

Supplementary Information

A fast-growing basal troodontid (Dinosauria: Theropoda) from the latest Cretaceous of Europe.

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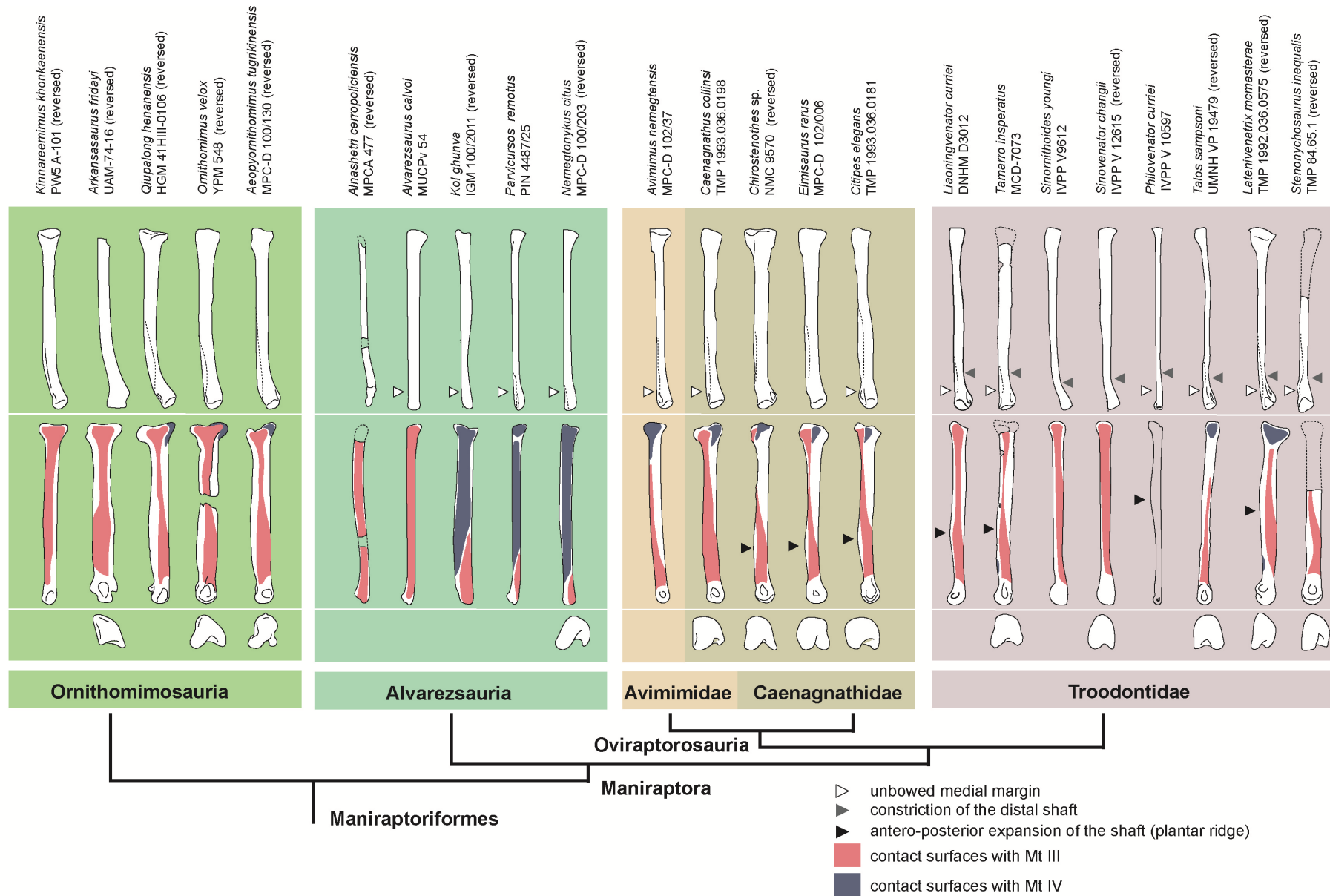
Table S1. Measurements (mm) of the second metatarsal (MCD-7073) of *Tamarro insperatus*. Estimated values are indicated between brackets.

Maximum length of the metatarsal II	10.52 (14.0)
Maximum depth (proximodistal) of the mid-shaft of metatarsal II	8.89
Maximum width (lateromedial) of the mid-shaft of metatarsal II	6.17
Maximum depth of the distal articulation of metatarsal II	9.85
Maximum width of the distal articulation of metatarsal II	9.55

Table S2. Measures (mm) of the length of the second metatarsal in selected Troodontidae taxa used as a proxy of relative body size. Data was primarily extracted from the Theropod Database developed by Mickey Mortimer (www.therpoddatabase.com 11/10/20).

Sub-groups	Taxa	Specimen	MtII length
Sinovenatorinae	<i>Sinovenator changii</i>	IVPP V 12615	77
Sinovenatorinae	<i>Sinovenator changii</i>	IVPP V12583	79
Sinovenatorinae	<i>Mei long</i>	DNHM D2514	42.5
Sinovenatorinae	<i>Mei long</i>	IVPP V12733	51
Jinfengopterigine	<i>Jinfengopteryx elegans</i>	CAGS-IG-04-0801	59
Jinfengopterigine	<i>Liaoningvenator curriei</i>	DNHM D3012	82
Jinfengopterigine	<i>Philovenator curriei</i>	IVPP V10597	94
Jinfengopterigine	Unnamed	IGM 100/1128	71.8
Jinfengopterigine	<i>Tamarro insperatus</i> gen. et sp. nov.	MCD-7073	140
Derived troodontidae	<i>Sinusergianus magnodens</i>	IVPP V11527	93.5
Derived troodontidae	<i>Daliansaurus liaoningensis</i>	DNHM D2885	98.1
Derived troodontidae	<i>Tochisaurus nemegtensis</i>	PIN 551-244	233
Derived troodontidae	<i>Gobivenator mongoliensis</i>	IGM 100/86	145.2
Derived troodontidae	<i>Sinornithoides youngi</i>	IVPP V9612	100.6
Derived troodontidae	<i>Troodon formosus</i>	MOR 748	202.4
Derived troodontidae	<i>Linhevenator tani</i>	LH V0021	120
Derived troodontidae	<i>Talos sampsoni</i>	UMNH VP 19479	158.86

Figure S1. Morphological comparison of the metatarsal II in maniraptoran theropods. Each taxon is represented in dorsal, medial, and distal view. Main anatomical features that allow the taxonomic classification of *Tamarro insperatus gen. et sp. nov.* are indicated for each selected species if present. The arctometatarsalia condition and its variations are illustrated as the spatial configuration of the contact surfaces of Mt III and IV upon the medial surface of Mt II. All silhouettes were created by the authors using Adobe Illustrator CC 2015 2.1.



Supplementary Text 1. Nexus file used in the phylogenetic exploration of *Tamarro insperatus gen. et. sp. nov.* The matrix is based on Hartman et al.

#NEXUS

BEGIN TAXA;

TITLE Taxa;

DIMENSIONS NTAX=502;

TAXLABELS

Dilophosaurus Sinosaurus Cryolophosaurus Tachiraptor Berberosaurus Genyodectes Ceratosaurus
Eoabelisaurus Rugops Rajasaurus Genusaurus Arcovenator Majungasaurus Dahalokely Rahiolisaurus
MCF_PVPH_237 Xenotarsosaurus Ilokelesia Ekrixinatosaurus Skorpiovenator Viavenator Carnotaurus Aucasaurus
Abelisaurus Noasaurus Velocisaurus Masiakasaurus Elaphrosaurus Afromimus Limusaurus Deltadromeus Gualicho
Angeac_taxon Chuandongocoelurus Monolophosaurus Pandoravenator Piatnitzkysaurus Condorraptor Marshosaurus
Poeikilopleuron Duriavenator Megalosaurus Torvosaurus Wiehvenator Dubreuillosaurus Afrovenator Leshansaurus
Eustreptospondylus Cristatusaurus Baryonyx Ichthyovenator Irritator Spinosaurus_sensu_lato Kaijiangosaurus
Erectopus Xuanhanosaurus Yangchuanosaurus Shidaisaurus Metriacanthosaurus Sinraptor_dongi hepingensis
Siamotyrannus MNNGAD_Kryptops_postcran Allosaurus Saurophaganax Neovenator Acrocanthosaurus Labocania
Shaochilong Concavenator Kelmaysisaurus Carcharodontosaurus iguidensis Tyrannotitan Mapusaurus Giganotosaurus
Datanglong Gasosaurus Lourinhanosaurus Chilantaisaurus Fukuiraptor Australovenator Megaraptor Murusraptor
Orkoraptor Aerosteon Kileskus Proceratosaurus Guanlong Mirischia Sinotyrannus Yutyranus Dilong Juratyrant
Xionguanlong Eotyrannus Alectrosaurus Appalachiosaurus Bistahieversor Raptorex Gorgosaurus Alioramus
Tyrannosaurus Coelurus Tanycolagreus Aristosuchus Biceratops Xinjiangovenator Zuolong Zuni Ornitholestes
Sinocalliopteryx Huaxiagnathus Juravenator Aniksosaurus Archaeornithoides Scipionyx Tugulusaurus Sinosauropteryx
Santanaraptor Haplocheirus Compsognathus Scieurumimus NGMC2124 Aorun Naze_dromaeosaur Deinocheirus
Hexing Shenzhousaurus Harpymimus Nedcolbertia Arkansaurus Archaeornithomimus_asiaticus GIN960910KD
Beishanlong Garudimimus Aepyornithomimus Sinornithomimus Ornithomimus Cerro_del_Pueblo_orn Tototlmimus
mongoliensis MNAPI1762A sedens_holotype_only Rativates Struthiomimus Gallimimus bullatus Timimus Anserimimus
Qiupalong Dromiceiomimus Kinnareemimus Fukuivenator Nqwebasaurus Pelecanimimus Patagonykus Xiyunykus
Bonapartenykus Bannykus Alvarezsaurus Achillesaurus Alnashetri Albertonykus Ceratonykus Qiupanykus Albinykus
Xixianykus Linhenykus Heptasteornis Bradycneme Parvicursor Tugrik_parvicursorine Shuvuuia Mononykus
Martharaptor Falcarius Jianchangosaurus Beipiaosaurus Alxasaurus Enigmosaurus zheziangensis Suzhousaurus
Neimongosaurus Erliansaurus Therizinosaurus_minus_hindlimb Nanchao_embryos Nanshiungosaurus_brevispinus
bohlini AMNH6368 Segnosaurus Erlikosaurus Nothronychus_mckinleyi graffami Protarchaeopteryx Similicaudipteryx
Ganzhousaurus Caudipteryx Shanyangosaurus Kol Avimimus Machairasaurus Caenagnathasia_dentaries_only
Hagryphus Apatosauraptor Leptorhynchus_gaddisi Elmisaurus_rarus elegans Chirolestes_sensu_lato Anzu Luoyangia
Incisivosaurus Microvenator Beibelong Gigantoraptor Tongtianlong Oviraptor Banji Yulong Huanansaurus Wulatelong
Corythoraptor NXMV Nomingia Rinchenia Nankangia IVPV9608 IGM10042 Citipati Anomalipes Shixinggia Khaan
Conchoraptor Jiangxisaurus Nemegtomaia Heyuannia yanshini Scansoriopteryx Yi Epidexipteryx Pedopenna Caihong
Serikornis Anchiornis Aurornis Eosinopteryx Ostromia Archaeopteryx Shanag BYU2023 ISMDVP09 Halszkaraptor
Mahakala Ningyuansaurus Austroraptor Buitreraptor Pamparaptor Ornithodesmus Pyroraptor Rahonavis
Unenlagia_sensu_lato Dakotaraptor Mei Xiaotingia Sinovenator Jianianhualong IGM100140 IGM100972_100974 Almas
Jinfengopteryx Liaoningvenator IGM1001128 IGM10044 Daliensaurus Toxosaurus Hesperornithoides Sinusonasus
Xixiasaurus Byronosaurus Sinornithoides IVPV11119 Gobivenator Urbacodon_mandibular_only Geminiraptor
Borogovia Sauroornithoides Zanabazar Troodon_sensu_lato Talos Tamarro_inesperatus Philovenator Linhevenator
Tianyuraptor Zhenyuanlong Acheroraptor Bambiraptor Variraptor Sinornithosaurus Microraptor Zhongjianosaurus
osmolskae NGMC91 Changyuraptor Graciliraptor Yurgovuchia Deinonychus Utahraptor Achillobator Yixianosaurus
Pneumatoraptor Saurornitholestes_langstoni Atrociraptor IGM10022_10023 Itemirus_holotype_only Linheraptor
Tsaagan Dromaeosaurus Hulsanpes IGM100980 Velociraptor_mongoliensis Luanchuanraptor Adasaurus DGBU_78
Zhongornis Hesperonychus_holotype_only Balaur Bauxitornis Sapeornis Zhongjianornis jianchangensis Jeholornis
Jixiangornis Yangavis Eoconfuciusornis Proornis Confuciusornis_sanctus dui chuonzhous Eopteryx Changchengornis
Chongmingia Yandangornis Jinguoortis Wyleyia Protopteryx Paraprotopteryx Orientius Eopengornis Pengornis
Elsornis Ootornis Yungavolucris Noguerosornis Iberomesornis LP_4450_IEI Concornis Cruralispennia Bohaiornis
Parabohaiornis Longsunguis Shenqornis Sulcavis Zhouornis Fortunguavis Dunhuangia Yuanjiawaornis Eoenantiornis
Huoshanornis Grabauornis Jibeinia Hebeiornis Gobipipus Gobipteryx Nanantius Gurilynia Holbotia Evgenavis
Enantiophoenix Parvavis Monoenantiornis chabuensis Junornis Eocathayornis Houornis aberransis
Cathayornis_yandica Sinornis Linyornis Gracilornis Alethoalaornis Cuspirostrisornis Dapingfangornis Largirostrornis
Longchengornis Microenantiornis Piscivorenantiornis Pterygornis Dalingheornis GMV2158 GMV2159 Liaoxiornis
Avisaurus Gettyia Mirarce Soroavisaurus Neuquenornis Intiornis Enantiornis_pectoral_wing_only
Elbretornis_holotype_only Martinavis_cruzyensis vincei saltariensis minor whetstonei Cratoavis Qiliania Feitianus
CAGS_IG_02_0901 CAGS_IG_04_CM_007 CAGS_IG_04_CM_023 Boluochia Longipteryx Shengjingornis
Shanweiniaio Longirostravis Rapaxavis Halimornis Flexomornis Alexornis Xiangornis Eoalulavis Liaoningornis Vorona
Lectavis Hollanda Aberratiodontus Bellulornis Archaeorhynchus Patagopteryx PMO228.582 Hongshanornis
Archaeornithura Jianchangornis Schizooura Chaoyangia Changmaornis guozhangia Changzuornis Yanornis_martini
Yixianornis Songlingornis Tianyuornis Parahongshanornis Longicrusavis Iteravis Gansus Ambitortus Yumenornis
Dingavis Juehuaornis Piscivoravis Mysteriornis Ichthyornis Gargantuavis Potamornis Enaliornis Chupkaornis
Pasquiaornis Bapornis Bmongoliensis baileyi varneri Fumicollis Parahesperornis Hesperornis Horezmavis
Maaqwi Jiuquanornis Eogranivora Qinornis Iaceornis Palintropus Apsaravis Lithornis Palaeotis Limenavis Struthio
Tingmiatornis Chauna Polarornis Vegavis Anatalavis Presbyornis Teviornis Anas Gallinuloides Paraortygoides
Sylviornis Meleagris Cerebavis Foro Columba

