	58	1	0.200	1 --> 0
	59	1	0.333	1 --> 0
	60	1	0.400	1 --> 2
	62	1	0.500	0 --> 1
	74	1	0.500	0 --> 1
	78	1	0.143	1 ==> 0
	86	1	0.500	0 --> 1
	92	1	0.333	0 ==> 1
	105	1	0.143	0 --> 1
	112	1	0.333	1 ==> 0
	113	1	0.375	2 --> 0
	115	1	0.286	2 --> 3
	132	1	0.250	0 ==> 1
	143	1	0.333	2 --> 1
	154	1	0.750	1 --> 2
	157	1	0.500	0 --> 1
	158	1	0.500	0 --> 1
	159	1	0.333	0 ==> 1
	160	1	0.500	0 ==> 1
	161	1	0.250	0 ==> 1
	169	1	0.400	0 --> 1
	170	1	0.400	1 --> 2
	179	1	0.500	0 ==> 1
	182	1	0.400	1 ==> 2

	195	1	0.500	0 --> 1
	196	1	0.167	0 --> 1
	208	1	1.000	2 --> 1
	215	1	0.500	1 --> 0
	216	1	0.500	1 --> 0
	223	1	0.500	0 --> 1
	224	1	0.750	1 --> 2
	225	1	0.333	0 ==> 1
	238	1	0.143	1 --> 0
	247	1	0.250	1 --> 0
	251	1	0.250	0 --> 1
	265	1	0.375	0 --> 1
	269	1	0.200	1 --> 0
	280	1	0.111	0 ==> 1
	282	1	0.400	0 ==> 1
	283	1	0.200	2 --> 0
	284	1	0.222	0 ==> 1
	289	1	0.333	1 --> 0
	291	1	0.286	0 --> 1
	313	1	0.250	0 --> 1
	315	1	0.500	1 --> 0
	316	1	0.462	1 --> 0
	339	1	0.125	1 --> 0
	349	1	0.273	1 --> 0
	364	1	0.250	0 ==> 1
	383	1	0.444	2 --> 0
	409	1	0.333	0 ==> 1
	442	1	0.222	1 --> 0
	446	1	0.462	0 --> 1
node_125 --> node_123	4	1	0.500	0 --> 1
	5	1	0.333	0 --> 1
	8	1	1.000	0 --> 1
	28	1	0.125	1 --> 0
	47	1	0.167	0 --> 1
	49	1	0.400	0 --> 1
	129	1	0.500	0 --> 1
	134	1	0.182	2 --> 0
	153	1	0.429	1 --> 2
	176	1	0.200	2 --> 1
	177	1	0.200	1 --> 0
	185	1	0.143	0 --> 1
	186	1	0.200	0 --> 1
	227	1	0.385	1 --> 3
	237	1	0.200	1 --> 0
	262	1	0.222	0 ==> 1
	283	1	0.200	0 --> 3
	295	1	0.320	2 --> 1
	296	1	0.367	2 --> 1
	309	1	0.250	1 --> 0
	314	1	0.250	0 ==> 1
	319	1	0.250	3 --> 1
	323	1	0.312	0 --> 1
	421	1	0.167	0 ==> 1
node_123 --> node_122	264	1	0.375	0 ==> 1
	272	1	0.500	1 --> 0
	279	1	0.143	1 ==> 0
	313	1	0.250	1 --> 0
	318	1	0.281	2 --> 0
	334	1	0.143	1 --> 0
	335	1	0.100	1 --> 0
	358	1	0.100	1 ==> 0
	363	1	0.200	1 ==> 0
	366	1	0.222	1 --> 2
	385	1	0.333	0 ==> 1
	391	1	0.286	1 ==> 0
	405	1	0.714	0 --> 1
	412	1	0.333	0 --> 1

	427	1	0.143	1 --> 0
	428	1	0.143	0 ==> 1
	432	1	0.333	1 --> 0
node_122 --> node_121	65	1	0.182	1 --> 0
	196	1	0.167	1 --> 0
	215	1	0.500	0 --> 2
	291	1	0.286	1 --> 0
	310	1	0.200	0 ==> 1
	327	1	0.111	1 --> 0
	342	1	0.143	0 ==> 1
	347	1	0.444	3 --> 0
	432	1	0.333	0 --> 2
	433	1	0.200	0 ==> 1
node_121 --> node_119	63	1	0.200	1 --> 0
	95	1	0.222	1 --> 0
	131	1	0.200	1 --> 0
	191	1	0.286	0 --> 1
	283	1	0.200	3 --> 2
	316	1	0.462	0 --> 1
	336	1	0.182	1 ==> 0
	366	1	0.222	2 --> 1
	367	1	0.250	1 ==> 0
	370	1	0.500	0 ==> 1
	371	1	0.500	0 ==> 1
	373	1	0.250	0 ==> 1
	384	1	0.500	0 ==> 1
	398	1	0.500	0 --> 1
	405	1	0.714	1 --> 0
	409	1	0.333	1 --> 0
	427	1	0.143	0 --> 1
	445	1	0.455	2 ==> 3
	449	1	0.250	0 ==> 1
node_119 --> node_118	294	1	0.083	0 ==> 1
	315	1	0.500	0 ==> 2
	347	1	0.444	0 --> 3
	363	1	0.200	0 ==> 2
	381	1	0.333	0 ==> 1
	382	1	0.333	0 --> 1
	386	1	0.143	0 --> 1
node_118 --> node_99	260	1	0.333	1 ==> 0
	265	1	0.375	1 ==> 2
	268	1	0.500	1 --> 0
	281	1	0.429	1 --> 0
	338	1	0.500	0 --> 1
	377	1	0.333	0 ==> 1
	378	1	0.500	1 ==> 0
	380	1	0.250	0 ==> 1
	382	1	0.333	1 --> 2
	383	1	0.444	0 ==> 2
	441	1	0.250	1 --> 0
	444	1	0.200	0 --> 1
node_99 --> *Ambondro*	336	1	0.182	0 ==> 1
	383	1	0.444	2 --> (12)
	385	1	0.333	1 ==> 0
	387	1	0.273	0 ==> 1
	450	1	0.200	0 ==> 1
node_99 --> *Henosferus*	257	1	0.435	0 ==> 2
	259	1	0.250	1 ==> 0
	266	1	0.167	1 ==> 0
	280	1	0.111	1 ==> 0
	342	1	0.143	1 ==> 0
	378	1	0.500	0 --> (01)
	379	1	0.333	1 ==> 0
node_99 --> *Asfaltomylos*	283	1	0.200	2 ==> 3
	372	1	0.286	0 ==> 2
node_118 --> node_117	257	1	0.435	0 ==> 1
	262	1	0.222	1 --> 0

	273	1	0.400	0 ==> 1
	275	1	0.250	1 ==> 0
	331	1	0.118	0 --> 1
node_117 --> node_116	1	1	0.333	0 --> 1
	16	1	0.400	1 --> 0
	21	1	0.333	1 --> 2
	27	1	0.500	0 --> 2
	29	1	0.500	1 --> 2
	30	1	1.000	1 --> 2
	36	1	0.167	0 --> 1
	44	1	0.333	0 --> 1
	45	1	0.222	1 --> 2
	49	1	0.400	1 --> 0
	50	1	0.500	0 --> 1
	53	1	0.500	0 --> 1
	54	1	0.500	0 --> 1
	68	1	0.429	0 --> 1
	70	1	0.333	0 --> 1
	77	1	0.200	1 --> 0
	88	1	0.333	1 --> 2
	94	1	0.143	0 --> 1
	125	1	0.500	0 --> 1
	126	1	0.455	2 --> 3
	128	1	0.400	1 --> 2
	130	1	1.000	0 --> 1
	134	1	0.182	0 --> 2
	136	1	0.333	0 --> 1
	139	1	0.333	0 --> 1
	142	1	0.286	0 --> 1
	148	1	0.167	1 --> 0
	154	1	0.750	2 --> 3
	166	1	1.000	1 --> 2
	171	1	0.500	0 --> 1
	173	1	1.000	0 --> 1
	181	1	0.333	0 --> 1
	203	1	0.333	0 --> 1
	233	1	0.333	1 --> 0
	246	1	0.333	0 --> 1
	280	1	0.111	1 ==> 0
	296	1	0.367	1 --> 0
	303	1	0.167	0 --> 1
	314	1	0.250	1 --> 0
	320	1	0.500	0 --> 1
	342	1	0.143	1 ==> 0
	347	1	0.444	3 --> 2
	349	1	0.273	0 --> 2
	358	1	0.100	0 ==> 1
	374	1	0.250	0 --> 1
	385	1	0.333	1 --> 0
	424	1	0.250	0 ==> 1
	425	1	0.125	0 ==> 1
	426	1	0.167	0 ==> 1
node_116 --> *Peramus*	257	2	0.435	1 --> (012)
	259	1	0.250	1 --> (01)
	269	1	0.200	0 ==> 1
	294	1	0.083	1 ==> 0
	318	1	0.281	0 ==> 1
	332	1	0.200	0 ==> 1
	336	1	0.182	0 ==> 1
	348	1	0.412	3 ==> 2
	361	1	1.000	0 --> (01)
	381	1	0.333	1 ==> 0
	382	1	0.333	1 --> 0
	398	1	0.500	1 --> 0
	405	1	0.714	0 --> (01)
	428	1	0.143	1 ==> 0
	432	1	0.333	2 ==> 1

	434	1	0.333	1 ==> 0
node_116 --> node_115	277	1	0.444	0 ==> 1
	319	1	0.250	1 --> 0
	324	1	0.333	1 --> 0
	327	1	0.111	0 --> 1
	331	1	0.118	1 --> 0
	334	1	0.143	0 --> 1
	380	1	0.250	0 ==> 1
	451	1	1.000	0 ==> 1
node_115 --> *Kielantherium*	315	1	0.500	2 --> (12)
	366	1	0.222	1 ==> 2
	374	1	0.250	1 --> 0
	385	1	0.333	0 --> (01)
	407	1	0.750	2 ==> 1
node_115 --> node_114	347	1	0.444	2 --> 3
	363	1	0.200	2 ==> 0
	377	1	0.333	0 --> 1
	384	1	0.500	1 --> 3
	403	1	0.500	0 ==> 1
node_114 --> node_113	400	1	1.000	0 ==> 1
	402	1	0.167	0 ==> 1
	423	1	0.333	1 --> 0
node_113 --> node_112	33	1	0.333	0 --> 1
	292	1	0.167	0 --> 1
	310	1	0.200	1 --> 0
	335	1	0.100	0 ==> 1
	399	1	0.200	0 --> 1
	401	1	0.500	2 ==> 1
	425	1	0.125	1 --> 0
node_112 --> node_111	185	1	0.143	1 --> 0
	186	1	0.200	1 --> 0
	189	1	0.333	0 --> 1
	200	1	0.500	0 --> 1
	207	1	0.556	0 --> 1
	232	1	0.300	1 --> 2
	262	1	0.222	0 ==> 1
	277	1	0.444	1 ==> 0
	326	1	0.200	0 ==> 1
	383	1	0.444	0 --> 1
	404	1	0.333	0 ==> 1
node_111 --> node_110	20	1	0.500	0 --> 1
	25	1	0.167	0 ==> 1
	32	1	0.250	0 --> 1
	34	1	0.500	0 --> 1
	51	1	0.400	1 ==> 2
	261	1	0.250	0 --> 1
	265	1	0.375	1 ==> 3
	269	1	0.200	0 --> 1
	279	1	0.143	0 ==> 1
	283	1	0.200	2 ==> 3
	294	1	0.083	1 ==> 0
	296	1	0.367	0 --> 1
	315	1	0.500	2 --> 3
	327	1	0.111	1 --> 0
	366	1	0.222	1 ==> 2
	378	1	0.500	1 --> 0
	384	1	0.500	3 --> 1
	406	1	0.600	1 --> 0
	425	1	0.125	0 --> 1
node_110 --> *Sinodelphys*	35	1	0.250	0 ==> 1
	47	1	0.167	1 ==> 0
	257	1	0.435	1 ==> 3
	259	1	0.250	1 ==> 0
	273	1	0.400	1 ==> 0
	290	1	0.200	1 ==> 0
	291	1	0.286	0 ==> 1
	363	1	0.200	0 ==> 1

	411	1	0.333	0 ==> 1
node_110 --> node_109	292	1	0.167	1 --> 0
	316	1	0.462	1 ==> 2
	318	1	0.281	0 ==> 1
	319	1	0.250	0 ==> 1
	358	1	0.100	1 ==> 0
	385	1	0.333	0 ==> 1
node_109 --> *Deltatheridium*	113	1	0.375	0 --> (01)
	115	1	0.286	3 ==> 2
	167	1	0.286	1 ==> 2
	284	1	0.222	1 ==> 0
	295	1	0.320	1 ==> 2
	304	1	0.500	0 ==> 1
	363	1	0.200	0 ==> 2
	379	1	0.333	1 ==> 0
	383	1	0.444	1 --> 0
	386	1	0.143	1 ==> 0
	399	1	0.200	1 --> 0
	400	1	1.000	1 --> (01)
	402	1	0.167	1 ==> 0
	421	1	0.167	1 ==> 0
	426	1	0.167	1 ==> 0
	449	1	0.250	1 ==> 2
node_109 --> node_108	79	1	0.267	2 ==> 1
	242	1	0.500	1 --> 2
	296	1	0.367	1 --> 0
	367	1	0.250	0 ==> 1
	372	1	0.286	0 --> 2
	378	1	0.500	0 --> 1
	382	1	0.333	1 --> 2
	384	1	0.500	1 --> 3
	419	1	0.600	0 ==> 1
	441	1	0.250	1 ==> 2
	442	1	0.222	0 ==> 2
	443	1	0.286	0 ==> 1
	444	1	0.200	0 ==> 1
node_108 --> node_102	45	1	0.222	2 --> 1
	48	1	0.143	0 ==> 1
	97	1	0.333	0 --> 1
	104	1	0.200	0 ==> 1
	144	1	0.333	0 --> 1
	183	1	0.333	0 --> 1
	232	1	0.300	2 --> 3
	235	1	0.200	1 --> 0
	247	1	0.250	0 --> 1
	280	1	0.111	0 --> 1
	361	1	1.000	0 ==> 1
	389	1	0.333	0 --> 1
	406	1	0.600	0 --> 1
	410	1	0.250	0 ==> 1
	425	1	0.125	1 ==> 0
node_102 --> node_100	36	1	0.167	1 --> 0
	261	1	0.250	1 --> 0
	386	1	0.143	1 ==> 0
node_100 --> *Asiatherium*	326	1	0.200	1 ==> 0
	387	1	0.273	0 ==> 1
	407	1	0.750	2 ==> 0
	419	1	0.600	1 ==> 0
	430	1	0.500	0 ==> 1
	431	1	0.333	0 ==> 1
node_100 --> *Kokopellia*	277	1	0.444	0 ==> 1
	363	1	0.200	0 ==> 1
	366	1	0.222	2 ==> 1
	383	1	0.444	1 --> 0
	399	1	0.200	1 --> 0
	401	1	0.500	1 ==> 2
	421	1	0.167	1 ==> 0

node_102 --> node_101	25	1	0.167	1 ==> 0
	80	1	0.167	0 ==> 1
	115	1	0.286	3 ==> 2
	140	1	0.500	0 ==> 1
	242	1	0.500	2 --> 1
	270	1	0.167	1 ==> 0
	304	1	0.500	0 ==> 1
	375	1	0.667	0 ==> 1
	383	1	0.444	1 --> 2
	400	1	1.000	1 ==> 2
	402	1	0.167	1 ==> 0
	411	1	0.333	0 ==> 1
	413	1	1.000	0 ==> 1
	417	1	0.333	0 ==> 1
	420	1	0.500	0 ==> 1
node_101 --> *Pucadelphys*	108	1	0.100	0 ==> 1
	194	1	0.333	0 ==> 1
	207	1	0.556	1 --> (12)
	246	1	0.333	1 --> 0
	252	1	1.000	0 ==> 1
	358	1	0.100	0 ==> 1
	383	1	0.444	2 --> (12)
	385	1	0.333	1 ==> 0
	399	1	0.200	1 --> 0
	419	1	0.600	1 --> (01)
	422	1	1.000	1 --> (01)
	449	1	0.250	1 ==> 2
node_101 --> *Didelphis*	91	1	0.300	0 ==> 2
	95	1	0.222	0 ==> 1
	106	1	0.400	2 ==> 1
	145	1	0.286	1 ==> 0
	167	1	0.286	1 ==> 2
	180	1	1.000	0 ==> 1
	183	1	0.333	1 --> 0
	206	1	0.333	0 ==> 1
	227	1	0.385	3 ==> 0
	237	1	0.200	0 --> 1
	267	1	0.600	0 ==> 1
	280	1	0.111	1 --> 0
	284	1	0.222	1 --> (01)
	292	1	0.167	0 ==> 1
	294	1	0.083	0 ==> 1
	318	1	0.281	1 ==> 2
	319	1	0.250	1 ==> 2
	326	1	0.200	1 ==> 0
	389	1	0.333	1 --> 0
	450	1	0.200	0 ==> 1
node_108 --> node_107	20	1	0.500	1 --> 0
	32	1	0.250	1 --> 0
	34	1	0.500	1 --> 0
	49	1	0.400	0 --> 1
	50	1	0.500	1 --> 2
	53	1	0.500	1 --> 2
	91	1	0.300	0 ==> 2
	108	1	0.100	0 ==> 1
	122	1	0.333	0 --> 1
	133	1	0.500	1 ==> 0
	138	1	0.500	0 ==> 1
	148	1	0.167	0 --> 1
	162	1	0.333	0 ==> 1
	163	1	0.333	0 ==> 1
	164	1	0.250	1 ==> 0
	171	1	0.500	1 --> 0
	172	1	0.333	0 ==> 1
	185	1	0.143	0 --> 1
	221	1	0.667	2 --> 3
	234	1	0.143	0 --> 1