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9 N";

CHARSTATELABELS

1 'Primary and secondary remiges - width of leading vane ' /
longer_or_subequal_to_trailing_vane__shorter_than_trailing_vane_,
2 'External naris - posterior extent with maxilla ventral border horizontal ' /
ends_anterior_to_antorbital_fossa__extends_posterior_to_anterior_edge_of_antorbital_fossa_,
3 'Nasal - dorsolateral surface posterior to external naris ' / solid_pneumatized_via_fossae,
4 'Maxilla - lateral surface of antorbital fossa anterior to antorbital fenestra ' / solid_'with small
maxillary fenestra entering maxillary antrum, greatest diameter <15% of orbit+jugal height 'with large maxillary fenestra
15-27% of orbit+jugal height' with large maxillary fenestra >27% of orbit+jugal height',
5 'Maxilla - lateral surface at ventral margin of antorbital fossa ' / fully_visible_laterally_
external_surface_projects_dorsally_to_form_a_lip_that_overlaps_ventral_edge_of_antorbital_fossa_,
6 'Maxilla - anteroposterior position of maxillary fenestra ' / 'close to anterior edge of antorbital
fossa (distance between them <11% of orbit+jugal height)' far from anterior edge of antorbital fossa (>10%)',
7 'Maxilla - lateral surface at anterior margin of antorbital fossa ' / solid_
with_promaxillary_fenestra_entering_promaxillary_recess_,
8 'Orbit - length compared to height ' / '>66%' '<67%',
9 'Postorbital - shape of anterior margin of ventral process ' / with_projecting_orbital_process_
smoothly_curved_or_straight_,
10 'Jugal and postorbital - convexity of posterior edge of postorbital bar ' / 'concave to minimally
convex (0-5% of orbit+jugal height) ' 'strongly convex (>5%)',
11 'Suborbital fenestra - size ' / 'greatest diameter >24% orbital height ' '<25%',
12 'Braincase - separation of anterior tympanic and subotic recesses ' /
separated_by_a_surface_which_is_not_bounded_by_walls_and_depressed__
both_within_a_common_lateral_depression_bounded_on_all_sides_,
13 'Basisphenoid - number of paired large foramina in basisphenoid recess ' / none_
at_least_one_pair_separated_at_midline_,
14 'Opisthotic - lateral extent of interfenestral crest ' / confluent_with_lateral_surface_
depressed_from_lateral_surface_,
15 'Exoccipital - convexity of posterior surface containing vagus (X), accessory (XI) and hypoglossal
(XII) nerve foramina' / flat_to_convex 'concave, forming paracondylar recess',
16 'Basisphenoid - pneumatic invasion of dorsolateral surface of basipterygoid process ' / flat_
excavated_by_an_extension_of_the_anterior_tympanic_recess_,
17 'Basisphenoid - pneumatic invasion of surface ventral to otic recess ' / 'excavated by subotic
recess, an extension of the anterior temporal recess ' flat,
18 'Basioccipital and basisphenoid - position of basisphenoid recess ' /
between_basisphenoid_and_basioccipital_entirely_within_basisphenoid_,
19 'Basisphenoid - pneumatic invasion of ventral surface ' / pneumatic_median_recess_present_
flat_to_convex_,
20 'Parasphenoid - transverse expansion of base of cultriform process ' / 'absent, process rodlike
or vertically platelike ' present,
21 'Basisphenoid - transverse angle of basipterygoid process ' /
less_than_51_degrees_laterally_from_vertical__>50_degrees',
22 'Basisphenoid - length of basipterygoid process ' / '>7% of median occipital condyle height '
'<8% but present' absent,
23 'Basisphenoid - pneumatic invasion of interior of basipterygoid process ' / 'absent, process solid '
'present, process hollow',
24 'Prootic - pneumatic invasion of lateral surface ' / flat_
excavated_by_shallow_depression_for_dorsal_tympanic_recess
excavated_by_posterolaterally_directed_cavity_for_dorsal_tympanic_recess_,
25 'Opisthotic - pneumatic invasion of surface dorsal to interfenestral crest ' / flat_
excavated_by_extension_of_posterior_tympanic_recess_,
26 'Opisthotic - pneumatic invasion of lateral surface of paroccipital process or inside otic recess ' /
flat_excavated_by_main_diverticulum_of_posterior_tympanic_recess_,
27 'Opisthotic - position of main entrance of posterior tympanic recess ' /
on_anterior_surface_of_paroccipital_process_opens_into_otic_recess_,
28 'Premaxilla - length of subnarial process' / does_not_contact_nasal__'contacts nasal, but does
not extend posterior to external naris' extends_posterior_to_external_naris_,
29 'Premaxillae - cross section of combined dorsal process ' /
transversely_compressed_or_not_compressed__dorsoventrally_compressed_,
30 'Premaxillae - angle of symphysis in dorsal or ventral view ' / 'low, so that snout is pointed '
'high, so that snout is rounded ',
31 'Premaxilla - shape of ventral edge ' / smooth_crenulated,
32 'Maxilla - posterior extent of palatal shelf ' / 'anterior edge of choana placed <18% down maxillary
length ' '>17%',
33 'Maxilla - ventral projection of posteromedial portion of palatal shelf ' / absent_'present, forming
'tooth-like" process ',
34 'Jugal - length of dorsal process ' / '>34% of orbit+jugal height, measured from lower edge of
orbit' '<35% ',

35 'Postorbital - length of ventral process ' / 'height of orbit taken up by ventral process / orbital height <80% ' '>79%',

36 'Jugal - cross section of posterior process ' / transversely_compressed__ dorsoventrally_or_not_compressed,

37 'Jugal - pneumatization of anterodorsal surface near antorbital fossa ' / 'present, surface invaded by pneumatic diverticulum of antorbital sinus ' 'absent, surface solid',

38 'Jugal - medial surface below postorbital process ' / penetrated_by_foramen_solid,

39 'Quadratojugal - length of posterior process (defined as area posterior to intersection of ventral edge with line drawn along posterior edge of dorsal process) ' / '<36% of length of rest of quadratojugal ' '>35%',

40 'Quadratojugal - contact with jugal ' / sutured_fused,

41 'Lacrima - projection of dorsal surface ' / unprojected_ 'with lateral ridge or boss projecting dorsally, forming lacrimal horn ',

42 'Lacrima - lateral projection at dorsal edge ' / unprojected_or_minimally_projected__ strongly_projected_.

43 'Lacrima - surface at posterodorsal corner of antorbital fossa ' / solid_ pneumatized_via_foramen,

44 'Lacrima - length of posterior process measured from anterior orbital edge ' / '<15% of ventral process length, measured from internal corner ' '15-30% ' '>30%',

45 'Lacrima - length of anterior process measured from internal corner ' / '<131% of ventral process length, measured from internal corner ' '>130% ',

46 'Prefrontal - size ' / 'large, greatest length >34% of orbit+jugal height ' 'small, <35% of orbit+jugal height ' absent_or_fused_to_another_element,

47 'Nasals and frontals - angle of sutures from median to lateral edge of contact ' / 'anteriorly convex <60 degrees ' 'anteriorly_convex_60_degrees_or_more_to_posteriorly_convex,

48 'Frontal - convexity of supratemporal fossa edge ' / completely_posteriorly_concave_to_straight_with_posteriorly_convex_portion_.

49 'Frontal - shape of orbital margin ' / straight_to_smoothly_curved__ abruptly_angled_at_postorbital_process,

50 'Frontal - shape of anterior edge of nasolacrimal articular surface ' / smooth_ notched_anterolaterally_.

51 'Postorbital - curvature of anterior process ' / decurved_to_straight__upcurved,

52 'Parietals - median proximity of supratemporal fossae ' / 'far, leaving flat dorsal surface between them ' 'close, separated by ridge forming sagittal crest ',

53 'Parietals - median contact ' / sutured_fused,

54 'Squamosal - angle of ventral process ' / '<60 degrees from posterior quadrate edge ' '>59 degrees',

55 'Squamosal - lateral surface ' / smooth_ 'horizontal ridge over ventral process, extends to posterior process ',

56 'Quadratojugal - extent of squamosal contact ' / contacting_ 'non-contacting',

57 'Quadrate - divergence of otic articular surface ' / 'if present, articular surface confluent with shaft and squamosal head ' 'distinct_otic_head_caused_by_intercotylar_incisure,

58 'Quadrate - orientation of posterior edge compared to ventral margin of jugal + quadratojugal ' / 'inside angle <106 degrees ' '>105 degrees ',

59 'Quadrate - width from the paraquadrate foramen medial edge to the lateral edge of the dorsal quadrate ' / '<30% of width across quadrate condyles ' '>29%',

60 'Quadrate - pneumaticity ' / solid_invaded_by_diverticulum_of_the_tympanic_airsac_.

61 'Foramen magnum - dorsoventral elongation ' / transversely_elongate_or_height_and_width_equal_height_greater_than_width_.

62 'Exoccipital and basioccipital - lateral margin of occipital condyle ' / posteromedially_sloped_ constricted_forming_condylar_neck_.

63 'Exoccipital - length of paroccipital process ' / 'height halfway out from lateral edge of occipital condyle / length from lateral edge of occipital condyle to tip of process <71% ' '>70%',

64 'Exoccipital - orientation of paroccipital process ' / 'long axis angled ventrally <41 degrees from horizontal ' '>40 degrees',

65 'Exoccipital - torsion of paroccipital process ' / untwisted_ twisted_so_that_distal_ends_face_posterodorsally,

66 'Ectopterygoid - ventromedial surface ' / flat_excavated_by_a_pneumatic_fossa_.

67 'Ectopterygoid - dorsal surface ' / flat_excavated_by_pneumatic_fossa_.

68 'Pterygoid - size of posterolateral flange anterior to basiptyergoid articulation ' / projects_ventrolaterally_from_element_unprojected,

69 'Palatine - development of jugal process ' / projected_to_form_posterior_concavity_between_it_and_main_palatine_body__unprojected,

70 'Ectopterygoid - palatine contact ' / absent_present,

71 'Dentary - medial curvature of symphyseal region ' / none_low_high,

72 'Surangular - shape of dorsal margin ' / smooth_or_with_small_coronoid_eminence__ with_prominent_coronoid_eminence_.

73 'Dentary - amount of anterior taper ' / 'anterior depth at symphysis <60% of maximum posterior depth ' '>59% ',

74 'Dentary - curvature in lateral view ' / upcurved_straight_downcurved,

75 'Dentary - lateral surface of posterior dentary ' / roughly_flat__with_horizontal_shelf_.

76 'Dentary - length of posterodorsal process ' / absent_ '<8% mandibular length, measured parallel to long axis of mandible ' '>8% mandibular length',

77 'Dentary - position of lateral nutrient foramina ' / on_flat_surface__inside_longitudinal_groove,

78 'Surangular - shape of external mandibular fenestra border ' / straight_to_evenly_convex with_distinct_process_.