	241	1	0.222	0 ==> 1
	265	1	0.375	3 ==> 1
	359	1	0.500	0 --> 2
	364	1	0.250	1 --> 2
node_107 --> node_106	39	1	0.333	1 --> 0
	57	1	0.250	0 ==> 1
	79	1	0.267	1 --> 0
	95	1	0.222	0 ==> 1
	189	1	0.333	1 --> 0
	307	1	0.500	0 --> 2
	310	1	0.200	0 ==> 1
	313	1	0.250	0 ==> 1
	362	1	0.333	0 ==> 1
	423	1	0.333	0 --> 1
node_106 --> *Asioryctes*	1	1	0.333	1 ==> 0
	35	1	0.250	0 ==> 1
	199	1	0.286	1 ==> 0
	224	1	0.750	2 ==> 3
	230	1	0.500	0 ==> 1
	257	3	0.435	1 ==> (234)
	267	1	0.600	0 --> (01)
	269	1	0.200	1 ==> 0
	314	1	0.250	0 ==> 1
	321	1	0.167	0 ==> 1
	372	1	0.286	2 --> 0
	379	1	0.333	1 ==> 0
	382	1	0.333	2 --> 1
	384	1	0.500	3 ==> 2
	404	1	0.333	1 ==> 0
node_106 --> node_105	48	1	0.143	0 --> 1
	65	1	0.182	0 --> 1
	80	1	0.167	0 --> 1
	113	1	0.375	0 ==> 1
	115	1	0.286	3 --> 0
	118	1	0.167	0 ==> 1
	122	1	0.333	1 --> 0
	128	1	0.400	2 --> 1
	134	1	0.182	2 ==> 1
	186	1	0.200	0 --> 1
	207	1	0.556	1 ==> 2
	222	1	0.500	0 --> 1
	227	1	0.385	3 ==> 0
	234	1	0.143	1 --> 0
	237	1	0.200	0 --> 1
	280	1	0.111	0 ==> 1
	295	1	0.320	1 ==> 3
	296	1	0.367	0 ==> 2
	305	1	0.333	0 --> 1
	306	1	0.250	0 --> 1
	316	1	0.462	2 --> 4
	319	1	0.250	1 --> 3
	326	1	0.200	1 --> 0
	332	1	0.200	0 ==> 1
	333	1	0.200	0 --> 1
	336	1	0.182	0 --> 2
	383	1	0.444	1 --> 2
	402	1	0.167	1 --> 0
	410	1	0.250	0 ==> 1
	411	1	0.333	0 --> 2
	416	1	0.667	1 ==> 0
	421	1	0.167	1 ==> 0
	424	1	0.250	1 --> 0
	425	1	0.125	1 --> 0
	426	1	0.167	1 --> 0
	449	1	0.250	1 --> 2
node_105 --> *Zalambdalestes*	6	1	0.400	0 ==> 1
	38	1	0.143	0 ==> 1

	39	1	0.333	0 --> 1
	50	1	0.500	2 --> 1
	56	1	0.250	1 ==> 0
	76	1	0.200	1 ==> 0
	77	1	0.200	0 --> 1
	79	1	0.267	0 --> (02)
	80	1	0.167	1 --> 0
	91	1	0.300	2 ==> 1
	95	1	0.222	1 ==> 0
	101	1	0.333	0 ==> 1
	102	1	0.200	2 ==> 1
	106	1	0.400	2 ==> 1
	115	1	0.286	0 --> 1
	120	1	0.250	0 ==> 1
	125	1	0.500	1 ==> 0
	140	1	0.500	0 ==> 1
	181	1	0.333	1 ==> 0
	183	1	0.333	0 ==> 1
	196	1	0.167	0 ==> 1
	207	1	0.556	2 --> (12)
	222	1	0.500	1 --> 0
	240	1	0.200	1 ==> 0
	241	1	0.222	1 ==> 0
	275	1	0.250	0 ==> 1
	283	1	0.200	3 ==> 1
	289	1	0.333	0 ==> 1
	292	1	0.167	0 ==> 1
	294	1	0.083	0 ==> 1
	295	1	0.320	3 ==> 2
	296	1	0.367	2 --> (23)
	307	1	0.500	2 --> (12)
	316	1	0.462	4 --> 2
	319	1	0.250	3 --> 1
	321	1	0.167	0 ==> 1
	323	1	0.312	1 --> (01)
	326	1	0.200	0 --> 1
	327	1	0.111	0 ==> 1
	331	1	0.118	0 ==> 1
	333	1	0.200	1 --> 0
	334	1	0.143	1 ==> 0
	358	1	0.100	0 ==> 1
	375	1	0.667	0 --> (01)
	406	1	0.600	0 --> (01)
	424	1	0.250	0 --> 1
	425	1	0.125	0 --> 1
	426	1	0.167	0 --> 1
node_105 --> node_104	32	1	0.250	0 --> 1
	86	1	0.500	1 --> 0
	89	1	0.250	0 ==> 1
	91	1	0.300	2 --> 0
	98	1	0.286	0 ==> 1
	105	1	0.143	1 ==> 0
	108	1	0.100	1 ==> 0
	135	1	0.500	0 ==> 1
	144	1	0.333	0 ==> 1
	162	1	0.333	1 --> 0
	182	1	0.400	2 ==> 1
	185	1	0.143	1 --> 0
	188	1	0.333	0 --> 1
	189	1	0.333	0 --> 1
	194	1	0.333	0 --> 1
	199	1	0.286	1 ==> 0
	225	1	0.333	1 ==> 2
	232	1	0.300	2 --> 3
	244	1	0.400	1 --> 0
	247	1	0.250	0 --> 1
	259	1	0.250	1 --> 2

	276	1	0.167	1 ==> 0
	293	1	0.250	0 --> 1
	296	1	0.367	2 --> 3
	297	1	0.500	0 --> 1
	298	1	0.250	0 --> 1
	300	1	0.333	0 --> 1
	301	1	0.250	0 --> 1
	308	1	0.167	0 --> 1
	312	1	0.250	0 --> 1
	315	1	0.500	3 --> 5
	318	1	0.281	1 --> 3
	323	1	0.312	1 --> 0
	324	1	0.333	0 ==> 1
	335	1	0.100	1 --> 0
	360	1	0.667	0 --> 1
	372	1	0.286	2 --> 0
	374	1	0.250	1 --> 0
	386	1	0.143	1 --> 0
	414	1	0.250	1 --> 0
	427	1	0.143	1 --> 0
node_104 --> node_103	25	1	0.167	1 --> 0
	27	1	0.500	2 --> 1
	36	1	0.167	1 --> 0
	50	1	0.500	2 --> 1
	51	1	0.400	2 ==> 1
	55	1	0.333	1 ==> 0
	58	1	0.200	0 ==> 1
	65	1	0.182	1 --> 0
	77	1	0.200	0 --> 1
	97	1	0.333	0 --> 1
	103	1	0.600	0 --> 1
	114	1	0.300	1 --> 0
	120	1	0.250	0 --> 1
	138	1	0.500	1 --> 0
	145	1	0.286	1 --> 0
	159	1	0.333	1 --> 0
	167	1	0.286	1 --> 2
	193	1	0.333	0 --> 1
	201	1	0.333	0 --> 1
	221	1	0.667	3 --> 4
	234	1	0.143	0 --> 1
	237	1	0.200	1 --> 0
	239	1	0.333	1 --> 0
	257	1	0.435	1 --> 0
	281	1	0.429	1 --> 2
	284	1	0.222	1 ==> 0
node_103 --> *Gomphos*	56	1	0.250	1 ==> 0
	256	1	0.333	1 ==> 0
	265	1	0.375	1 ==> 2
	316	1	0.462	4 --> 3
	319	1	0.250	3 --> 2
	331	1	0.118	0 ==> 1
	409	1	0.333	0 ==> 1
	420	1	0.500	0 ==> 1
	431	1	0.333	0 ==> 1
	450	1	0.200	0 ==> 1
node_103 --> *Tribosphenomys*	282	1	0.400	1 ==> 0
	295	1	0.320	3 ==> 4
	296	1	0.367	3 --> 4
	315	1	0.500	5 --> 6
	318	1	0.281	3 --> 4
	322	1	0.333	1 ==> 2
	323	1	0.312	0 --> 1
	333	1	0.200	1 --> 0
	334	1	0.143	1 ==> 0
	360	1	0.667	1 --> (01)
	380	1	0.250	1 ==> 0

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	400	1	1.000	1 --> (01)
	406	1	0.600	0 --> (01)
	407	1	0.750	2 --> (12)
	412	1	0.333	1 ==> 0
	427	1	0.143	0 --> 1
node_104 --> *Dasypus*	38	1	0.143	0 ==> 1
	42	1	0.286	1 ==> 0
	45	1	0.222	2 ==> 1
	47	1	0.167	1 ==> 0
	49	1	0.400	1 ==> 2
	57	1	0.250	1 ==> 0
	64	1	0.400	0 ==> 2
	78	1	0.143	0 ==> 1
	90	1	0.333	0 ==> 1
	92	1	0.333	1 ==> 0
	94	1	0.143	1 ==> 0
	107	1	0.333	0 ==> 1
	113	1	0.375	1 --> 2
	116	1	0.200	1 ==> 0
	118	1	0.167	1 ==> 0
	134	1	0.182	1 ==> 0
	143	1	0.333	1 ==> 2
	168	1	1.000	1 --> (01)
	172	1	0.333	1 ==> 0
	227	1	0.385	0 ==> 3
	229	1	0.300	1 ==> 2
	238	1	0.143	0 ==> 1
	241	1	0.222	1 ==> 0
	249	1	1.000	0 ==> 1
	257	2	0.435	1 --> (123)
	270	1	0.167	1 ==> 0
	273	1	0.400	1 ==> 0
	274	1	0.333	1 ==> 0
	283	2	0.200	3 ==> (01)
	295	1	0.320	3 ==> 5
	296	1	0.367	3 --> 5
	349	1	0.273	2 ==> 0
	350	1	0.500	0 ==> 1
	432	1	0.333	2 ==> 1
	433	1	0.200	1 ==> 0
	445	1	0.455	3 ==> 5
node_105 --> *Erinaceus*	6	1	0.400	0 --> (01)
	21	1	0.333	2 ==> 1
	35	1	0.250	0 ==> 1
	48	1	0.143	1 --> 0
	78	1	0.143	0 ==> 1
	79	1	0.267	0 --> 1
	104	1	0.200	0 ==> 1
	107	1	0.333	0 ==> 1
	113	1	0.375	1 --> 2
	115	1	0.286	0 --> 2
	116	1	0.200	1 ==> 0
	128	1	0.400	1 --> 2
	148	1	0.167	1 ==> 0
	167	1	0.286	1 ==> 2
	211	1	0.600	2 ==> 1
	212	1	1.000	2 ==> 1
	221	1	0.667	3 ==> 4
	224	1	0.750	2 ==> 3
	229	1	0.300	1 ==> 2
	238	1	0.143	0 ==> 1
	270	1	0.167	1 ==> 0
	279	1	0.143	1 ==> 0
	290	1	0.200	1 ==> 0
	305	1	0.333	1 --> 0
	306	1	0.250	1 --> 0
	307	1	0.500	2 --> 0

	309	1	0.250	0 ==> 1
	315	1	0.500	3 ==> 4
	318	1	0.281	1 ==> 2
	336	1	0.182	2 --> 0
	337	1	0.250	1 ==> 0
	362	1	0.333	1 ==> 0
	363	1	0.200	0 ==> 1
	364	1	0.250	2 ==> 1
	399	1	0.200	1 ==> 0
	402	1	0.167	0 --> 1
	403	1	0.500	1 ==> 0
	406	1	0.600	0 ==> 1
	407	1	0.750	2 ==> 1
	411	1	0.333	2 --> 0
	415	1	0.500	0 ==> 1
	430	1	0.500	0 ==> 1
	431	1	0.333	0 ==> 1
	449	1	0.250	2 --> 1
	450	1	0.200	0 ==> 1
node_107 --> *Ukhaatherium*	15	1	0.125	1 ==> 0
	36	1	0.167	1 --> 0
	98	1	0.286	0 ==> 1
	112	1	0.333	0 ==> 1
	181	1	0.333	1 ==> 0
	199	1	0.286	1 --> (01)
	200	1	0.500	1 --> 0
	226	1	0.333	1 ==> 0
	240	1	0.200	1 ==> 0
	251	1	0.250	1 --> 0
	289	1	0.333	0 ==> 1
	294	1	0.083	0 ==> 1
	320	1	0.500	1 ==> 0
	323	1	0.312	1 ==> 0
	327	1	0.111	0 ==> 1
	335	1	0.100	1 ==> 0
	401	1	0.500	1 ==> 2
node_111 --> *Eomaia*	15	1	0.125	1 ==> 0
	53	1	0.500	1 --> 2
	57	1	0.250	0 ==> 1
	257	1	0.435	1 ==> 0
	259	1	0.250	1 ==> 2
	270	1	0.167	1 ==> 0
	293	1	0.250	0 ==> 1
	324	1	0.333	0 --> 1
	401	1	0.500	1 --> (01)
	402	1	0.167	1 ==> 0
	416	1	0.667	1 --> (01)
	421	1	0.167	1 ==> 0
	432	1	0.333	2 ==> 1
	449	1	0.250	1 ==> 2
node_112 --> *Prokennalestes*	162	1	0.333	0 ==> 1
	165	1	0.500	0 ==> 1
	251	1	0.250	1 --> 0
	267	1	0.600	0 --> (01)
	322	1	0.333	1 --> (12)
	423	1	0.333	0 --> 1
node_113 --> *Juramaia*	283	1	0.200	2 ==> 1
	449	1	0.250	1 ==> 2
node_114 --> *Pappotherium*	372	1	0.286	0 ==> 2
	385	1	0.333	0 --> 1
	404	1	0.333	0 ==> 1
	410	1	0.250	0 ==> 1
node_117 --> *Vincelestes*	32	1	0.250	0 ==> 1
	43	1	0.250	1 ==> 0
	58	1	0.200	0 --> 1
	61	1	0.250	1 ==> 0
	81	1	0.273	0 --> 1

	91	1	0.300	0 ==> 2
	102	1	0.200	2 ==> 1
	106	1	0.400	2 ==> 1
	114	1	0.300	1 --> (01)
	117	1	0.250	1 ==> 0
	129	1	0.500	1 --> 0
	155	1	0.250	1 --> 0
	156	1	0.500	0 ==> 1
	170	1	0.400	2 --> 1
	175	1	0.250	1 ==> 0
	176	1	0.200	1 --> 2
	177	1	0.200	0 --> 1
	225	1	0.333	1 ==> 0
	229	1	0.300	1 ==> 0
	241	1	0.222	0 ==> 1
	261	1	0.250	0 ==> 1
	295	1	0.320	1 ==> 3
	302	1	0.333	1 ==> 0
	315	1	0.500	2 ==> 5
	316	1	0.462	1 --> 4
	318	1	0.281	0 ==> 3
	319	1	0.250	1 ==> 3
	323	1	0.312	1 --> 0
	328	1	0.200	1 ==> 2
	363	1	0.200	2 ==> 1
	368	1	0.333	1 ==> 2
	373	1	0.250	1 ==> 0
	386	1	0.143	1 --> 0
	421	1	0.167	1 ==> 0
node_119 --> *Amphitherium*	374	1	0.250	0 ==> 1
node_121 --> node_120	15	1	0.125	1 --> 0
	37	1	0.286	1 --> 0
	134	1	0.182	0 --> 1
	284	1	0.222	1 ==> 0
	290	1	0.200	1 --> 0
	318	1	0.281	0 --> 1
	321	1	0.167	0 ==> 1
	348	1	0.412	3 ==> 0
	349	1	0.273	0 ==> 1
	359	1	0.500	0 --> 3
	422	1	1.000	1 ==> 0
	434	1	0.333	1 ==> 0
node_120 --> *Henkelotherium*	257	1	0.435	0 ==> 1
	259	1	0.250	1 ==> 0
	262	1	0.222	1 ==> 0
	358	1	0.100	0 ==> 1
node_120 --> *Dryolestes*	28	1	0.125	0 --> 1
	177	1	0.200	0 --> 1
	319	1	0.250	1 ==> 4
	322	1	0.333	1 ==> 0
	323	1	0.312	1 --> 0
	331	1	0.118	0 ==> 1
	417	1	0.333	0 ==> 1
	418	1	1.000	0 ==> 1
	419	1	0.600	0 ==> 1
node_122 --> *Cronopio*	79	1	0.267	2 ==> 0
	89	1	0.250	0 ==> 1
	97	1	0.333	0 ==> 1
	102	1	0.200	2 ==> 0
	136	1	0.333	0 ==> 1
	147	1	0.333	1 ==> 0
	165	1	0.500	0 --> (01)
	175	1	0.250	1 ==> 0
	215	1	0.500	0 --> (03)
	261	1	0.250	0 ==> 1
	269	1	0.200	0 --> 1
	283	1	0.200	3 ==> 1

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	292	1	0.167	0 ==> 1
	296	1	0.367	1 --> 3
	316	1	0.462	0 --> 2
	331	1	0.118	0 ==> 1
	332	1	0.200	0 ==> 1
	333	1	0.200	0 ==> 1
	336	1	0.182	1 ==> 2
	362	1	0.333	0 ==> 1
	364	1	0.250	1 ==> 2
	392	1	0.667	1 ==> 0
	408	1	1.000	0 ==> 1
	417	1	0.333	0 ==> 1
	419	1	0.600	0 ==> 2
node_123 --> *Tinodon*	275	1	0.250	1 ==> 0
	315	1	0.500	0 --> 4
	367	1	0.250	1 ==> 0
	368	1	0.333	1 ==> 2
	386	1	0.143	0 ==> 1
	387	1	0.273	0 ==> 1
	415	1	0.500	0 ==> 1
	446	1	0.462	1 --> 0
node_125 --> node_124	25	1	0.167	0 --> 1
	27	1	0.500	0 ==> 1
	45	1	0.222	1 --> 2
	90	1	0.333	0 --> 1
	108	1	0.100	0 --> 1
	113	1	0.375	0 --> 1
	230	1	0.500	0 --> 1
	232	1	0.300	1 --> 0
	257	1	0.435	0 --> 1
	259	1	0.250	1 ==> 0
	347	1	0.444	3 ==> 0
	348	1	0.412	3 ==> 0
	359	1	0.500	0 --> 3
	397	1	0.500	0 ==> 1
	416	1	0.667	1 ==> 0
	425	1	0.125	0 ==> 1
	426	1	0.167	0 ==> 1
node_124 --> *Akidolestes*	7	1	0.200	1 ==> 0
	38	1	0.143	0 ==> 1
	42	1	0.286	1 ==> 0
	43	1	0.250	1 ==> 0
	48	1	0.143	0 ==> 1
	295	1	0.320	2 --> 1
	296	1	0.367	2 ==> 1
	318	1	0.281	2 --> 0
	326	1	0.200	0 ==> 1
	331	1	0.118	0 ==> 1
	364	1	0.250	1 ==> 2
node_124 --> *Spalacotherium*	283	1	0.200	0 --> 2
	327	1	0.111	1 --> 0
	405	1	0.714	0 ==> 1
	424	1	0.250	0 ==> 1
node_124 --> *Maotherium*	36	1	0.167	0 ==> 1
	176	1	0.200	2 --> 0
	178	1	0.400	2 ==> 1
	257	1	0.435	1 --> 3
	294	1	0.083	0 ==> 1
	315	2	0.500	0 --> (12)
	316	1	0.462	0 --> 3
	318	1	0.281	2 --> (24)
	319	1	0.250	3 --> (34)
	342	1	0.143	0 ==> 1
node_124 --> *Zhangheotherium*	25	1	0.167	1 --> 0
	27	1	0.500	1 --> (01)
	37	1	0.286	1 --> 0
	45	1	0.222	2 --> 1