79 'Prearticular - concavity of anteroventral margin ' / convex_to_straight_concave,

80 'Surangular - size of posterior foramen ' / absent_small_foramen enlarged_fenestra,
81 'Splenic - lateral exposure ' / absent_or_narrow__ broad,
82 'Coronoid - size' / large_small absent,
83 'Articular - dorsal surface of medial retroarticular process ' / on_level_with_rest_of_element_
projected_dorsally_into_distinct_process_,
84 'Articular - retroarticular process elongation ' / taller_than_long_to_equidimensional_
longer_than_tall_,
85 'Articular - dorsal surface of glenoid ' / concave_to_flat_in_lateral_view__ convex,
86 'Premaxilla - presence of teeth ' / toothed_toothless,
87 'Premaxilla - size of second premaxillary tooth compared to third and fourth premaxillary teeth ' /
smaller_to_equal_in_size_much_larger_,
88 'Maxilla - presence of teeth ' / toothed_toothless,
89 'Lateral teeth - serration extent ' / present_on_mesial_and_distal_carinae__
absent_on_mesial_carinae_but_present_on_distal_carinae_absent_on_mesial_and_distal_carinae_,
90 'Dentary - number of teeth ' / '1-11' '12-24' '25-30' '>30',
91 'Lateral teeth - largest crown height ' / '>15% of orbit + jugal height ' '5-15%' '<5%',
92 'Teeth - serration size ' / '<26 on distal carina ' '>25',
93 'Teeth - distal serration shape ' / symmetrically_rectangular_to_rounded__ hooked_apically,
94 'Teeth - crown root transition ' / 'constricted mesial and/or distal edges '
undifferentiated_mesial_and_distal_edges_,
95 'Dentary teeth - size of anterior teeth ' / smaller_than_posterior_two_thirds_of_teeth 'similar to
posterior third of teeth, leaving teeth in the middle third the largest' larger_than_posterior_two_thirds_of_teeth,
96 'Dentary teeth - difference in spacing between anterior and posterior teeth ' /
anterior_more_widely_spaced_subequal_spacing_anterior_more_closely_spaced_,
97 'Premaxilla, maxilla and dentary - medial bone between teeth ' / 'undifferentiated from
interdental septa and/or main body of element ' forms_distinct_interdental_plates_,
98 'Dorsal vertebrae - separation of postzygapophyses ' / joined_into_median_lamina__
separated_over_neural_canal_,
99 'Premaxillary teeth - convexity of lingual surface ' /
subequally_or_more_convex_compared_to_labial_surface much_flatter_to_concave,
100 'Cervical vertebrae - number ' / ten_or_less_eleven_or_more_,
101 'Cervical vertebrae - posterior extent of epiphyses on axis ' /
does_not_extend_past_postzygapophyses_extend_past_postzygapophyses_,
102 'Axis - development of spinopostzygapophyseal lamina ' / 'deep, broadly connecting neural
spine with postzygapophyses ' 'narrow to absent, so that neural spine and postzygapophyses are separated',
103 'Cervical vertebrae - anteroposterior position of epiphyses ' /
partly_over_postzygapophyseal_facets_anterior_to_postzygapophyseal_facets,
104 'Cervical vertebrae - posterior extent of centrum on cervicals 3-4 ' /
completely_under_neural_arch_extending_posteriorly_past_neural_arch,
105 'Cervical vertebrae - anteroventral surface of cervicals 9-10 ' / convex_or_flat__
transversely_concave_due_to_carotid_processes_,
106 'Cervical vertebrae - anterior central articular surface dimensions of cervicals 3-4 ' /
less_than_1.71_times_wider_than_tall__ over_1.70_times_wider_than_tall_,
107 'Cervical vertebrae - neural spine anteroposterior length of cervicals 3-5 ' / 'length / neural arch
length excluding epiphyses >29%' '<30%',
108 'Cervical vertebrae - number of pneumatic foramina in each centrum ' /
one_pair_anteriorly_located_behind_parapophyses_two_pairs,
109 'Cervical vertebrae - convexity of anterior articular surface ' / flat_or_concave_convex 'convex
dorsoventrally, concave horizontally',
110 'Dorsal vertebrae - convexity of anterior articular surface of centra 1-3' / flat_or_concave__
convex 'convex dorsoventrally, concave horizontally',
111 'Dorsal vertebrae - hypapophysis size on dorsals 1-3 ' /
hypapophyses_absent_or_all_less_than_25%_of_posterior_central_articular_surface_height_
at_least_one_hypapophysis_more_than_25%_of_posterior_central_articular_surface_height,
112 'Dorsal vertebrae - lateral projection of parapophyses on dorsals 6-13 ' / 'parapophysis width
measured from ventromedial corner <20% of centrum width ' '>19%',
113 'Dorsal vertebrae - orientation of medial postzygapophyseal edge - undifferentiated from
postzygapophyseal facet ' / undifferentiated_from_postzygapophyseal_facet__
bent_ventrally_to_form_hyposphene_which_articulates_with_hypantrum_on_previous_vertebra_,
114 'Dorsal vertebrae - extent of central pleurocoels in series' / absent_only_present_anteriorly
present_in_anterior_and_posterior_dorsals_,
115 'Dorsal vertebrae - lateral extent of transverse processes on dorsals 1-4 ' /
project_far_beyond_prezygapophyses_laterally_'project slightly past prezygapophyses laterally (distance from midline
to transverse process tip / distance from midline to prezygapophysis tip <180% for d1, <200% for d2, <215% for d3 and
<250% for d4)',
116 'Dorsal vertebrae - transverse width of neural spine distal tip ' / '<151% of minimum neural
spine width ' '>150%',
117 'Sacral vertebrae - number ' / less_than_6_6_7_8_9_10 '11-14' '>14',
118 'Sacral vertebrae - ventral surface of posterior centra ' / transversely_rounded__
transversely_flattened_with_median_groove_on_some_with_median_keel_on_some_,
119 'Sacral vertebrae - number of vertebrae with central pneumatic foramina' / none_
at_least_one_vertebra_but_not_present_in_all_all,
120 'Sacral vertebrae - convexity of posterior articular surface of last sacral centrum ' /
concave_to_flat__ convex,

121 'Sacral vertebrae - dorsal connection of zygapophyses ' /
 each_zygapophyseal_articulation_distinct_from_that_of_adjacent_vertebrae_
 zygapophyseal_articulations_joined_to_form_ridge,
 122 'Caudal vertebrae - number with transverse processes of any size ' / eleven_or_more__
 seven_to_ten_less_than_seven_,
 123 'Caudal vertebrae - transverse section of proximal centra ' / rounded_rectangular,
 124 'Caudal vertebrae - ventral surface of centra 1-2' / 'convexly rounded, flat or grooved '
 with_a_median_keel_,
 125 'Caudal vertebrae - dorsal outline of neural spines in caudals ~5-30 ' / convex_or_flat__
 concave_to_form_accessory_anterior_spine_,
 126 'Caudal vertebrae - transverse convexity of dorsal midline in distal caudals ' /
 narrowly_convex_to_form_neural_spine__ flat_with_no_spine_or_groove__ concave_to_form_median_groove,
 127 'Caudal vertebrae - length of longest prezygapophyses in distal caudals ' / '<33% of centrum
 length ' '33-100% of centrum length ' '>100% of centrum length ',
 128 'Caudal vertebrae - number ' / '>40' '25-40' '21-24' '<21',
 129 'Chevrons - anteroposterior length compared to dorsoventral depth ' / '<76% through chevron
 10 ' '>75% by chevron 10 ',
 130 'Chevrons - transverse convexity of anterior ventral edge in distal elements ' /
 convex_to_straight__ concave_to_form_bifurcated_anterior_ventral_process_,
 131 'Cervical ribs - length ' / greater_than_centrum__ equal_or_less_than_centrum_,
 132 'Uncinate processes - ossification ' / unossified_or_absent__ ossified,
 133 'Sternal ribs - ossification ' / unossified_or_absent__ ossified,
 134 'Gaстрalia - length of lateral segments ' / shorter_than_medial_segment__ longer,
 135 'Sternum - fusion of sternal plates and ventral projection of median surface ' / 'sternal plates
 unfused, without ventral keel ' 'sternal plates fused, without ventral keel ' 'sternal plates fused, with low ventral keel'
 'sternal plates fused, with tall ventral keel ',
 136 'Sternum - shape of lateral edge posterior to rib articulations ' / evenly_rounded_or_straight__
 distinct_posterolateral_process_present_,
 137 'Sternum - surface of coracoid articulation ' / concave_dorsoventrally_forming_groove__
 convex,
 138 'Furcula - size of hypocleideum ' / absent_small_ridge_or_tubercle_large_process_,
 139 'Scapula - eversion of dorsal edge of acromion ' / 'absent, acromion completely dorsally to
 medially projected ' 'present, edge of acromion laterally projected ',
 140 'Humerus - length ' / less_or_equal_to_scapula__ greater_than_scapula_,
 141 'Coracoid - transverse convexity of posterior edge (anteroposterior convexity of lateral edge in
 Aves) ' / convex_to_flat__ concave_forming_subglenoid_fossa_,
 142 'Scapulocoracoid - form of contact between components ' / sutured_or_freely_articulated_fused,
 143 'Coracoid - proximodistal elongation ' / 'proximodistal depth <91% of anteroposterior length
 from anterior edge to glenoid (mediolateral length from medial edge to glenoid in Aves) ' '91-200%' '>200% ',
 144 'Coracoid - angle formed in posterior (lateral in Aves) view at level of coracoid tubercle ' / '<31
 degrees' '>30 degrees ',
 145 'Scapula - orientation of glenoid ' / mostly_on_ventral_edge__ wraps_onto_lateral_surface,
 146 'Humerus - angle between distal deltopectoral crest edge at apex and posterior edge of shaft at
 that point ' / '>85 degrees ' '46-85 degrees' '<46 degrees',
 147 'Humerus - proximodistal placement of deltopectoral crest apex ' / '<30% of element length'
 '30-50%' '>50%',
 148 'Humerus - depth of deltopectoral crest ' / 'width of humerus at deepest part of deltopectoral
 crest <301% minimal shaft depth ' '>300%',
 149 'Humerus - lateral surface of distal deltopectoral crest ' / flat_with_longitudinal_ridge,
 150 'Ulna - length of olecranon process ' / 'proximal tip to apex of coronoid process compared to
 length of element <15%' '15-25%' '>25%',
 151 'Ulna - transverse convexity of distal end ' / rather_straight_to_concave_highly_convex,
 152 'Ulna - separation of proximal cotylae ' / single_cotyla_separate_cotylae,
 153 'Manual phalanx I-1 - shape of proximoventral edge ' / convex_to_flat__
 concave_due_to_flexor_tubera,
 154 'Distal carpals I and II - form of contact' / unfused_fused,
 155 'Distal carpal I - form of contact with metacarpal I ' / unfused_fused,
 156 'Distal carpal II - form of contact with metacarpal II' / unfused_fused,
 157 'Distal carpals I and II - combined transverse width' / 'covers >74% of proximal transverse
 width of metacarpals I and II ' '<75%',
 158 'Metacarpal I - length compared to metacarpal II ' / '<50%' '50-65%' '66-80%' '>80%',
 159 'Manual digit III - number of phalanges ' / four_three_two_one_none,
 160 'Manual unguals - proximodistal position of flexor tubercle apex ' / '<25% down length of ungual
 (measured on the ventral curve, excluding the tubercle) ' '>24%',
 161 'Manual ungual I - curvature, measured as maximum distance between ventral edge and line
 drawn between proximodorsal and distoventral tips divided by length of latter line ' / '>16%' '10-16%' '<10%',
 162 'Manual ungual II - curvature, measured as maximum distance between ventral edge and line
 drawn between proximodorsal and distoventral tips divided by length of latter line ' / '>16%' '10-16%' '<10%',
 163 'Manual ungual III - curvature, measured as maximum distance between ventral edge and line
 drawn between proximodorsal and distoventral tips divided by length of latter line ' / '>16%' '10-16%' '<10%',
 164 'Manual unguals - depth of flexor tubercles ' / '>32% of articular facet height ' '<33%',
 165 'Manual ungual I - size compared to manual ungual II ' / smaller__
 equal_to_three_times_larger__ over_three_times_larger_,
 166 'Manual ungual I - shape of proximodorsal margin ' / smoothly_convex__
 with_lip_rising_dorsally,

167 'Manual ungual II - shape of proximodorsal margin ' / smoothly_convex__
with_lip_rising_dorsally_,

168 'Manual ungual III - shape of proximodorsal margin ' / smoothly_convex__
with_lip_rising_dorsally_,

169 'Ilium - ventral expansion of preacetabular process ' / 'expansion (measured as distance
preacetabular tip extends ventrally past highest point at ventral edge of preacetabular process / height of preacetabular
process at that point) >18% ' <19% but present' absent,

170 'Ilium - length of preacetabular process, measured from notch below process ' / '<50% of
postacetabular length, measured from posterior edge of ischial peduncle base' '50-120%' '>120%',

171 'Ilium - angle of anterior edge of preacetabular process ' /
less_than_11_degrees_posteroventrally_ '10-70 degrees posteroventrally ' 'more than 70 degrees posteroventrally,
often being the anteroventral edge of a round process',

172 'Ilium - dorsal margin of acetabulum in dorsal/ventral view ' /
markedly_convex_due_to_well_developed_supracetabular_crest_
slightly_convex_due_to_poorly_developed_supracetabular_crest_
straight_or_concave_due_to_absence_of_supracetabular_crest_,

173 'Ilium - lateral surface at dorsal edge posterodorsal to acetabulum ' / flat_
developed_into_supratrochanteric_process_,

174 'Ilium - shape of postacetabular process ' / quadrangular_posteriorly__triangular_posteriorly,
175 'Ilium - dorsal postacetabular edge angled posterolaterally' / '<11 degrees between right and
left ilia ' '>10 degrees',

176 'Ilium - depth of brevis fossa ' / deep_shallow_absent,
177 'Ilium - lateral projection of antitrochanter ' /
undifferentiated_from_supracetabular_area_and_postacetabular_process_projected_further_laterally_,

178 'Ilium - posterior extent of m. cuppedicus fossa over pubic peduncle in lateral view ' /
over_at_least_half_of_peduncle__over_less_than_half_,

179 'Ilium - ventral surface on preacetabular process for m. puboischiofemoralis internus
(iliofemoralis internus and ilioprochantericus cranialis in Aves) /
forms_cuppedicus_fossa_which_is_overhung_laterally__
forms_flat_surface_or_laterally_angled_fossa_which_is_not_overhung_laterally_
muscles_attach_to_undifferentiated_blade_of_ilium_,

180 'Ischium - proximodorsal edge ' / unprojected_
projected_into_low_process_separated_from_ilial_peduncle_by_shallow_concavity
projected_into_tall_process_and_separated_from_ilial_peduncle_by_notch,

181 'Ischium - distal curvature ' / curved_dorsally_straight_curved_ventrally,
182 'Ischium - dorsoventral convexity of lateral surface ' / concave_flat_or_convexly_rounded
ridged,

183 'Ischium - proximodistal position of obturator process apex ' / '<34% down shaft' '34-66%'
'>66%',

184 'Ischium - contact between obturator process and pubis ' / absent_present,
185 'Ischium - development of ischial apron' /
notch_proximally_between_obturator_process_and_pubic_peduncle_
notch_enclosed_fully_forming_obturator_foramen_no_ventral_projection_or_foramen_in_ischium_ventral_margin,

186 'Ischium - ventral edge of pubic peduncle ' / flat_projected_as_obturator_tuber_,
187 'Ischium - length compared to pubis ' / '>100%' '66-100%' '50-65%' '<50%',
188 'Ischium - form of median contact ' / fused_unfused_but_contacting_no_contact,
189 'Ischium - dorsoventral expansion of distal end ' / wider_than_shaft_
narrower_or_equal_to_shaft,