	57	1	0.250	0 ==> 1
	58	1	0.200	0 --> 1
	60	1	0.400	2 ==> 1
	315	1	0.500	0 --> 1
	318	1	0.281	2 ==> 3
	331	1	0.118	0 ==> 1
	348	1	0.412	0 ==> 1
	368	1	0.333	1 ==> 2
	387	1	0.273	0 ==> 1
node_147 --> node_130	5	1	0.333	0 --> 1
	6	1	0.400	0 --> 1
	11	1	0.250	1 --> 0
	12	1	0.400	1 --> 0
	13	1	0.286	1 --> 0
	14	1	0.375	2 --> 0
	15	1	0.125	1 --> 0
	17	1	0.333	1 --> 0
	19	1	0.250	1 --> 0
	21	1	0.333	1 --> 0
	22	1	0.333	1 --> 0
	36	1	0.167	0 --> 1
	37	1	0.286	0 --> 1
	38	1	0.143	0 --> 1
	45	1	0.222	1 --> 2
	47	1	0.167	0 --> 1
	51	1	0.400	1 --> 0
	75	1	0.400	1 --> 0
	77	1	0.200	1 --> 0
	79	1	0.267	2 --> 0
	80	1	0.167	0 --> 1
	81	1	0.273	0 --> 1
	85	1	0.333	1 --> 0
	89	1	0.250	0 --> 1
	91	1	0.300	0 --> 2
	92	1	0.333	0 --> 2
	97	1	0.333	0 --> 1
	110	1	0.333	0 --> 1
	111	1	1.000	1 --> 2
	118	1	0.167	0 --> 1
	124	1	0.333	0 --> 1
	131	1	0.200	1 --> 0
	134	1	0.182	2 --> 1
	142	1	0.286	0 --> 1
	146	1	0.250	1 --> 0
	153	1	0.429	1 --> 2
	165	1	0.500	0 --> 1
	167	1	0.286	1 --> 0
	192	1	0.333	1 --> 0
	194	1	0.333	0 --> 1
	197	1	0.333	1 --> 0
	198	1	0.200	1 --> 0
	201	1	0.333	0 --> 1
	202	1	1.000	0 --> 1
	203	1	0.333	0 --> 1
	206	1	0.333	0 --> 1
	207	1	0.556	0 --> 2
	209	1	0.500	1 --> 0
	222	1	0.500	0 --> 2
	229	1	0.300	1 --> 2
	232	1	0.300	1 --> 0
	233	1	0.333	1 --> 0
	234	1	0.143	0 --> 1
	241	1	0.222	0 --> 1
	242	1	0.500	1 --> 2
	244	1	0.400	1 --> 2
	246	1	0.333	0 --> 1
	257	1	0.435	0 --> 2

	261	1	0.250	0 --> 1
	264	1	0.375	0 ==> 1
	265	1	0.375	0 --> 2
	267	1	0.600	0 --> 1
	272	1	0.500	1 ==> 0
	279	1	0.143	1 ==> 0
	280	1	0.111	0 ==> 1
	282	1	0.400	0 ==> 1
	284	1	0.222	0 ==> 1
	295	1	0.320	2 --> 5
	296	1	0.367	2 --> 5
	308	1	0.167	0 --> 1
	312	1	0.250	0 --> 1
	316	1	0.462	1 --> 5
	318	1	0.281	2 --> 0
	323	1	0.312	0 --> 1
	324	1	0.333	1 --> 0
	338	1	0.500	0 ==> 1
	342	1	0.143	0 ==> 1
	348	1	0.412	3 --> 4
	349	1	0.273	1 --> 0
	358	1	0.100	1 ==> 0
	364	1	0.250	0 ==> 2
	370	1	0.500	0 ==> 1
	371	1	0.500	0 ==> 1
	372	1	0.286	0 --> 1
	373	1	0.250	0 ==> 1
	375	1	0.667	0 --> 1
	380	1	0.250	0 --> 1
	382	1	0.333	0 --> 2
	384	1	0.500	0 --> 3
	387	1	0.273	0 ==> 1
	390	1	1.000	0 --> 1
	391	1	0.286	1 ==> 0
	410	1	0.250	0 --> 1
	411	1	0.333	0 --> 2
	432	1	0.333	1 --> 3
	433	1	0.200	0 --> 1
	434	1	0.333	1 --> 0
	441	1	0.250	1 --> 0
	442	1	0.222	1 --> 2
	443	1	0.286	0 --> 1
	445	1	0.455	2 ==> 3
	449	1	0.250	0 --> 2
	450	1	0.200	0 --> 1
node_130 --> node_126	262	1	0.222	0 --> 1
	275	1	0.250	1 ==> 0
	332	1	0.200	0 ==> 1
	333	1	0.200	0 ==> 1
	363	1	0.200	1 ==> 0
	372	1	0.286	1 --> 2
	377	1	0.333	0 ==> 1
	381	1	0.333	0 ==> 1
	446	1	0.462	0 ==> 1
	452	1	1.000	0 ==> 1
node_126 --> *Ausktribosphenos*	261	1	0.250	1 --> 0
	269	1	0.200	1 ==> 0
node_126 --> *Bishops*	283	1	0.200	2 ==> 3
	315	1	0.500	1 --> (01)
	339	1	0.125	1 --> 0
	364	1	0.250	2 ==> 1
node_130 --> node_129	278	1	1.000	0 ==> 1
	315	1	0.500	1 --> 5
	318	1	0.281	0 --> 3
	335	1	0.100	1 --> 0
	336	1	0.182	1 --> 0
	366	1	0.222	1 ==> 2

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	376	1	1.000	0 ==> 1
	385	1	0.333	0 --> 1
	388	1	0.333	1 ==> 0
	389	1	0.333	0 ==> 1
node_129 --> node_127	362	1	0.333	0 ==> 1
	367	1	0.250	1 ==> 0
node_127 --> *Teinolophos*	362	1	0.333	1 --> (12)
	385	1	0.333	1 --> 0
node_129 --> node_128	265	1	0.375	2 --> 0
	267	1	0.600	1 --> 0
	277	1	0.444	0 ==> 1
	360	1	0.667	0 ==> 1
	392	1	0.667	1 ==> 2
node_128 --> *Obdurodon*	94	1	0.143	0 --> 1
	132	1	0.250	0 ==> 1
	265	1	0.375	0 --> 3
	441	1	0.250	0 --> 2
	446	1	0.462	0 --> (02)
node_128 --> *Ornithorhynchus*	82	1	0.333	1 ==> 0
	84	1	0.500	1 ==> 0
	264	1	0.375	1 --> (01)
	315	1	0.500	5 --> 7
	316	1	0.462	5 --> 6
	318	1	0.281	3 --> 4
	319	1	0.250	3 ==> 4
	347	1	0.444	3 ==> 4
	373	1	0.250	1 ==> 0
	387	1	0.273	1 ==> 0
	446	1	0.462	0 --> (02)
node_147 --> node_132	7	1	0.200	1 --> 0
	23	1	0.250	0 --> 1
	29	1	0.500	0 --> 1
	48	1	0.143	0 --> 1
	67	1	0.400	2 --> 1
	75	1	0.400	1 --> 0
	88	1	0.333	1 --> 2
	90	1	0.333	0 --> 1
	105	1	0.143	0 --> 1
	106	1	0.400	2 --> 1
	108	1	0.100	0 --> 1
	114	1	0.300	1 --> 0
	118	1	0.167	0 --> 1
	126	1	0.455	2 --> 1
	143	1	0.333	2 --> 1
	176	1	0.200	2 --> 1
	182	1	0.400	1 --> 2
	190	1	0.200	1 --> 0
	195	1	0.500	0 --> 1
	227	1	0.385	1 --> 0
	232	1	0.300	1 --> 0
	240	1	0.200	1 --> 0
	257	1	0.435	0 --> 2
	259	1	0.250	1 --> 0
	284	1	0.222	0 ==> 1
	287	1	0.333	1 --> 0
	290	1	0.200	1 --> 0
	295	1	0.320	2 --> 3
	303	1	0.167	0 --> 1
	313	1	0.250	0 --> 1
	318	1	0.281	2 --> 1
	321	1	0.167	0 --> 1
	327	1	0.111	1 --> 0
	337	1	0.250	1 ==> 0
	339	1	0.125	1 --> 0
	343	1	0.600	1 --> 2
	347	1	0.444	3 ==> 1
	348	1	0.412	3 --> 2

	365	1	0.333	1 --> 0
	366	1	0.222	1 ==> 0
	368	1	0.333	1 ==> 0
	369	1	0.333	0 --> 1
	386	1	0.143	0 ==> 1
	405	1	0.714	0 --> 2
	414	1	0.250	1 --> 0
	429	1	0.500	0 --> 1
	447	1	0.333	1 --> 0
node_132 --> node_131	283	1	0.200	2 ==> 1
	315	1	0.500	1 --> 3
	328	1	0.200	1 ==> 2
	335	1	0.100	1 ==> 0
node_131 --> *Gobiconodon*	257	1	0.435	2 --> 3
	259	1	0.250	0 --> 2
	277	1	0.444	0 --> (01)
	295	1	0.320	3 --> 4
	296	1	0.367	2 --> 3
	315	2	0.500	3 --> (123)
	316	1	0.462	1 --> (01)
	318	1	0.281	1 --> (12)
	319	1	0.250	3 ==> 1
	323	1	0.312	0 ==> 3
	326	1	0.200	0 ==> 2
	343	1	0.600	2 --> (12)
	347	1	0.444	1 --> (12)
	348	1	0.412	2 --> (12)
node_131 --> *Repenomamus*	6	1	0.400	0 ==> 1
	27	1	0.500	0 ==> 1
	63	1	0.200	1 --> 0
	78	1	0.143	1 ==> 0
	229	1	0.300	1 --> (01)
	316	1	0.462	1 --> 3
	318	1	0.281	1 ==> 3
	333	1	0.200	0 ==> 1
	391	1	0.286	1 ==> 0
node_132 --> *Amphilestes*	262	1	0.222	0 ==> 1
node_147 --> node_135	2	1	0.333	1 --> 0
	3	1	0.500	1 --> 0
	6	1	0.400	0 --> 1
	7	1	0.200	1 --> 0
	23	1	0.250	0 --> 1
	29	1	0.500	0 ==> 1
	31	1	0.333	0 ==> 1
	60	1	0.400	1 --> 0
	61	1	0.250	1 --> 0
	63	1	0.200	1 --> 0
	65	1	0.182	1 --> 0
	68	1	0.429	0 --> 1
	77	1	0.200	1 --> 0
	79	1	0.267	2 --> 1
	80	1	0.167	0 ==> 1
	102	1	0.200	2 --> 0
	104	1	0.200	0 --> 1
	155	1	0.250	1 --> 0
	169	1	0.400	0 --> 1
	176	1	0.200	2 --> 1
	190	1	0.200	1 --> 0
	196	1	0.167	0 --> 1
	220	1	0.500	1 --> 0
	237	1	0.200	1 --> 0
	257	1	0.435	0 --> 1
	277	1	0.444	0 --> 1
	285	1	0.400	1 ==> 0
	295	1	0.320	2 --> 3
	296	1	0.367	2 --> 1
	309	1	0.250	1 --> 0

	315	1	0.500	1 --> 3
	316	1	0.462	1 --> 2
	327	1	0.111	1 --> 0
	349	1	0.273	1 --> 0
	359	1	0.500	0 --> 2
	365	1	0.333	1 --> 0
	366	1	0.222	1 ==> 0
	368	1	0.333	1 ==> 0
	369	1	0.333	0 --> 1
	385	1	0.333	0 ==> 1
	414	1	0.250	1 --> 0
	429	1	0.500	0 ==> 1
	445	1	0.455	2 --> 1
	447	1	0.333	1 --> 0
	448	1	0.500	1 --> 0
node_135 --> node_133	88	1	0.333	1 --> 2
	315	1	0.500	3 --> 4
	316	1	0.462	2 --> 4
	318	1	0.281	2 --> 3
	337	1	0.250	1 ==> 0
	391	1	0.286	1 ==> 0
	427	1	0.143	1 ==> 0
node_133 --> *Yanoconodon*	51	1	0.400	1 ==> 0
	296	1	0.367	1 --> 3
	315	1	0.500	4 --> 5
	335	1	0.100	1 ==> 0
	336	1	0.182	1 ==> 0
	428	1	0.143	0 ==> 1
node_133 --> *Jeholodens*	153	1	0.429	1 --> (01)
	295	1	0.320	3 --> 1
	347	1	0.444	3 ==> 2
	405	1	0.714	0 --> (02)
	445	1	0.455	1 --> 2
node_135 --> node_134	281	1	0.429	1 ==> 2
	291	1	0.286	0 ==> 1
	310	1	0.200	0 --> 1
	319	1	0.250	3 --> 1
	321	1	0.167	0 ==> 1
	331	1	0.118	0 ==> 1
	334	1	0.143	1 ==> 0
	397	1	0.500	0 ==> 1
	411	1	0.333	0 ==> 2
node_134 --> *Priacodon*	200	1	0.500	0 ==> 2
	284	1	0.222	0 ==> 1
	294	1	0.083	0 ==> 1
	319	1	0.250	1 --> 2
	335	1	0.100	1 ==> 0
	336	1	0.182	1 ==> 2
	347	1	0.444	3 ==> 2
	348	1	0.412	3 ==> 2
node_134 --> *Trioracodon*	295	1	0.320	3 --> 2
	318	1	0.281	2 --> 1
	326	1	0.200	0 ==> 1
	385	1	0.333	1 --> (01)
node_147 --> node_146	1	1	0.333	0 --> 1
	14	1	0.375	2 --> 1
	16	1	0.400	1 --> 0
	24	1	0.500	0 --> 1
	28	1	0.125	1 --> 0
	33	1	0.333	0 --> 1
	38	1	0.143	0 --> 1
	40	1	0.500	0 --> 1
	41	1	0.333	0 --> 1
	43	1	0.250	0 --> 1
	45	1	0.222	1 --> 2
	47	1	0.167	0 --> 1
	55	1	0.333	0 --> 1

	62	1	0.500	0 --> 1
	65	1	0.182	1 --> 0
	68	1	0.429	0 --> 1
	70	1	0.333	0 --> 1
	71	1	0.667	1 --> 0
	73	1	0.500	0 --> 1
	79	1	0.267	2 --> 0
	81	1	0.273	0 --> 1
	82	1	0.333	1 --> 0
	83	1	0.200	1 --> 0
	92	1	0.333	0 --> 1
	93	1	0.667	0 --> 1
	94	1	0.143	0 --> 1
	102	1	0.200	2 --> 0
	110	1	0.333	0 --> 1
	115	1	0.286	2 --> 1
	127	1	0.333	0 --> 1
	132	1	0.250	0 --> 1
	134	1	0.182	2 --> 1
	135	1	0.500	0 --> 1
	141	1	0.667	0 --> 1
	144	1	0.333	0 --> 1
	161	1	0.250	0 --> 1
	167	1	0.286	1 --> 2
	179	1	0.500	0 --> 1
	185	1	0.143	0 --> 1
	188	1	0.333	0 --> 1
	191	1	0.286	0 --> 1
	200	1	0.500	0 --> 2
	204	1	1.000	1 --> 0
	207	1	0.556	0 --> 2
	222	1	0.500	0 --> 1
	223	1	0.500	0 --> 1
	225	1	0.333	0 --> 1
	227	1	0.385	1 --> 0
	231	1	0.556	1 --> 2
	240	1	0.200	1 --> 0
	271	1	1.000	0 --> 1
	281	1	0.429	1 --> 2
	283	1	0.200	2 --> 0
	285	1	0.400	1 ==> 0
	293	1	0.250	0 ==> 1
	305	1	0.333	0 ==> 1
	307	1	0.500	0 --> 2
	308	1	0.167	0 --> 1
	311	1	1.000	0 --> 1
	315	1	0.500	1 --> 4
	316	1	0.462	1 --> 2
	319	1	0.250	3 --> 0
	326	1	0.200	0 ==> 1
	340	1	0.250	1 --> 0
	341	1	0.333	0 --> 1
	358	1	0.100	1 ==> 0
	391	1	0.286	1 ==> 0
	427	1	0.143	1 ==> 0
	428	1	0.143	0 ==> 1
	444	1	0.200	0 --> 1
	445	1	0.455	2 ==> 4
	446	1	0.462	0 --> 3
node_146 --> node_145	253	1	0.333	0 --> 1
	255	1	0.250	1 ==> 0
	261	1	0.250	0 ==> 1
	283	1	0.200	0 --> 1
	295	1	0.320	2 --> 4
	298	1	0.250	0 ==> 1
	302	1	0.333	1 ==> 0
	312	1	0.250	0 ==> 1