190 'Pubis - orientation of proximal half in lateral view ' / '<67 degrees from anteriorly horizontal'
'67-120 degrees' '121-150 degrees' '>150 degrees',

191 'Pubis - anteroposterior length of anterior boot, measured as flare from prior curvature of pubis'
' '>3% of pubic length ' '<4%',

192 'Pubis - anteroposterior length of posterior boot, measured as distal depth of pubis excluding
anterior boot ' / '>29% of pubic length ' '15-29%' '6-14%' '<6%',

193 'Pubis - anteroposterior position of apron ' / in_middle_or_at_posterior_edge_of_shaft__
at_anterior_edge_of_shaft,

194 'Pubis - curvature in lateral view ' / anteriorly_concave__straight_or_sigmoid
posteriorly_concave,

195 'Pubis - proximal extent of symphysis, measured to median edge ' / '>41% of pubic length '
'<42% but present' absent,

196 'Femur - medial surface of head ' / flat_to_convex__concave_to_form_capital_ligament_fossa,
197 'Femur - separation of anterior and greater trochanters ' / 'depth of the intertrochanteric notch
(from the tip of the anterior trochanter) >65% the minimum anteroposterior diameter of the femur ' '<66% but still
present' 'absent, trochanters fused forming trochanteric crest',

198 'Femur - section of anterior trochanter in proximal view ' / 'anteroposteriorly elongate, forming
aliform trochanter' equal_to_transversely_elongate_,

199 'Femur - posterolateral surface at proximal end ' / flat_'posterior trochanter for insertion of m.
ischiotrochantericus (m. ischiofemoralis in Aves) present but separate from more anterior m. iliofemoralis externus
insertion (trochanteric shelf homolog)' posterior_trochanter_present_and_congruent_with_trochanteric_shelf,

200 'Femur - posterior surface of midshaft ' / 'with convexity for insertion of M. caudofemoralis
longus, forming fourth trochanter' flat_or_depressed_,

201 'Femur - convexity of anterior edge of anterior trochanter in lateral view ' /
convex_or_straight__concave, forming accessory trochanter distal to it',

202 'Femur - anteromedial surface of distal end ' / uniformly_convex_transversely
with_proximodistal_ridge_forming_medial_epicondyle,

distally_closed, 203 'Femur - distal enclosure of popliteal fossa between distal condyles ' / distally_open___
 204 'Fibula - contact with proximal tarsals ' / contact_present_contact_absent,
 deep_concavity_, 205 'Fibula - concavity of proximomedial surface ' / flat_to_convex_shallow_concavity_
 206 'Proximal tarsals - depth of concavity between medial and lateral condyles in distal view ' /
 '<20% of anteroposterior depth of deepest condyle '>19%',
 with_proximodistal_ridge_forming_medial_cnemial_crest_, 207 'Tibia - anteromedial surface of proximal portion ' / flat_
 apex' / '>84% of astragalocalcaneal width '<85%',
 208 'Astragalus - height of ascending process, from distal tibiotarsal edge to ascending process
 209 'Astragalus - mediolateral width of ascending process ' / 'measured halfway up, <58% width of
 astragalocalcaneum '>57%',
 'markedly concave, at least comparable in depth to Shuvuuia and Mononykus',
 separated_by_groove, 210 'Astragalus - concavity of medial edge of ascending process ' / convex_to_slightly_concave
 211 'Astragalus - confluence of condyles and ascending process ' / confluent_
 flat_compared_to_rest_of_ascending_process_distinctly_depressed_as_a_fossa_, 212 'Astragalus - convexity of anterior surface at base of ascending process ' /
 213 'Astragalus - form of contact with tibia ' / unfused_fused,
 214 'Astragalus - form of contact with calcaneum ' / unfused_fused,
 215 'Distal tarsals - form of contact with metatarsals ' / unfused_fused,
 'fused proximally and distally, but not distal to distal vascular foramen between III and IV '
 fusion_encloses_distal_vascular_foramen, 216 'Metatarsals II-IV - extent of fusion ' / unfused_'at least two fused proximally, but not distally'
 217 'Metatarsal II - depth of distal articular groove ' / absent_or_shallow___ deep,
 218 'Metatarsal III - depth of distal articular groove ' / absent_or_shallow___ deep,
 219 'Metatarsal III - proximal transverse constriction ' /
 anterior_exposure_wider_or_subequal_to_metatarsals_II_and_IV_ 'anterior exposure significantly narrower than II and
 IV but still present at proximal end, subarctometatarsal ' 'hidden anteriorly at proximal end by contact between II and IV
 but still exposed on proximal surface, arctometatarsal ' 'does not extend to proximal surface, hyperarctometatarsal ',
 220 'Metatarsal IV - transverse width at midshaft ' / '<117% of depth at midshaft '>116% of depth',
 221 'Metatarsal I - presence ' / present_absent,
 222 'Metatarsal I - proximodistal position ' / 'distance between distal ends of metatarsals I and II
 when articulated >30% length of metatarsal II ' '18-30%' '6-18%' '<6%',
 223 'Metatarsal I - proximal extent ' / ends_distal_to_tarsus___ extends_to_contact_tarsus_
 224 'Pedal ungual II - length on straight line compared to ungual III ' / '<141%' '>140%',
 225 'Pedal ungual II - curvature ' / 'depth of the dorsal arc <30% of ungual length (measured in a
 straight line from the proximodorsal tip to the distal tip) '>29%',
 '>166%',
 226 'Metatarsal IV - transverse width at midshaft compared to metatarsal II ' / '<66%' '66-165%'
 height ' '<40%',
 227 'Skull - depth of snout ' / 'height of preorbital snout one fourth from tip >39% of orbit+jugal
 degrees ', 228 'Premaxilla - angle between anterior subnarial and ventral margins ' / '>34 degrees ' '<35
 '<50',
 229 'Premaxilla - subnarial height compared to alveolar length ' / '>180%' '101-180%' '50-100%'
 similar_to_that_between_teeth_in_each_element_'greater, forming diastema between elements ',
 230 'Premaxilla and maxilla - space between toothrows of each element ' /
 '<36%',
 231 'Maxilla- shape of promaxillary fenestra ' / 'minimum diameter >35% of maximum diameter '
 232 'Nasal - convexity of dorsal edge in lateral view' / convex_or_straight___ concave,
 233 'External naris - length ' / 'longest axis <49% of orbit+jugal height ' '49-80%' '>80%',
 234 'Postorbital - length of posterior process ' / shorter_or_equal_to_ventral_process___ longer,
 235 'Frontal - dorsal surface of supratemporal fossa ' / flat_with_pit,
 236 'Parietal - minimum width ' / less_or_equal_to_minimum_frontal_transverse_width___ more,
 237 'Parietal - dorsal outline ' / concave_to_straight convex,
 238 'Quadrate - proximodistal position of pterygoid process apex ' / '>45%' '<46%',
 239 'Basioccipital - shape of notch between basal tubera ' / rounded_angled,
 excavated_by_fossa_, 240 'Laterosphenoid - lateral surface dorsal to exit for oculomotor (III) nerve' / flat_to_convex
 241 'Dentary - posterior depth compared to length ' / '<15%' '15-50%' '>50%',
 242 'Teeth - DSD' / '<1.19' '>1.2',
 243 'Dorsal vertebrae - length of column ' / '>119% of femoral length ' '<120%',
 244 'Dorsal vertebrae - centrum proportions of dorsals 6-13 ' / 'length <83% of posterior height '
 '83-130%' '130-200%' '>200%',
 245 'Dorsal vertebrae - anteroposterior expansion of neural spine apex in dorsals 6-13 ' / '<116% of
 minimum anteroposterior spine length '>115%',
 246 'Sacral vertebrae - transverse width of ancestral neotheropod sacral centra 1 and 2 ' / '>69% of
 ancestral sacral centrum 3 width '<70%',
 tapered_subequal_expanded, 247 'Caudal vertebrae - distal anteroposterior width of transverse processes on caudals 1-4 ' /
 '>200% longer',
 248 'Caudal vertebrae - length of caudals 10-15 ' / shorter_than_caudal_1 '100-200% longer'
 249 'Sternal ribs - number which contact dorsal ribs ' / none_to_three___ at_least_four,

250 'Furcula - size ' / 'length of arm from omal tip to base excluding hypocleidium <36% of scapular length '>35%',
 251 'Coracoid - surface just distal to coracoid tuber ' / solid_pierced_by_supracoracoid_fenestra,
 252 'Scapula - contact between acromion and coracoid ' / present_to_near_anterior_tip__ 'absent, scapula-coracoid contact limited to short area near glenoid ',
 253 'Scapulocoracoid - length of glenoid edge formed by scapula, with glenoid edge of each bone simplified to a straight line ' / '<160% the length of glenoid edge formed by coracoid '>159%',
 254 'Humerus - length compared to femur ' / '<38% '38-69% '70-100%'>100%',
 255 'Femur - distal extent of lateral condyle past medial condyle ' / '<11% of distal femur width '>10% of distal femur width ',
 256 'Radius - midshaft anteroposterior diameter ' / '>71% of ulnar midshaft anteroposterior diameter '51-71%'<51%',
 257 'Manual phalanx I-1 - length compared to metacarpal II ' / '<70% '70-100%'>100%',
 258 'Manual phalanx III-2 - length compared to III-1 ' / '>105% '60-105%'<60%',
 259 'Manual phalanx III-2 - proximoventral heel, prominence measured as angle between dorsal and ventral edges of element ' / '<11 degrees '>10 degrees',
 260 'Manual phalanx III-3 - dorsoventral depth of shaft just proximal to distal condyles ' / similar_to_rest_of_shaft__ much_shallower_than_rest_of_shaft_,
 261 'Ilium - length ' / '>63% of femoral length ''<64%',
 262 'Ilium - anteroposterior diameter of external acetabulum (measured between lateral surfaces of peduncles, excluding any medial walls or angled anterior and posterior acetabular surfaces) ' / '>18% of ilial length ''<19%',
 263 'Ilium - angle main axis of pubic peduncle projects, compared to line drawn between bases of peduncles' / anterior_to_vertical_posterior,
 264 'Pubis - lateral surface of mid shaft ' / smooth_with_lateral_projection_,
 265 'Ischium - dorsal process at midshaft ' / absent_present,
 266 'Tibia - surface just posterior to fibular crest ' / flat_longitudinally_grooved_,
 267 'Pedal phalanx II-2 - length compared to II-1 ' / '<60% '60-82% '83-100%'>100%',
 268 'Pedal phalanx II-2 - height of distal condyles compared to length (excluding posterior lips) ' / '<61% '>60%',
 269 'Metatarsal IV - convexity of posterior surface in section ' / flat_or_broadly_convex__ sharply_keeled,
 270 'Pedal phalanx IV-4 - length compared to IV-3 ' / '<101% '>100%',
 271 'Metatarsal V - length compared to metatarsal IV ' / '<41% '>40%',
 272 'Pedal ungual I - depth of the dorsal arc compared to ungual length (measured in a straight line from the proximodorsal tip to the distal tip) ' / '<23% '>22%',
 273 'Pedal unguals III and IV - depth of the dorsal arc compared to ungual length (measured in a straight line from the proximodorsal tip to the distal tip) ' / '<16% '16-21%'>21%',
 274 'Pedal unguals - cross section of III and IV' / 'expanded ventrally, triangular ' subequal_in_transverse_width_dorsally_and_ventrally,
 275 'Feathers - presence' / 'absent, skin naked or scaled ' 'present, unbranched or branched filamentous integument',
 276 'Feathers - arrangement of barbs ' / unbranched_or_with_basally_radiating_barbs__ with_barbs_arranged_in_a_vane_,
 277 'Feathers - length of feathers along metatarsus ' / absent_to_comparable_to_body_feathers__ elongated,
 278 'Pubis - angle of posterior pubic boot to shaft ' / '>79 degrees ''<80 degrees',
 279 'Chevrons - transverse convexity of posterior ventral edge in distal elements' / convex_to_straight__ concave_to_form_bifurcated_posterior_ventral_process_,
 280 'Metacarpal I - proportions in dorsal/ventral view ' / longer_than_wide_wider_than_long,
 281 'Manual phalanx I-1 - minimum transverse width ' / less_than_or_equal_to_minimum_transverse_width_of_radius_greater,
 282 'Angular - posterior extent at ventral mandibular edge ' / 'extends to reach >94% down mandibular length from symphysis ''<95%',
 283 'Surangular - dorsolateral surface just anterior to glenoid ' / unprojected_dorsally_projected_as_everted_ridge,
 284 'Metacarpal I - convexity of distal end in dorsal view ' / deeply_concave_due_to_well_developed_ginglymus_slightly_concave_flat_to_convex,
 285 'Metacarpal II - convexity of distal end in dorsal view ' / concave_flat_to_convex,
 286 'Dentary - convexity of anterodorsal edge ' / concave_to_rounldy_convex__ with_abrupt_ventral_deflection,
 287 'Quadrate - lateral exposure of head ' / covered_by_squamosal__ visible_laterally_,
 288 'Ilium - ventral projection of medial brevis ridge ' / at_least_partly_ventral_to_lateral_brevis_fossa_edge__ reduced_to_not_be_visible_laterally_,
 289 'Femur - development of insertion for M. iliofemoralis externus on proximolateral surface' / unprojected_to_low_mound__ forms_longitudinal_ridge_forms_trochanteric_shelf,
 290 'Dentary teeth - extent ' / over_most_of_alveolar_edge__ restricted_to_anterior_tip_absent,
 291 'Coracoid - depth of subglenoid notch ' / 'anteroposterior length from anterior coracoid edge to posterior tip of coracoid glenoid (mediolateral length from medial coracoid edge to lateral tip of coracoid glenoid in Aves) <106% of depth from anterior coracoid edge to subglenoid notch ''>105%',
 292 'Articular - curvature of retroarticular process ' / straight_or_decurved__ upcurved,
 293 'Scapula - lateral surface dorsal to glenoid ' / flat__ with_dorsoventral_ridge_forming_supraglenoid_buttress,
 294 'Basioccipital - transverse width across basal tubera ' / '>164% of occipital condyle transverse width ''<165%',
 295 'Metatarsal II - length' / '<98% of metatarsal III ''>97%',

296 'Basioccipital - posterior surface ventrolateral to occipital condyle ' / flat_ excavated_by_subcondylar_recess,

297 'Humerus - transverse width of entepicondyle ' / narrow_or_absent_ 'wide, >15% of distal humeral width',

298 'Ilium - convexity of ischial peduncle articular surface ' / concave_to_flat__ 'convex, articulates with socket on ischium',

299 'Teeth - labiolingual compression of roots of lateral teeth ' / 'labiolingual width <70% FABL ' '>69%',

300 'Ilium - lateral deflection of preacetabular process ' / lateral_edge_of_preacetabular_process_less_than_60_degrees_from_dorsal_postacetabular_margin__ '60-90 degrees' more_than_90_degrees,

301 'Teeth - recurvature ' / significant_slight_or_absent,

302 'Dentary and maxilla - method of tooth implantation ' / all_in_distinct_sockets__ some_in_confluent_groove,

303 'Pubis - extent of symphyseal contact of aprons ' / continuous_interpubic_fenestra,

304 'Ilium - convexity of dorsal edge of postacetabular process ' / convex_or_straight_concave,

305 'Ilium - posterolateral edge of postacetabular process in dorsal view ' / ventral_edge_does_not_project_laterally_compared_to_dorsal_edge_ ventral_edge_has_lateral_projection_at_posterior_end_of_iliuim,

306 'Pedal phalanx II-2 - length of proximoverventral heel compared to height of distal condyles ' / absent 'present but <44% ' '>43%',

307 'Ischium - obturator notch distal to process ' / present_absent,

308 'Ischium - angle between edges of obturator process ' / '>29 degrees ' '<30 degrees',

309 'Metatarsals II and III - topology of dorsal surface of shaft ' / no_tubercle_developed_on_either_metatarsal_ tubercle_for_insertion_of_m_tibialis_cranialis_on_center_or_medial_edge_of_metatarsal_II tubercle_for_insertion_of_m_tibialis_cranialis_on_lateral_edge_of_metatarsal_II_or_on_metatarsal_III,

310 'Maxilla - concavity of anterodorsal margin at base of dorsal process ' / 'depth of concavity <4% of orbit+jugal height ' '>3%',

311 'Maxilla - length of anterior ramus, measured from point of maximum anterodorsal concavity ' / '<150% of maxillary height at that point ' '>149%',

312 'Nasal - extent of antorbital fossa on lateral surface ' / absent_present,

313 'External mandibular fenestra - length compared to mandibular length ' / '>18% ' '12-18% ' '1-11%' absent,

314 'Anterior teeth - texture of carinae ' / serrated_ unserrated,

315 'Maxilla - posterior extent of teeth ' / posterior_to_anterior_orbital_margin__ restricted_anterior_to_anterior_orbital_margin_but_extend_over_half_of_maxillary_length restricted_to_less_than_anterior_half_of_maxilla_,

316 'Metacarpal IV - presence' / present_absent,

317 'Ilium - ventral extent of pubic peduncle compared to ischial peduncle ' / equal_or_less_ greater,

318 'Pubis - extent of puboischiadic plate proximally ' / obturator_foramen_pierces_plate__ obturator_notch_formed_when_foramen_opens_ventrally_ obturator_notch_reduced_so_that_posterior_edge_of_ischial_peduncle_does_not_project_distally,

319 'Femur - proximal extent of anterior trochanter ' / completely_distal_to_head__ extends_to_lower_half_of_head_extends_at_least_to_upper_half_of_head_,

320 'Astragalus - anteroposterior depth of ascending process' / deep_and_blocky_ shallow_and_laminar,

321 'Maxilla - dorsoventral position of maxillary fenestra ' / 'distance from ventral antorbital fossa rim <11% of orbit+jugal height ' '>10%',

322 'Maxilla - depth of posterior process ' / 'minimal depth <16% orbit+jugal height ' '>15%',

323 'Maxilla - convexity of lateral surface surrounding maxillary fenestra ' / flat_ 'concave, forming fossa ',

324 'Maxilla - size of external portion of dorsal process' / robust_reduced absent,

325 'Maxilla - height of antorbital fossa portion of dorsal process ' / broadly_contacts_external_portion_of_dorsal_process__ separated_from_external_portion_,

326 'Nasal - contact with antorbital fossa ' / absent_ present_but_does_not_contact_antorbital_fenestra present_and_contacts_antorbital_fenestra_,

327 'Premaxilla - contact with antorbital fossa ' / absent_present,

328 'Jugal - contact with antorbital fenestra ' / absent_present,

329 'Splénial - concavity of posterior margin ' / convex_to_slightly_concave__ strongly_concave,

330 'Premaxillary teeth - height of first tooth' / 'less than twice height of premaxillary teeth 2-4 ' 'more than twice height of premaxillary teeth 2-4 ',

331 'Postorbital - angle of anterior process ' / '<96 degrees from long axis of ventral process ' '>95 degrees',

332 'Jugal - lateral exposure of posterior process ' / much_of_process_exposed__ most_of_process_hidden_by_quadratejugal_,

333 'Frontal - shape of suture with nasal ' / roughly_straight_or_curved__ 'W-shaped',

334 'Cervical vertebrae - height of neural spines ' / taller_than_anteroposteriorly_long_ lower_than_anteroposteriorly_long_,

335 'Caudal vertebrae - fusion of distal caudals ' / absent_ 'present, fused into pygostyle',

336 'Coracoid - anterior projection of anterodistal margin (medial projection of mediodistal margin in Aves) ' / posterior_to_or_on_level_with_anterior_margin_of_scapulocoracoid_boundary_ 'anterior to anterior margin (medial to medial margin in Aves) of scapulocoracoid boundary ',

337 'Skull - length compared to femur ' / '>125% ' '80-125% ' '61-79% ' '<61%',

338 'External naris - dorsoventral placement' / 'distance between ventral edge and alveolar edge <51% of orbit+jugal height' '>50%',

339 'Maxilla - posterior extent of medial wall of antorbital fossa' / 'length of antorbital fossa anterior to antorbital fenestra / antorbital fenestra length <46%' '>45%',

340 'Maxilla - elongation of maxillary fenestra' / 'height >50% of length' '25-50%' '<25%',

341 'Nasals - median contact' / 'sutured or non-contacting' 'fused',

342 'Nasal - surface texture' / 'smooth_rugose',

343 'Jugal - minimum suborbital height' / '>30% of orbital height' '20-30%' '<20%',

344 'Nasal - length compared to frontal' / 'longer_or_equal_shorter',

345 'Skull - ventral deflection of snout' / 'angle between maxilla and jugal+quadratojugal ventral margins <30 degrees' '>29 degrees',

346 'Maxilla - length of ventral margin' / '>125% of orbit+jugal height' '<126%',

347 'Frontal - level of lateral edge of dorsal surface' / 'equal_or_depressed_compared_to_rest_of_frontal__raised_rim',

348 'Parietal - length compared to frontal' / 'shorter_longer',

349 'Laterotemporal fenestra - greatest anteroposterior length' / '>30% of orbit+jugal height' '<31%',

350 'Exoccipital and basioccipital - transverse width of foramen magnum' / '<101% of occipital condylar width' '>100%',

351 'Dentary - depth of Meckelian groove' / 'deep_shallow',

352 'Dentary - posterior extent of ventral dentary' / 'ends_prior_to_or_partly_overlapping_external_mandibular_fenestra__extends_past_external_mandibular_fenestra__',

353 'Surangular - lateral surface ventral to glenoid' / 'flat_with_horizontal_ridge_',

354 'Premaxillary teeth - height of longest compared to longest maxillary tooth' / '>70%' '<71%',

355 'Dentary teeth - presence at tip of dentary' / 'present_absent_for_space_of_more_than_two_FABs_from_dentary_tip',

356 'Cervical vertebrae - elongation' / 'centrum_length_less_than_centrum_height_equal_to_twice_as_long_length_more_than_twice_height_',

357 'Dorsal vertebrae - height of neural spines of posterior dorsals (6-13)' / '>149% taller than long' '>75% of posterior central height' '<76%',

358 'Dorsal vertebrae - posterior extent of postzygapophyses on mid and posterior dorsals (4-13)' / 'end_above_centrum__extend_posterior_to_centrum_',

359 'Chevrons - length of proximal chevrons compared to caudal centrum length' / '>149%' '<150%',

360 'Furcula - interclavicular angle, measured from center of median to tips of arms' / '>69 degrees' '<70 degrees',

361 'Scapula - angle of posterior edge of acromion' / '>80 degrees compared to dorsal edge of shaft just proximal to it' '80-20 degrees' '<20 degrees',

362 'Scapula - angle of anterior edge of acromion' / '<106 degrees compared to dorsal edge of shaft just posterior to it' '>105 degrees',

363 'Scapulocoracoid - shape of anterior edge at suture' / 'notched_smooth',

364 'Scapula - expansion of posterior end' / '>184% of minimum shaft width' '<185%' 'tapered',

365 'Coracoid - position of coracoid tuber' / 'distal_to_scapular_articulation__proximal_to_scapular_articulation, forming acrocoracoid process',

366 'Humerus - minimum width in anterior view compared to length' / '>12%' '<13%',

367 'Ulna - shape of posterior margin' / 'straight, sigmoid or concave' 'convex',

368 'Distal carpals I and II - shape of combined proximal surface' / 'flat_or_irregular__strongly_and_smoothly_convex_',

369 'Metacarpal I - height of medial condyle ventrally compared to lateral condyle' / 'higher_lower',

370 'Metacarpal II - medial expansion of proximal end' / 'much greater than distal width, >119%' 'subequal or less than distal width, <120%',

371 'Metacarpal III - length compared to metacarpal II' / '>79%' '<80%',

372 'Metacarpal III - distal extent of contact with metacarpal II' / 'extensive_intermetacarpal_space_metacarpals_in_contact_for_almost_all_of_their_length_',

373 'Metacarpal III - position of proximal end' / 'mostly_lateral_to_metacarpal_II__mostly_ventral_to_metacarpal_II_',

374 'Manual phalanx II-2 - length compared to II-1' / '<101%' '101-119%' '120-200%' '>200%',

375 'Manual phalanx II-1 - expansion of lateral edge' / 'fully_concave__with_low_convexity_developed_on_at_least_portion_of_shaft, maximum shaft width <161% of minimum width of metacarpal II' 'with deep convexity, >160% of minimum width of metacarpal II',

376 'Manual digit II - length of II-1 and II-2 compared to metacarpal II' / '>100%' '<101%',

377 'Manual phalanx I-1 - ventral curvature' / 'straight_bowed',

378 'Manual ungual I - dorsal projection of dorsal curve' / 'with articular surface oriented vertically, dorsal edge of at least mid portion of ungual does not project dorsally over the level of the proximodorsal ungual corner' 'dorsal_edge_of_at_least_mid_portion_of_ungual_does_project_dorsally_over_the_level_of_the_proximodorsal_ungual_corner_',

379 'Manual ungual II - dorsal projection of dorsal curve' / 'with articular surface oriented vertically, dorsal edge of at least mid portion of ungual does not project dorsally over the level of the proximodorsal ungual corner' 'dorsal_edge_of_at_least_mid_portion_of_ungual_does_project_dorsally_over_the_level_of_the_proximodorsal_ungual_corner_',

380 'Manual phalanx III-3 - length compared to combined lengths of III-1 and III-2' / '<93%' '93-109%' '>109%',

381 'Ilium - height of preacetabular process, dorsal extent over line drawn between bases of peduncles, compared to height at base of postacetabular process' / '<90%' '90-150%' '>150%',

382 'Ischium - minimum anteroposterior depth of shaft distal to obturator process compared to pubic shaft' / '<80%' '80-130%' '>130%',

383 'Tibia - length compared to femur ' / shorter_or_equal_longer,

384 'Tibia - anterior constriction at base of lateral condyle in proximal view ' / lateral_condyle_does_not_laterally_overlap_incisura_tibialis_overlap_present,

385 'Metatarsus - length compared to femur ' / '>49%' '37-49%' '<37%',

386 'Metatarsal II - depth at midshaft ' / less_or_equal_to_transverse_width_at_midshaft_greater_than_transverse_thickness_,

387 'Metatarsus - distal extent of metatarsal II-IV contacts ' / shafts_separated__ shafts_appressed,

388 'Metatarsus - minimum transverse width distally compared to proximal width ' / '>59%' '<60%',

389 'Metatarsal I - torsion ' / absent_present, so that hallux faces medially or posteriorly ',

390 'Pedal ungual I - length on straight line compared to ungual III ' / '<90%' '>89%',

391 'Manual ungual III - length on straight line compared to ungual II ' / '<96%' '>95%',

392 'Metatarsus - transverse slenderness at midshaft ' / '>50% of length ' '30-50%' '13-29%' '<13%',

393 'Ilium - anteroposterior length of pubic peduncle, measured halfway down ' / over_twice_as_long_as_ischial_peduncle_measured_halfway_down 'less than twice, but still longer than ischial peduncle ' equal_or_shorter,

394 'Pedal phalanx III-1 - slenderness ' / 'length >139% transverse width ' '<140%',

395 'Humerus - transverse width of distal end ' / '<200% minimum shaft width ' '200-269%' '>269%',

396 'Humerus - transverse extent of ectepicondyle ' / '<20% of distal humeral width ' '>19%',

397 'Metatarsal I - transverse width of distal condyle ' / '<81% of transverse width of distal condyle of metatarsal III ' '>80%',

398 'Metacarpal II - length compared to humerus ' / '>32%' '<33%',

399 'Jugal - dorsoventral expansion of anterior process ' / 'expansion dorsal to ventral orbit margin <6% of orbit+jugal height' '>5%',

400 'Chevrons - anteroventral process on distal chevrons ' / absent_present,

401 'Metacarpal III - depth of distal articular groove ' / absent_present,

402 'Scapula - dorsoventral depth of acromion ' / '>20% of total scapular depth ' '<21%',

403 'Metatarsus - medial extent of metatarsal IV posterior to III ' / 'extensive, often leading to L-shaped metatarsal III ' slight_to_absent,