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	317	1	1.000	0 ==> 1
	331	1	0.118	0 --> 1
	333	1	0.200	0 ==> 2
	347	1	0.444	3 ==> 4
	348	1	0.412	3 ==> 4
	446	1	0.462	3 --> 4
node_145 --> node_139	33	1	0.333	1 --> 0
	38	1	0.143	1 --> 0
	45	1	0.222	2 --> 1
	47	1	0.167	1 --> 0
	61	1	0.250	1 --> 0
	67	1	0.400	2 --> 1
	68	1	0.429	1 --> 0
	69	1	0.500	0 --> 1
	70	1	0.333	1 --> 0
	83	1	0.200	0 --> 1
	89	1	0.250	0 --> 1
	92	1	0.333	1 --> 0
	98	1	0.286	0 --> 1
	99	1	0.667	0 --> 1
	107	1	0.333	0 --> 1
	110	1	0.333	1 --> 0
	112	1	0.333	1 --> 0
	113	1	0.375	2 --> 1
	114	1	0.300	1 --> 2
	115	1	0.286	1 --> 2
	126	1	0.455	2 --> 0
	127	1	0.333	1 --> 0
	137	1	1.000	0 --> 1
	141	1	0.667	1 --> 2
	143	1	0.333	2 --> 0
	147	1	0.333	1 --> 0
	148	1	0.167	1 --> 0
	151	1	0.500	2 --> 1
	156	1	0.500	0 --> 1
	157	1	0.500	0 --> 1
	158	1	0.500	0 --> 1
	159	1	0.333	0 --> 1
	160	1	0.500	0 --> 1
	163	1	0.333	0 --> 1
	169	1	0.400	0 --> 1
	172	1	0.333	0 --> 1
	185	1	0.143	1 --> 0
	201	1	0.333	0 --> 1
	207	1	0.556	2 --> 3
	227	1	0.385	0 --> 2
	229	1	0.300	1 --> 0
	235	1	0.200	1 --> 0
	236	1	0.500	1 --> 0
	239	1	0.333	1 --> 0
	243	1	1.000	1 --> 0
	244	1	0.400	1 --> 0
	250	1	0.333	0 --> 1
	264	1	0.375	0 --> 1
	272	1	0.500	1 --> 0
	296	1	0.367	2 ==> 3
	297	1	0.500	0 --> 1
	300	1	0.333	0 --> 1
	315	1	0.500	4 ==> 7
	316	1	0.462	2 --> 4
	318	1	0.281	2 --> 3
	319	1	0.250	0 --> 2
	324	1	0.333	1 ==> 0
	326	1	0.200	1 --> 2
	328	1	0.200	1 --> 2
	345	1	0.500	0 --> 1
	392	1	0.667	1 ==> 0

	395	1	0.400	1 --> 4
	432	1	0.333	1 ==> 0
	435	1	0.500	0 --> 2
	442	1	0.222	1 --> 0
	443	1	0.286	0 --> 1
node_139 --> node_138	261	1	0.250	1 --> 2
	306	1	0.250	0 ==> 1
	339	1	0.125	1 ==> 0
	344	1	0.333	0 --> 1
	353	1	1.000	0 ==> 1
	355	1	1.000	0 ==> 1
node_138 --> *Feruglіotherium* B	317	1	1.000	1 ==> 4
	331	1	0.118	1 --> 2
	443	1	0.286	1 --> 2
node_138 --> node_137	315	1	0.500	7 --> 6
	333	1	0.200	2 --> 1
	343	1	0.600	1 --> 2
	445	1	0.455	4 ==> 5
node_137 --> node_136	350	1	0.500	0 ==> 1
	351	1	1.000	0 ==> 1
node_136 --> *Bharattherium*	357	1	0.500	0 ==> 1
	442	1	0.222	0 ==> 2
node_136 --> *Gondwanatherium*	318	1	0.281	3 --> 5
	443	1	0.286	1 --> 0
node_136 --> *Lavanify*	354	1	0.500	0 ==> 1
	357	1	0.500	0 ==> 1
	442	1	0.222	0 ==> 2
node_136 --> *Sudamerica* B	258	1	0.400	1 ==> 2
	352	1	1.000	1 ==> 0
	354	1	0.500	0 ==> 1
	356	1	1.000	0 --> (01)
	443	1	0.286	1 --> 0
node_136 --> Tanzanian taxon B	307	1	0.500	2 ==> 1
	347	1	0.444	4 ==> 2
node_136 --> *Greniodon*	356	1	1.000	0 ==> 1
	441	1	0.250	1 --> (12)
	443	1	0.286	1 ==> 2
node_136 --> *Vintana* B	432	1	0.333	0 ==> 3
	441	1	0.250	1 ==> 2
	442	1	0.222	0 ==> 2
	446	1	0.462	4 ==> 5
	453	1	1.000	0 ==> 1
node_139 --> *Arboroharamiya*	275	1	0.250	1 ==> 0
	276	1	0.167	1 ==> 0
	296	1	0.367	3 --> (34)
	316	1	0.462	4 --> 5
	318	1	0.281	3 --> 4
	319	1	0.250	2 --> 3
	333	1	0.200	2 ==> 0
	446	1	0.462	4 ==> 3
node_145 --> Guimarota Paulchoffatidae	76	1	0.200	1 ==> 0
	78	1	0.143	1 ==> 0
	81	1	0.273	1 --> (01)
	96	1	0.500	1 ==> 0
	115	1	0.286	1 --> (01)
	131	1	0.200	1 ==> 0
	139	1	0.333	0 ==> 1
	161	1	0.250	1 --> 0
	188	1	0.333	1 --> 0
	195	1	0.500	0 --> (01)
	228	1	0.500	0 ==> 1
	231	1	0.556	2 --> 1
	253	1	0.333	1 --> 0
	255	1	0.250	0 ==> 1
	269	1	0.200	1 ==> 0
	275	1	0.250	1 ==> 0
	284	1	0.222	0 ==> 1

	285	1	0.400	0 --> (01)
	289	1	0.333	1 --> (01)
	290	1	0.200	1 --> (01)
	291	1	0.286	0 --> (01)
	308	1	0.167	1 ==> 0
	316	1	0.462	2 --> (23)
	317	1	1.000	1 --> (01)
	318	1	0.281	2 --> (12)
	319	1	0.250	0 --> (01)
	329	1	1.000	1 ==> 0
	340	1	0.250	0 --> 1
	396	1	0.500	2 ==> 0
	441	1	0.250	1 ==> 0
node_145 --> Plagiaulacidae	259	1	0.250	1 ==> 0
	298	1	0.250	1 ==> 0
	315	1	0.500	4 --> (45)
	318	1	0.281	2 --> (12)
	322	1	0.333	1 ==> 0
	331	1	0.118	1 --> 2
	340	1	0.250	0 --> 1
	346	1	0.200	0 ==> 1
	395	1	0.400	1 ==> 0
	437	1	0.333	0 ==> 1
	438	1	0.500	1 ==> 0
	441	1	0.250	1 ==> 0
node_145 --> node_143	2	1	0.333	1 --> 0
	21	1	0.333	1 ==> 2
	35	1	0.250	0 --> 1
	37	1	0.286	0 ==> 1
	42	1	0.286	0 ==> 1
	48	1	0.143	0 ==> 1
	49	1	0.400	0 ==> 1
	59	1	0.333	1 --> 0
	60	1	0.400	1 --> 2
	63	1	0.200	1 --> 0
	82	1	0.333	0 --> 1
	88	1	0.333	1 ==> 2
	100	1	0.333	0 --> 1
	108	1	0.100	0 --> 1
	109	1	1.000	0 ==> 1
	116	1	0.200	1 ==> 0
	117	1	0.250	1 --> 0
	124	1	0.333	0 ==> 1
	126	1	0.455	2 ==> 1
	155	1	0.250	1 --> 0
	170	1	0.400	1 ==> 2
	174	1	1.000	1 ==> 2
	186	1	0.200	0 --> 1
	193	1	0.333	0 --> 1
	196	1	0.167	0 ==> 1
	215	1	0.500	1 --> 2
	225	1	0.333	1 --> 2
	232	1	0.300	1 ==> 2
	280	1	0.111	0 ==> 1
	296	1	0.367	2 ==> 3
	301	1	0.250	0 --> 1
	302	1	0.333	0 ==> 1
	306	1	0.250	0 --> 1
	315	1	0.500	4 ==> 6
	316	1	0.462	2 ==> 3
	318	1	0.281	2 ==> 3
	319	1	0.250	0 ==> 1
	322	1	0.333	1 ==> 2
	323	1	0.312	0 --> 2
	325	1	1.000	0 ==> 1
	328	1	0.200	1 ==> 2
	330	1	1.000	0 ==> 1

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	331	1	0.118	1 --> 0
	344	1	0.333	0 ==> 1
	346	1	0.200	0 --> 1
	395	1	0.400	1 --> 4
	435	1	0.500	0 ==> 2
	437	1	0.333	0 ==> 1
node_143 --> *Ptilodus*	19	1	0.250	1 ==> 0
	44	1	0.333	0 ==> 1
	52	1	0.500	0 ==> 1
	79	1	0.267	0 ==> 2
	80	1	0.167	0 ==> 1
	83	1	0.200	0 ==> 1
	97	1	0.333	0 ==> 2
	104	1	0.200	0 ==> 1
	108	1	0.100	1 --> 0
	118	1	0.167	0 ==> 1
	193	1	0.333	1 --> 0
	207	1	0.556	2 --> 0
	301	1	0.250	1 --> 0
	306	1	0.250	1 --> 0
	322	1	0.333	2 ==> 0
	323	1	0.312	2 --> 0
	325	1	1.000	1 ==> 3
	331	1	0.118	0 --> 2
	341	1	0.333	1 ==> 0
	345	1	0.500	0 ==> 2
	441	1	0.250	1 ==> 2
node_143 --> node_140	28	1	0.125	0 --> 1
	64	1	0.400	0 ==> 1
	66	1	0.500	0 ==> 1
	82	1	0.333	1 --> 2
	92	1	0.333	1 --> 2
	97	1	0.333	0 ==> 1
	100	1	0.333	1 --> 0
	115	1	0.286	1 ==> 2
	131	1	0.200	1 ==> 0
	134	1	0.182	1 ==> 0
	141	1	0.667	1 --> 0
	142	1	0.286	0 --> 1
	161	1	0.250	1 --> 0
	176	1	0.200	2 --> 1
	185	1	0.143	1 --> 0
	186	1	0.200	1 --> 0
	225	1	0.333	2 --> 0
	228	1	0.500	0 ==> 1
	250	1	0.333	0 --> 1
	279	1	0.143	1 ==> 0
	281	1	0.429	2 ==> 1
	282	1	0.400	0 --> 1
	283	1	0.200	1 ==> 2
	315	1	0.500	6 ==> 7
	316	1	0.462	3 ==> 6
	318	1	0.281	3 ==> 4
	319	1	0.250	1 ==> 4
	339	1	0.125	1 ==> 0
	346	1	0.200	1 --> 0
	432	1	0.333	1 --> 3
	438	1	0.500	1 ==> 2
node_140 --> *Taeniolabis*	15	1	0.125	1 --> 0
	81	1	0.273	1 ==> 0
	114	1	0.300	1 ==> 0
	121	1	0.667	0 ==> 1
	235	1	0.200	1 ==> 0
	259	1	0.250	1 ==> 0
	282	1	0.400	1 --> (01)
	436	1	0.600	0 ==> 2
node_140 --> *Lambdopsalis*	23	1	0.250	0 ==> 1