404 'Nasals - transverse convexity of dorsal surface ' / concave_to_slightly_convex__ 'highly convex, forming median crest',

405 'Ectopterygoid - anteroposterior position ' / posterior_to_palatine__ lateral_to_palatine_,

406 'Pterygoid - orientation of palatal process ' / 'within 20 degrees of ventral jugal edge, palatal process completely dorsal to ventral margin of jugal ' 'projects strongly downward (>20 degrees), palatal process mostly ventral to jugal',

407 'Articular - contact with surangular ' / sutured_fused,

408 'Cervical ribs - contact with vertebrae ' / mobile_or_sutured_fused,

409 'Caudal vertebrae - pneumaticity of caudal centra 1-5 ' / absent_pleurocoels_present,

410 'External mandibular fenestra - anteroposterior placement ' / 'length of mandible posterior to fenestra <140% orbit+jugal height ' '>139%',

411 'Manual ungual II - presence ' / present_absent,

412 'Ilium - convexity of anterodorsal edge ' / convex_or_flat_with_concavity,

413 'Basioccipital - basal tubera size' / present_absent,

414 'Postorbital - length of anterior process ' / shorter_than_ventral_process__ equal_or_longer_than_ventral_process_but_without_thin_extension_along_orbit 'longer than ventral process, with thin extension along orbit ',

415 'Postorbital - angle between ventral and posterior processes (measured with vertex equidistant between orbit, supratemporal and laterotemporal fenestrae, through tips of processes) ' / '<120 degrees ' '>119 degrees ',

416 'Scapula - medial curvature' / 'present, anterior end placed medially to blade ' absent,

417 'Scapula - sectional shape of posterior half ' / thin_blade__ 'ventrally thick, drop-shaped ',

418 'Coracoid - convexity of medial (posterior in Aves) surface ' / flat_with_fossa,

419 'Ulna - height of coronoid process ' / prominent_low_or_absent,

420 'Ulna - height of proximomedial process ' / low_or_absent_prominent,

421 'Ulna - anterior surface of proximal third ' / smooth_with_longitudinal_ridge_,

422 'Ulna - proximal extent of distal articular surface up posterolateral side ' / slight__ over_half_of_ulnar_depth_,

423 'Ulna - position of thickest portion of distal end ' / near_medial_margin__ near_middle_or_lateral_margin,

424 'Ulna - anterolateral surface distally ' / convex_to_shallowly_depressed__ well_defined_radial_sulcus_extending_to_distal_articulation_,

425 'Ulna - proportions of distal end ' / transversely_compressed_to_equilateral__ 'transverse width greater, but less than 201% ' transverse_width_greater_than_200%_,

426 'Radius - dorsal projection of distal end ' / absent_present, forming flange',

427 'Radiale - size' / '<90% of distal ulnar depth ' '>89%',

428 'Ulnare - convexity of distal edge' / convex_to_straight__ 'slightly concave (1-15% of ulnare depth measured perpendicular to line across tips of rami), forming metacarpal incisure to make ulnare heart-shaped' 'deeply concave (>15%), making ulnare V-shaped',

429 'Ilium - ventral extent of postacetabular process ' / completely_dorsal_to_ischial_peduncle_tip__ extends_ventral_to_ischial_peduncle_,

430 'Sternum - posterior expansion of posteromedian process' / absent present_but_posteriorly_convex_present_and_posteriorly_concave__,

431 'Pubis - distal extent of posterior median groove ' / 'proximally restricted, posterodorsal edge of pubic boot rounded ' 'distally extending between most of pubic boots, posterodorsal edge of pubic boot sharply ridged forming hypopubic cup ',

432 'Tibia - midshaft transverse diameter compared to femur ' / '>80%' '<81%',

433 'Femur - posterior surface of femoral head ' / transversely_flat_to_convex_ with_vertical_groove_near_medial_margin,

434 'Manual phalanx I-1 - convexity of distoventral surface proximal to condyles ' / convex_to_flat_ concave_to_form_flexor_fossa_,

435 'Tibia - angle of anterior edge of cnemial crest ' / '>10 degrees from anterior shaft edge ' '<11 degrees',

436 'Tibia - orientation of cnemial crest in proximal view ' / mostly_anterior_mostly_lateral,

437 'Tibia - proximal extent of fibular crest ' / separate_from_lateral_condyle__ continuous_with_lateral_condyle_,

438 'Braincase - prominence of crista prootica ' / slight_convexity_to_small_ridge_ well_developed_ridge_prominent_overhanging_ala_,

439 'Astragalus - contact between ascending process and fibula ' / absent_present,

440 'Basisphenoid - expansion ' / unexpanded_'expanded ventrally, posteriorly and laterally due to extensive pneumatization ',

441 'Supraoccipital - posterior median surface ' / pronounced_sagittal_crest__ concave_to_slightly_convex,

442 'Vomer - posterior extent ' / ends_anterior_to_subtemporal_fenestra__ extends_posterior_to_anterior_edge_of_fenestra_,

443 'Dentary - angle of symphysis ' / '>45 degrees from dorsal dentary margin ' '<46 degrees',

444 'Dentary teeth - labiolingual compression of teeth 1-2' / 'labiolingual width <90% of mesiodistal length '>89%',

445 'Teeth - labiolingual compression of lateral tooth crowns ' / 'labiolingual width <80% of FABL ' '>79%',

446 'Cervical vertebrae - transverse convexity of ventral centrum surface' / convex_or_flat__ concave,

447 'Dorsal vertebrae - height of neural arch in mid dorsals (4-6)' / distance_from_neurocentral_suture_to_prezygapophysis_less_than_height_of_anterior_articular_surface__ greater,

448 'Dorsal vertebrae - diameter of parapophysis on mid dorsals (4-6)' / '<66% height of anterior articular surface' '>65% ',

449 'Dorsal vertebrae - division of infrazygapophyseal fossae in mid dorsals (4-6)' / undivided_ accessory_centrodiapophyseal_laminae_present,

450 'Dorsal vertebrae - inclination of diapophysis in mid dorsals (4-6)' / inclined_or_horizontal_ declined,

451 'Dorsal vertebrae - anterior bifurcation of neural spine in dorsal view ' / absent_present,

452 'Dorsal vertebrae - posterior bifurcation of neural spine in dorsal view ' / absent_present,

453 'Sacral vertebrae - fusion of neural spines ' / all_separate at_least_some_fused_into_a_continuous_lamina_,

454 'Furcula - curvature of arms ' / 'straight or curved laterally to form V-shape ' 'curved medially to form U-shape ',

455 'Scapula - dorsal edge of scapular blade ' / straight_or_evenly_curved__ with_flange_,

456 'Humerus - size of bicipital crest' / 'low, projected <45% of minimum humeral width from humeral head' 'moderate, projected 45-100% of minimum humeral width ' 'prominent, projected >100% of minimum humeral width ',

457 'Humerus - angle of bicipital crest in proximal view ' / '<45 degrees from long axis of humeral head' 'angled laterally/posteriorly 45 degrees or more from long axis of humeral head',

458 'Humerus - separation of bicipital crest from humeral head ' / confluent_'separated laterally (posteriorly in Aves) by capital groove',

459 'Humerus - shape of bicipital crest' / with_convex_outer_edge_ with_straight_to_concave_outer_edge_,

460 'Humerus - posteromedial surface of midshaft ' / flat_with_crest__,

461 'Humerus - anterior surface proximal to ectepicondyle ' / flat_with_tuberosity_,

462 'Humerus - angle of torsion between long axes of proximal and distal ends ' / '>32 degrees ' '<33 degrees ',

463 'Humerus - anterior flexure of distal end ' / significant_absent_or_slight_,

464 'Humerus - shape of entepicondyle ' / hemispherical_'proximodistally elongate, crest-like',

465 'Humerus - anteromedial surface proximal to entepicondyle ' / flat_with_longitudinal_groove_,

466 'Metacarpal I - ventrolateral surface ' / unprojected_with_flange_underlying_metacarpal_II_,

467 'Metacarpal III - convexity of lateral margin ' / straight_or_concave_convex_,

468 'Manual ungual II - length compared to metacarpal II ' / shorter_or_equal_longer_,

469 'Ilium - distance between dorsal edge of mid ilium and sacral neural spines ' / 'marginal, ilia almost contact neural spines ' significant,

470 'Ilium - lateral surface of posterodorsal corner of postacetabular process ' / flat_ with_small_rugosity_with_large_tuber_,

471 'Ilium - transverse compression of pubic peduncle distal surface' / more_than_twice_as_long_as_wide__ 'length 50-200% of width ' less_than_half_as_long_as_wide_,

472 'Ilium - angle pubic peduncle distal articular surface projects ' / '>17 degrees anteriorly' '17 degrees anteriorly_to_9_degrees_posteriorly '>9 degrees posteriorly',

473 'Ilium - ventral extent of antitrochanter' / ends_proximal_to_articular_surface_of_ischial_peduncle_extends_to_ventral_edge_of_ischial_peduncle_,

474 'Ilium - shape of antitrochanter ' / with_flattened_ventral_side__ hemispherical,

475 'Ischium - proximal enclosure of obturator notch' / absent_'present, process on ventral edge of pubic peduncle curves distally',

476 'Ischium - proximodorsal position of mid dorsal process" apex' / '<67% down ischium ' '>66%',

477 'Pubis and ischium - shape of subacetabular contact ' / straight_or_simply_curved sinuous,

478 'Pubis - anteroposterior expansion of distal shaft ' / less_than_twice_minimum_shaft_depth_ at_least_twice_.

479 'Femur - angle of femoral head to shaft ' / declined_to_perpendicular__ inclined,
 480 'Femur - anteroposterior constriction of femoral head in proximal view ' /
 at_most_constricted_to_80%_of_medial_head_width_ 'constricted to <80% of medial head width ',
 481 'Femur - anteroposterior width of greater trochanter ' /
 narrower_than_or_equal_to_width_of_femoral_head_wider,
 482 'Femur - ventral constriction of femoral head ' / present absent,
 483 'Tibia - depth of incisura tibialis compared to proximal width of tibia ' / '>15%' '<16%',
 484 'Tibia - transverse compression of proximal end ' / longer_than_wide_
 equal_or_wider_than_long_
 485 'Tibia - distal extent of fibular crest ' / 'ends at <45% of tibial length ' '>44%',
 486 'Fibula - angle of proximal edge ' / '<16 degrees from perpendicular to long axis of shaft ' '>15
 degrees anteroproximally',
 487 'Fibula - proximodistal position of iliofibularis tubercle apex ' / 'placed <41% down length of
 fibula ' '>40%',
 488 'Fibula - transverse width of posterior half in proximal view ' /
 equal_to_or_wider_than_anterior_half_ 'narrower, forming posteriorly tapered surface ',
 489 'Tibia - distal exposure of lateral condyle ' / 'absent, covered by astragalocalcaneum '
 present_due_to_reduction_in_astragalus_
 490 'Femur - convexity of proximal surface between head and greater trochanter ' /
 convex_to_slightly_concave_strongly_concave,
 491 'Maxillary teeth - position of largest teeth ' / in_anterior_third_larger_in_middle_third_
 in_posterior_third_
 492 'Tibia - anterior exposure of mediodistal corner of tibia ' / covered_by_astragalus exposed,
 493 'Caudal vertebrae - separation of tip of distal caudal prezygapophyses ' / unseparated
 bifurcated,
 494 'Braincase - confluence of otic recess and lateral depression ' / separate
 within_common_depression,
 495 'Postorbital and jugal - minimum anteroposterior length of postorbital bar ' /
 less_than_or_equal_to_minimum_anteroposterior_length_of_lacrimal_greater,
 496 'Lacrimal - separation from postorbital dorsal to orbit ' / wide narrow absent,
 497 'Premaxillary teeth - labiolingual compression ' / longest_axis_mesiodistal_
 longest_axis_labiolingual,
 498 'Premaxillary teeth - lingual surface ' / flat_with_central_basoapical_ridge_
 499 'Infratemporal fenestra - posterior constriction caused by squamosal and quadratojugal ' /
 'greatest anteroposterior width of posterior intrusion into fenestra / greatest anteroposterior width of fenestra if protrusion
 were absent <10% ' '>9%',
 500 'Nasals - convexity of dorsolateral surface ' / 'concave to right-angled ' 'sharply convex, forming
 paired ridges or crests',
 501 'Ilium - lateral surface dorsal to acetabulum ' / flat_or_slightly_rounded__
 with_well_defined_vertical_ridge,
 502 'Nasal - lateral surface along or inside antorbital fossa ' / solid_
 pierced_by_at_least_one_pneumatic_foramen,
 503 'Articular - transverse width of retroarticular process ' /
 equal_to_narrower_than_mandible_anterior_to_glenoid_wider_than_mandible_anterior_to_glenoid_
 504 'Basioccipital and basisphenoid - transverse width across basipterygoid processes ' /
 equal_to_less_than_anteroposterior_length_between_anterior_edge_of_basipterygoid_processes_and_posterior_edge
 _of_basal_tubera__ greater,
 505 'Ischium - transverse convexity of acetabular surface ' / convex_or_flat_
 concave_due_to_sagittal_groove,
 506 'Paraquadrate foramen - dorsoventral size ' / '<18% of quadrate height ' '>17%',
 507 'Paraquadrate foramen - composition of lateral edge ' /
 formed_at_least_partially_by_quadrate__ formed_completely_by_quadratejugal_
 508 'Axis - dorsal transverse expansion of neural spine ' / tapered_to_equal_to_base_ 'expanded
 dorsally, resulting in epineurapophyseal processes ',
 509 'Ilium - extent of supracetabular crest along pubic peduncle ' /
 present_on_most_of_peduncle__ present_on_minority_of_peduncle_if_at_all_
 510 'Scapula - convexity of dorsal acromial edge ' / convex_to_straight_concave,
 511 'Basisphenoid - lateral walls of basisphenoid recess ' / unmarked_have_muscle_scars_
 512 'Quadratojugal - convexity of external surface ' / flat_ 'flexed at posterior border, so that distinct
 posterior face is present ',
 513 'Nasal - convexity of lateral edge ' / convex_or_straight__ 'concave, so that paired nasals are
 hourglass-shaped',
 514 'Metatarsal III - shape of medial edge when articulated, taking into account curvature of shaft ' /
 distally_concave_to_slightly_convex_ with_deep_convexity_localized_distally_
 515 'Ilium - convexity of pubic peduncle articular surface ' /
 convex_with_angled_anterior_and_posterior_components__ convex_and_rounded_ flat_or_concave_
 516 'Ilium - distal anteroposterior expansion of pubic peduncle ' / unexpanded_ expanded,
 517 'Axis - lateral surface of centrum ' / solid_ pneumatized_by_pleurocoel,
 518 'Maxilla - medial wall of maxillary antrum ' / solid_ pneumatized_by_medial_antral_fenestra,
 519 'Surangular - dorsoventral depth at intersection of dentary and external mandibular fenestra ' /
 '>50% mandibular depth at that level ' '<51%',
 520 'Pedal ungual II - convexity of posteroventral edge between articular facet and flexor tubercle ' /
 convex_or_straight_concave_due_to_notch_at_base_of_tubercle_
 521 'Sternum - ossification ' / unossified_in_adult__ ossified,
 522 'Pedal digit II - length compared to pedal digit IV, excluding metatarsals and unguals ' / '>79% '
 '<80%',

absent_present, 523 'Metatarsal III - transverse medial and lateral bulges on shaft just proximal to articular condyle' /

524 'Metatarsal II - length compared to metatarsal IV' / 'much shorter, <98% of length of metatarsal IV' 'subequal, lengths within 2% of each other' 'much longer, >102% the length of metatarsal IV',

unprojected_with_longitudinal_ridge_, 525 'Metatarsal IV - projection of lateral surface dorsal to lateral flexor ridge on distal end' /

extends_posterior_to_interfenestral_wall_, 526 'Maxilla - posterior extent of postantral wall' / no_greater_than_interfenestral_wall__

527 'Teeth - texture of labial and lingual surfaces' / smooth_fluted_basoapically_,

evenly_projected_along_spine_ 528 'Dorsal vertebrae - anterior projection of interspinal ligament scars on neural spine' / 'more projected dorsally, forming beak-like process',

covered_by_lateral_lamina_of_dorsal_process__at_least_partially_visible_laterally__, 529 'Maxilla - lateral exposure of promaxillary fenestra' /

530 'Antorbital fossa - proportions' / longer_than_tall equal_to_taller_than_long,

531 'Jugal - length of posterior process' / '>15% of total jugal length' '<16%',

posteriorly_concave, 532 'Furcula - cross section of omal ends of arms' / posteriorly_convex_to_flat_

pleurocoels_absent, 533 'Cervical vertebrae - post-axial central pneumatization' / pleurocoels_present

prezygapophyses_articulate_ventral_to_postzygapophyses prezygapophyses_articulate_dorsal_to_postzygapophyses,

535 'Uncinate processes - articulation to dorsal ribs' / unfused_fused,

distinctly_projected_as_a_semilunate_ridge_, 536 'Ulna - posterior projection of dorsal condyle' / unprojected_or_minimally_projected_

537 'Ischium - distal extent of pubic contact' /

limited_to_acetabular_area_and_sometimes_obturator_process 'extensive, along most of ischial shaft',

538 'Nasals - transverse convexity of combined dorsal surface' / relatively_flat_to_concave

strongly_convex,

539 'Jugal - convexity of anterior tip' / convex_concave_due_to_bifurcation,

540 'Radius - length compared to humerus' / '<51%' '50-90%' '91-110%' '>110%',

541 'Premaxillae - form of contact at symphysis' / unfused_fused_anteriorly_but_not_posteriorly

completely_fused,

542 'Dentaries - form of contact at median' / unfused_fused,

543 'Dentary - anteroventral surface of tip' / smooth_

with_groove_extending anterolaterally_from_ventral_corner_of_symphysis__,

544 'Premaxilla - length of ventral margin' / '<91% of orbit+jugal height' '>90%',

'>60%', 545 'Premaxilla - length of dorsal process' / 'from tip of snout, extends <61% of preorbital length'

546 'Vomer - extent of contact with pterygoid' / broad_narrow absent,

547 'Palatine - extent of contact with pterygoid' / 'long, overlapping' 'short, vertical',

548 'Palatine - contact with premaxilla' / absent present,

549 'Vomer - contact with premaxilla' / present absent,

550 'Basisphenoid - anteroposterior position of basiptyergoid processes' /

located_basally_on_basisphenoid_body located_anteriorly_on_parasphenoid_rostrum_,

551 'Basisphenoid - orientation of articulation with pterygoid' / anteroventral mediolateral

dorsoventral,

552 'Pterygoid - convexity of articulation with basisphenoid' / concave flat_to_low_and_convex

'highly convex, forming stalk',

553 'Pterygoid - angle between palatal process and posterior end in lateral view' / 'present,

posterior end kinked dorsally' 'absent, element straight',

554 'Interorbital septum - ossification' / unossified ossified,

555 'Mesethmoid - anterior extent' / barely_surpasses_frontals_if_at_all_

extends_far_anterior_to_frontals,

556 'Basisphenoid - lateromedial position of ossified eustachian tubes' / lateral

medial_but_widely_separated_medial_and_adjacent_or_medial_and_confluent_,

557 'Basisphenoid - ventral surface anterior to basisphenoid recess' / solid

perforated_by_paired_foramina_or_medain_foramen_for_ossified_eustachian_tubes,

558 'Squamosal - length of ventral process' / projects_noticeably_ventral_to_quadrate_notch_

absent,

559 'Quadrate - form of articulation with pterygoid' /

pterygoid_broadly_overlaps_medial_surface_of_pterygoid_process

restricted_to_anteromedial_edge_of_process_or_body_of_quadrate_,

560 'Quadrate - position of articulation with pterygoid' / extends_to_tip_of_pterygoid_process_

'extends to pterygoid process, but ends before tip' restricted_from_pterygoid_process,

561 'Quadrate - convexity of pterygoid articulation' / flat_or_slightly_convex highly_convex,

562 'Quadrate - anterolateral surface on dorsal portion of pterygoid process' / flat_with_tubercle,

563 'Quadrate - form of articulation with quadratojugal' / planar condylar trochlear,

564 'Quadrate - proximal articulation with prootic and/or opisthotic' / absent present,

565 'Quadrate - number of distal condyles on posterior edge' / two_or_less 'three, with posterior

condyle between lateral and medial condyles',

566 'Articular - pneumaticity' / solid pneumatized_by_diverticulum_of_the_tympnic_airsac_,

567 'Splénial - anterior extent' / does_not_extend_close_to_mandibular_symphysis_ 'extends

close to, but does not participate in mandibular symphysis' participates_in_mandibular_symphysis_,

568 'Dentaries - transverse convexity of posterior symphysis' / concave flat_or_convex,

569 'Dentaries - dorsal surface of fused symphysis' / solid with_one_or_more_foramina_,

570 'Dentaries - arrangement of symphyseal foramina' / median paired,

571 'Dentaries - position of symphyseal foramina ' / on_posterior_edge_of_symphysis_ on_dorsal_surface_of_symphysis,

572 'Splenic - medial overlap of Meckelian groove ' / 'absent, Meckelian groove exposed ' 'present, Meckelian groove hidden ',

573 'Jugal - contact with postorbital ' / present absent,

574 'Frontal - contact with parietal ' / unfused fused,

575 'Cervical vertebrae - convexity of posterior articular surface ' / flat_or_concave convex 'concave dorsoventrally, convex horizontally ',

576 'Dorsal vertebrae - size of hypapophyses on dorsals posterior to third ' / absent_or_small large_on_at_least_some,

577 'Dorsal vertebrae - number ' / more_than_12 12 11 10_or_less,

578 'Dorsal vertebrae - anteroposterior position of parapophyses ' / anterior_to_diapophyses_ at_same_level_as_diapophyses_,

579 'Dorsal vertebrae - transverse compression of centra ' / length_less_than_midlength_width_ length_equal_to_or_greater_than_midlength_width_,

580 'Dorsal vertebrae - convexity of lateral centrum surface ' / convex_to_slightly_depressed_ 'highly concave due to deep fossa, which may be dorsoventrally compressed to form a groove ',

581 'Dorsal vertebrae - connection of adjacent transverse processes ' / 'absent, processes separate' processes_connected_by_ossified_ligaments_,

582 'Dorsal vertebrae - fusion ' / no_dorsals_fused_together_ at_least_two_anterior_dorsals_fused_to_form_notarium,

583 'Sacrum - length of ancestral avepod thirteenth dorsal and first two sacral centra ' / at_least_one_longer_or_equal_to_more_anterior_and_posterior_centra_all_shorter_than_surrounding_centra_ at_least_one_adjacent_centrum_also_shorter_than_surrounding_centra_,

584 'Caudal vertebrae - length of transverse processes in caudals 1-5' / equal_to_or_longer_than_centrum_width_shorter_than_centrum_width_,

585 'Caudal vertebrae - number fused into pygostyle ' / more_than_five_three_to_five two,

586 'Gastralia - ossification ' / ossified unossified,

587 'Sternum - extent of ventral median keel ' / restricted_to_the_posterior_part_ extends_from_close_to_anterior_edge_to_posterior_part_restricted_to_the_anterior_part_,

588 'Sternum - pneumatization of dorsal surface ' / solid invaded_by_one_or_more_diverticula_of_the_clavicular_airsac_,

589 'Sternum - pneumatization of lateral edge between sternal rib articulations ' / solid invaded_by_diverticula_of_the_clavicular_airsac_,

590 'Sternum - distance between coracoid sulci ' / wide narrow sulci_overlap,

591 'Sternum - number of sternal ribs that contact sternum ' / two_or_less three four five six seven_or_more,

592 'Sternum - topology of ventral surface lateral to midline ' / smooth 'with longitudinal ridge, an intermuscular line between the m. supracoracoideus and m. pectoralis ',

593 'Sternum - shape of posterior edge near midline ' / unprojected_without_fenestra_ with_free_posteromedial_processes 'with posteromedial processes fused distally with posteromedian process, forming paired fenestrae ',

594 'Clavicles - median fusion ' / fused_to_form_furcula_unfused,

595 'Furcula - shape of omal tips in dorsal/ventral view ' / flat_to_rounded_pointed,

596 'Furcula - shape of ventral edge ' / convex flat_to_concave,

597 'Scapulocoracoid - convexity of mobile articulation ' / 'concave on scapula, convex on coracoid' flat_on_both_bones_ 'convex on scapula, concave on coracoid ',

598 'Coracoid - topology of anterior (medial in Aves) edge near level of scapular articulation ' / unprojected_with_procoracoid_process_,

599 'Coracoid - convexity of posterior (lateral in Aves) margin of distal portion ' / concave_or_straight convex,

600 'Coracoid - pneumatization of proximal area, near scapular articulation or coracoid tuber ' / solid invaded_by_diverticula_of_the_clavicular_airsac_,

601 'Coracoid - pneumatization of mediolateral (posterodistal in Aves) area, near sternal articulation ' / solid invaded_by_diverticula_of_the_clavicular_airsac_,

602 'Coracoid - shape of posterior (lateral in Aves) edge just proximal to sternal articulation ' / confluent_with_more_proximal_part_of_edge_projected_into_lateral_process_,

603 'Coracoid - topology of posterior area of lateral surface (lateral area of anterior surface in Aves) ' / smooth 'with ridge extending distally from coracoid tuber to sternal articulation, an intermuscular line between origins of the m. supracoracoideus and m. coracobrachialis posterior ',

604 'Coracoid - shape of acrocoracoid process ' / straight_or_curved_laterally_curved_medially,

605 'Coracoid - position of supracoracoid nerve ' / 'passes through coracoid, resulting in coracoid foramen' 'does not penetrate coracoid, coracoid foramen absent ',

606 'Coracoid - convexity of external surface surrounding coracoid foramen ' / concave flat_or_convex,

607 'Coracoid - size of portion proximal to biceps tuber ' / 'present, forming distinct protrusion or area of the bone' absent, biceps tuber at same level as scapular articulation ',

608 'Scapula - curvature of shaft in lateral view ' / straight_or_dorsally_curved_ventrally_curved,

609 'Scapula - curvature of acromion ' / lateromedially_straight_or_medially_curved_ anterior_portion_curved_laterally,

610 'Humerus - convexity of proximal edge of humeral head when viewed perpendicular to long axis' / concave_to_flat convex,

611 'Humerus - closure of capital groove ' / groove_open groove_closed,

612 'Humerus - convexity of anterior edge of head in proximal view ' / straight_to_convex_ concave,

613 'Humerus - separation of head from more distal humerus on anterior surface ' / confluent separated_by_transverse_groove_for_acrocoracohumeral_ligament_

614 'Humerus - orientation of deltopectoral crest in proximal view ' / in_line_with_long_axis_of_humeral_head_angled_from_long_axis_of_humeral_head_

615 'Humerus - convexity of proximolateral/posterior surface of deltopectoral crest ' / convex_or_flat_concave_

616 'Humerus - surface of deltopectoral crest ' / solid_perforated_by_fenestra_

617 'Humerus - surface of bicipital crest ' / smooth_scar_or_fossa_for_m._scapulohumeralis_posterior_

618 'Humerus - position of m. scapulohumeralis posterior insertion ' / 'medial (anterior in Aves) surface of bicipital crest ' distal_surface_of_bicipital_crest_'lateral (posterior in Aves) surface of bicipital crest '

619 'Humerus - medial (anterior in Aves) projection of bicipital crest ' / absent_moderate_highly_convex_

620 'Humerus - proximal pneumaticity ' / solid'invaded by diverticulum of the clavicular airsac near base of lateral (posterior in Aves) surface of bicipital crest '

621 'Humerus - orientation of ectocondyle ' / mostly_proximodistal_mostly_transverse_

622 'Humerus - shape of entocondyle ' / rounded'ridge-like',

623 'Humerus - angle of distal edge ' / perpendicular_to_shaft_or_angled_so_that_ectocondyle_is_further_distal_angled_so_that_entocondyle_is_further_distal_