	229	1	0.300	1 ==> 2
	303	1	0.167	0 ==> 1
	323	1	0.312	2 --> 3
	324	1	0.333	1 ==> 2
	325	1	1.000	1 ==> 2
	343	1	0.600	1 ==> 2
	395	1	0.400	4 --> 3
node_143 --> node_142	76	1	0.200	1 --> 0
	78	1	0.143	1 ==> 0
	89	1	0.250	0 ==> 1
	101	1	0.333	0 ==> 1
	105	1	0.143	0 ==> 1
	121	1	0.667	0 ==> 1
	122	1	0.333	0 ==> 1
	195	1	0.500	0 --> 2
	198	1	0.200	1 ==> 0
	206	1	0.333	0 ==> 1
	227	1	0.385	0 --> 1
	229	1	0.300	1 ==> 2
	234	1	0.143	0 ==> 1
	244	1	0.400	1 --> 2
	255	1	0.250	0 --> 1
	299	1	1.000	0 ==> 1
	395	1	0.400	4 --> 1
	396	1	0.500	2 ==> 1
	435	1	0.500	2 --> 1
node_142 --> node_141	64	1	0.400	0 ==> 2
	65	1	0.182	0 ==> 1
	66	1	0.500	0 ==> 1
	79	1	0.267	0 ==> 2
	118	1	0.167	0 ==> 1
	120	1	0.250	0 ==> 1
	165	1	0.500	0 --> 1
	238	1	0.143	1 --> 0
	255	1	0.250	1 --> 0
	323	1	0.312	2 --> 1
node_141 --> *Kryptobaatar*	152	1	0.250	1 ==> 0
	191	1	0.286	1 ==> 0
	198	1	0.200	0 ==> 1
	234	1	0.143	1 ==> 0
	322	1	0.333	2 ==> 1
	331	1	0.118	0 ==> 1
	343	1	0.600	1 ==> 0
	345	1	0.500	0 ==> 1
	396	1	0.500	1 --> (12)
node_141 --> *Catopsbaatar*	37	1	0.286	1 ==> 0
	44	1	0.333	0 ==> 1
	46	1	0.500	0 ==> 1
	53	1	0.500	0 ==> 1
	54	1	0.500	0 ==> 1
	88	1	0.333	2 --> (12)
	98	1	0.286	0 ==> 1
	105	1	0.143	1 ==> 0
	114	1	0.300	1 ==> 0
	192	1	0.333	1 ==> 0
	258	1	0.400	1 ==> 2
	316	1	0.462	3 ==> 4
	319	1	0.250	1 ==> 2
	323	1	0.312	1 --> 3
	346	1	0.200	1 ==> 0
	395	1	0.400	1 ==> 2
	438	1	0.500	1 ==> 2
node_142 --> *Chulsanbaatar*	102	1	0.200	0 ==> 1
	258	1	0.400	1 ==> 2
	349	1	0.273	1 --> (12)
	439	1	0.500	1 ==> 0
node_142 --> *Nemegtbaatar*	25	1	0.167	0 ==> 1

	82	1	0.333	1 ==> 2
	83	1	0.200	0 ==> 1
	94	1	0.143	1 ==> 0
	104	1	0.200	0 ==> 1
	116	1	0.200	0 ==> 1
	139	1	0.333	0 ==> 1
	225	1	0.333	2 ==> 1
	231	1	0.556	2 ==> 1
	395	1	0.400	1 ==> 3
	435	1	0.500	1 --> 2
	438	1	0.500	1 ==> 2
node_145 --> *Thomasia*	322	1	0.333	1 ==> 2
	333	1	0.200	2 ==> 0
	339	1	0.125	1 ==> 0
	432	1	0.333	1 --> (12)
	446	1	0.462	4 ==> 3
node_145 --> node_144	4	1	0.500	0 ==> 1
	5	1	0.333	0 ==> 1
	15	1	0.125	1 --> 0
	27	1	0.500	0 --> 2
	31	1	0.333	0 ==> 1
	90	1	0.333	0 --> 1
	100	1	0.333	0 --> 1
	101	1	0.333	0 --> 1
	134	1	0.182	1 --> 2
	253	1	0.333	1 --> 0
	270	1	0.167	1 ==> 0
	272	1	0.500	1 --> 2
	280	1	0.111	0 ==> 1
	307	1	0.500	2 ==> 1
	331	1	0.118	1 --> 2
	341	1	0.333	1 --> 0
	349	1	0.273	1 --> 0
	396	1	0.500	2 --> 0
	435	1	0.500	0 --> 1
	439	1	0.500	1 --> 0
node_144 --> *Rugosodon*	289	1	0.333	1 ==> 0
	290	1	0.200	1 ==> 0
	298	1	0.250	1 ==> 0
	308	1	0.167	1 ==> 0
	318	1	0.281	2 --> 1
	322	1	0.333	1 ==> 0
	395	1	0.400	1 ==> 2
	436	1	0.600	0 ==> 1
node_144 --> *Sinobaatar*	37	1	0.286	0 --> (01)
	42	1	0.286	0 ==> 1
	88	1	0.333	1 ==> 2
	315	1	0.500	4 --> 5
	323	1	0.312	0 --> (01)
	344	1	0.333	0 ==> 1
	345	1	0.500	0 ==> 1
	346	1	0.200	0 ==> 1
	396	1	0.500	0 --> 1
	435	1	0.500	1 --> (01)
	437	1	0.333	0 ==> 1
node_146 --> *Haramiyavia*	276	1	0.167	1 ==> 0
	303	1	0.167	0 --> 1
	318	1	0.281	2 --> 0
	328	1	0.200	1 ==> 2
	339	1	0.125	1 --> 0
	349	1	0.273	1 --> 2
	395	1	0.400	1 --> 2
	436	1	0.600	0 ==> 1
node_150 --> *Hadrocodium*	81	1	0.273	1 --> 0
	132	1	0.250	0 ==> 1
	134	1	0.182	2 ==> 0
	136	1	0.333	0 ==> 1

```
                                142            1  0.286  0 ==> 1
                                153            1  0.429  1 ==> 2
                                170            1  0.400  0 ==> 1
                                187            1  0.333  0 ==> 1
                                203            1  0.333  0 ==> 1
                                229            1  0.300  1 ==> 2
                                234            1  0.143  0 ==> 1
                                241            1  0.222  0 ==> 1
                                266            1  0.167  0 --> 1
                                281            1  0.429  1 ==> 0
                                315            1  0.500  0 --> 5
                                316            1  0.462  0 --> 5
                                331            1  0.118  0 ==> 1
                                335            1  0.100  1 ==> 0
                                347            1  0.444  1 ==> 4
                                348            1  0.412  1 ==> 4
node_152 --> Sinoconodon        11             1  0.250  1 --> 0
                                14             1  0.375  1 --> 0
                                72             1  0.500  1 --> 0
                                73             1  0.500  0 ==> 1
                                82             1  0.333  2 ==> 0
                                95             1  0.222  0 ==> 1
                                108            1  0.100  0 ==> 1
                                210            1  0.500  1 --> 0
                                213            1  0.667  2 --> 1
                                287            1  0.333  1 --> 0
                                385            1  0.333  0 --> (01)
                                405            1  0.714  0 --> (01)
                                428            1  0.143  0 ==> 1
node_154 --> Tritheledontids    64             1  0.400  0 --> (01)
                                68             1  0.429  0 --> (01)
                                71             1  0.667  0 --> (01)
                                79             1  0.267  2 ==> 1
                                103            1  0.600  0 --> (01)
                                108            1  0.100  0 ==> 1
                                126            1  0.455  0 --> (01)
                                127            1  0.333  1 --> (01)
                                145            1  0.286  1 ==> 0
                                178            1  0.400  1 --> 0
                                184            1  1.000  1 --> (01)
                                225            1  0.333  0 --> (01)
                                227            1  0.385  3 --> (03)
                                238            1  0.143  1 ==> 0
                                257            1  0.435  0 --> (01)
                                264            1  0.375  1 --> (01)
                                295            1  0.320  2 --> (23)
                                296            2  0.367  2 --> (234)
                                315            1  0.500  3 --> (23)
                                316            1  0.462  2 --> (12)
                                444            1  0.200  0 ==> 1
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