624 'Humerus - anterior surface just proximal to condyles ' / flat_concave_for_origin_of_M._brachialis_inferior_

625 'Humerus - size of entocondyle ' / long_axis_shorter_than_long_axis_of_ectocondyle_equal_or_longer_

626 'Humerus - lateral side of posterior surface on distal end ' / flat_with_longitudinal_groove_for_passage_of_m._scapulotriceps_

627 'Humerus - medial side of posterior surface on distal end ' / flat'with longitudinal groove for passage of m. humerotricipitalis, confluent with olecranon fossa '

628 'Ulna - separation of lateral and medial cotylae ' / confluent_or_only_separated_by_ridge_separated_by_groove_

629 'Ulna - convexity of lateral cotyla ' / concave_or_flat_convex_

630 'Ulna - anteroproximal surface ' / flat_scar_for_the_insertion_of_the_M._biceps_brachii_tubercle_for_the_insertion_of_the_M._biceps_brachii_

631 'Ulna - anteromedial surface of proximal end ' / flat_scar_for_insertion_of_m._brachialis_

632 'Radius - posterolateral surface ' / flat_with_long_scar_for_m._pronator_teres_with_long_groove_

633 'Ulnare - length of medial (ventral) ramus ' / shorter_than_lateral_ramus_subequal_to_lateral_ramus_longer_than_lateral_ramus_

634 'Metacarpal III - distal contact with metacarpal II ' / 'absent, contacting or sutured ' fused,

635 'Metacarpal III - minimum transverse width compared to minimum transverse width of metacarpal II ' / '>49%' '<50%',

636 'Metacarpal I - development of medial process for insertion of m. extensor metacarpi ulnaris' / unprojected_or_slightly_convex_'greatest length of extensor process (measured medially from proximal metacarpal articular surface and lateralmost part of medial edge of metacarpal I) 8-20% of transverse width between medial edge of distal articular surface of metacarpal I and lateral edge' '21-30%' '>30%',

637 'Metacarpal I - proximodistal convexity of medial edge ' / concave_or_straight_convex_

638 'Metacarpal II - proximal part of ventral surface ' / flat_pisiform_process_for_retinaculum_flexorum_

639 'Distal carpal I - ventral surface ' / flat_with_infratrochlear_fossa_for_ventral_radiocarpometacarpal_ligament_

640 'Metacarpal III - distal extent ' / proximal_to_or_subequal_to_metacarpal_II_distal_to_metacarpal_II_

641 'Metacarpal II - dorsolateral surface near middle of shaft ' / smooth_scar_for_insertion_of_m._extensor_carpi_ulnaris_longus_intermetacarpal_tubercle_or_process_for_insertion_of_m._extensor_carpi_ulnaris_longus_

642 'Manual phalanx II-1 - projection of laterodistal margin ' / does_not_extend_distally_past_articular_surface_extends_past_surface_as_internal_index_process_

643 'Pubis - contact with ilium ' / articulated_fused_

644 'Ischium - contact with ilium ' / articulated_fused_

645 'Pubis - contact with ischium ' / articulated_fused_

646 'Ischium - contact between mid dorsal process and ilium ' / absent_present_

647 'Ischium - contact between proximodorsal process and ilium ' / absent_present_

648 'Ilium - position of antitrochanter ' / mostly_posterior_to_acetabulum_mostly_dorsal_to_acetabulum_

649 'Pelvis - development of pubic tubercle on anterolateral surface of proximal pubis or pubic peduncle of ilium' / undeveloped_or_a_scar_'process for attachment of inguinal ligament, M. obliquus abdominus and/or M. ambiens '

650 'Iliia - contact between dorsal edges of preacetabular processes or between dorsal edges and sacral neural spines' / absent_or_freely_contacting_fused_

651 'Ilium - overlap with last dorsal rib ' / absent_present_

652 'Ilium - orientation of postacetabular process in section ' / mostly_vertical_mostly_horizontal_

653 'Ilium - internal surface of postacetabular process ' / flat_with_renal_fossa_for_posterior_portion_of_kidney_

654 'Pubis - transverse compression of midshaft ' / anteroposteriorly_compressed_or_equal_transversely_compressed_

655 'Femur - convexity of anterior edge of distal end' / convex_to_slightly_concave 'markedly concave, forming deep extensor or patellar groove',

656 'Femur - confluence between lateral condyle and ectocondylar tuber' / separated_by_notch_joined_into_tibiofibular_crest_,

657 'Femur - posterior projection of posterior surface just proximal to lateral condyle' / in_line_with_medial_surface_distinctly_more_posteriorly_projected_than_medial_surface_,

658 'Femur - transverse position of lateral edge of ectocondylar tuber or tibiofibular crest' / 'far medial to lateral edge of lateral condyle, <90% of distance across condyles, measured from medial edge' 'roughly in line with lateral edge of lateral condyle, 90-100% of distance across condyles' 'lateral to lateral edge of lateral condyle, >100% of distance across condyles',

659 'Astragalocalcaneum - anterior projection of medial condyle' / much_greater_than_lateral_condyle 'slightly greater to less than lateral condyle (measuring from a line across the posterior tip of each condyle, medial condyle extends anteriorly <110% as much as lateral condyle)',

660 'Tibiotarsus - lateral side of anterior surface just proximal to distal condyles' / flat with_open_longitudinal_extensor_canal_for_ligament_of_m_extensor_digitorum_longus_ossified_ligament_crossing_extensor_canal_to_form_supratendinal_bridge_,

661 'Astragalus - anterior surface of ascending process' / concave_or_flat_ with_tubercle_for_attachment_of_retinaculum_bridging_m_tibialis_cranialis_and_m_digitorum_longus_,

662 'Astragalocalcaneum - transverse width of medial condyle' / '>110% transverse width of lateral condyle (measured from point of greatest constriction between condyles)' '<90%',

663 'Astragalocalcaneum - convexity of anterior edge of medial condyle' / highly_convex straight_or_almost_straight_,

664 'Tibia - proximal extent of trochlea for the tibial cartilage on the posterior surface of the distal end' / proximal_extent_less_than_51%_of_distal_tibiotarsus_transverse_width_'>50%',

665 'Tibia - definition of lateral and medial edges of trochlea for the tibial cartilage on the posterior surface of the distal end' / undifferentiated_from_adjacent_bone_or_low_rounded_ridges_defined_by_sharp_crests_continuous_with_distal_condyles_,

666 'Tibia - distal transverse expansion' / 'transverse width just proximal to distal condyles >150% of midshaft transverse width' '<151%',

667 'Metatarsal V - presence' / present absent,

668 'Tarsometatarsus - proximal surface' / flat with_central_raised_intercotylar_eminence_,

669 'Tarsometatarsus - proximal part of posterior surface' / flat raised_hypotarsus_with_flat_posterior_surface raised_hypotarsus_with_grooved_posterior_surface_for_flexor_tendons_ raised_hypotarsus_with_perforated_posterior_surface_for_flexor_tendons_,

670 'Metatarsus - dorsal and ventral surface near proximal end between metatarsals III and IV' / solid with_vascular_foramen_,

671 'Metatarsus - dorsal and ventral surface near proximal end between metatarsals II and III' / solid with_vascular_foramen_,

672 'Metatarsal I - posterior curvature' / 'absent, shaft straight in medial view' 'present, shaft J-shaped',

673 'Metatarsal II - surface for articulation of metatarsal I' / flat_or_convex_slightly_concave well_developed_fossa_,

674 'Metatarsal II - transverse width of trochlea' / '<80% of metatarsal III trochlea' '80-130% of metatarsal III trochlea' '>130% of metatarsal III trochlea',

675 'Metatarsal IV - transverse width of trochlea' / '<60% of metatarsal III trochlea' '60-200% of metatarsal III trochlea' '>200% of metatarsal III trochlea',

676 'Metatarsus - distal surface between fused metatarsals III and IV' / solid_ with_vascular_foramen_,

677 'Metatarsal III - proximal extent of lateral trochlear edge on posterior surface' / less_than_or_equal_to_medial_trochlear_edge_greater_than_medial_trochlear_edge_,

678 'Chevrons - length of posterodistal process on distal caudals' / shorter_than_centrum_longer_than_centrum_,

679 'Exoccipital - length of metotic strut, measured from base of paroccipital process to tip of basal tuber' / '<35% of height from tip of basal tuber to skull roof' '>34%',

680 'Basisphenoid - lateral surface ventral to trigeminal (V) nerve foramen and anteroventral to otic recess' / flat_excavated_by_main_portion_of_anterior_tympanic_recess_,

681 'Basisphenoid - position of anterior tympanic recess' / extends_posterior_to_basipterygoid_processes_restricted_to_above_or_anterior_to_basipterygoid_processes_,

682 'Pedal phalanx II-2 - height of distal end' / greater_than_79%_height_of_proximal_end less_than_80%,

683 'Ulna - size of lateral cotyla' / smaller_than_medial_cotyla equal_or_larger_than_medial_cotyla,

684 'Quadratojugal - size' / 'length of ventral margin >29% of jugal+orbit height' '<30%',

685 'Frontal - surface of articulation for postorbital' / smooth_or_slightly_notched_ deeply_notched,

686 'Furcula - cross section of center' / compressed_dorsoventrally_to_slightly_compressed_anteroposteriorly highly_compressed_anteroposteriorly,

687 'Furcula - width of epicleidial ends' / equal_or_narrower_than_arms_broader_than_arms_,

688 'Furcula - width of arms' / equal_or_narrower_than_center_and_epicleidia_ broader_than_center_and_epicleidia_,

689 'Furcula - anterior surface of hypocleidium' / flat_or_rounded_keeled,

690 'Furcula - symmetry' / asymmetrical_nearly_symmetrical,

691 'Furcula - robusticity' / 'width halfway down arms <20% of arm length' '>19%',

692 'Distal caudal vertebrae - separation of postzygapophyses' / separated_posterior_to_centrum_joined_by_lamina_past_centrum,

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Coelurus
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Tanycolagreus
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Aristosuchus
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Xinjiangovenator
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Ornithomimus

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Cerro_del_Pueblo_orn

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Tototlimimus

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mongoliensis

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1}??0??200200001100?01?0?-(0 1)?????1?011?201?1?21?1?0?0?-(0 1)--11?01000??0--112211?000{0 1}0??-
11?1??3010?0?000?01??0?--2010?{0 1}??1010011000300100210100111--?2{1 2}000-
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MNAPI1762A

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sedens_holotype_only

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Rativates

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00????????00-??0?0??-0--?1001?000-?-?02{1 2}110000000?-?????{2 3}01000?0?0??0??-
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Struthiomimus
 ?00110101100111?010110?101021001011011000102000000000000101000001?0011002010001020101-1-----1-001010100(0 1)(0 1)0010?01100000?0011001000---001(0 1)001200000010001301001110000110001010002100001000010100000011002000001?(0 1)00000201--001?03-01000001101-03001(0 1)?-000(1 2)?02(0 1)??01000?010(0 1)0-00???0(1)00?(0 1)1211100-111001010-11001000--1--1022110000001?-11110030100020(0 1)01011000--2{1 2}?0-10110100110113001102001?0111--032000-(0 1)(0 1)100100001000000000?1?0?100010-0?11000{0 1}10001--???0?1-00?00000100000000?{0 1}10?-?0000?00000?00-00-10--100-???01?0(0 1)0001??1?1-001(0 1)0?-0100-0?-001(0 1)100000??00?0?0?0?0?00?0?0--?00(0 1)010?00?0-0-----00?00-010001-??1000-{0 1}0?01?101--{0 1}1{0 1}00000?00{0 1}0000--0000?0?000010010000001----{0 1}1-?01101-00-----110?00100

Gallimimus_bullatus ?002111011001?100101101101021101010-1100010200000010000001?001100(1 2)010001020001-1-----1-0010101000000111011200000001100(0 1)00?????01100012000000?000130100011000011000101000210000100000110000001100200010?1000000201--001002-0100001?001-0200(1 2)0?0002(0 1)0201100000101000-00???100011211100-10110101-0--11001000--1--1122110?000010-11010030120020001010000--2110?10?10100110002001001100111--030000-1010010000(0 1)000000000110000000?0?0001?000{0 1}101?(0 1)--0000001?00000001100000010?00-00100100000000-00-10--100-1100-0010001011?0-?01(0 1)0?-0100?00-001010000000?0{1 2}0000-000?-0000100---000010100000-???????0?0?00-010001-101?00-001010100--110?00000?0{0 1}0000--00001000000000000001----11--00100-00?????111100100

Timimus
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Anserimimus
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Qiupalong
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Dromaeiomimus ?00(1 2)001011?00?1001011010210010(0 1)11(0 1)10000(0 1)20000001000000(0 1)01000001?0??101(1 2)01000(0 1)0?0001-1-----1-0010111(0 1)000001(0 1)10110000000011001000---0(0 1)1(0 1)00(0 1)200000?000030(0 1)2(1 2)1100001100010000(0 1)(1 2)100010000(0 1)1100000011002000?010(0 1)00000(2 3)01--001103-0(0 1)(0 1)00011001-021(1 2)11-001(1 2)000(0 1)1001000100000-001101000(0 1)1211100-1110101-0--11001100001--10(1 2)2100100(0 1)01?-11010030110(0 1)20001011001--(1 2)110-1(0 1)0(0 1)01(0 1)01(0 1)0(0 1)3001002101?011(0 1)-0(2 3)00(0 1)0-0(0 1)01001000(0 1)(0 1)00000000?(0 1)00011100?0-001?0001100?1--(0 1)0??100(0 1)-010000011000000010--0-0(0 1)000?000(0 1)0?00-00-10--10001000100(0 1)000(0 1)211110010?0-0101-00-0010100000????010?0???00?-?0001?0---?000?101000(0 1)0-0-----00?00-010101-10110?001001100-0??0000??0{0 1}0(0 1)(0 1)(0 1)---00000?0000?00?0000?{0 1}----00-?0010?-00-----0(1)?100100

Kinnareemimus
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 Fukuiventor ??{1 2}101010?~111010001000?0-????00?0?????0?0?1110??01????10001??0??0?0?0?0?0?02?{1 2}--(0 1)????(0 1)10100010000001{0 1}00{1 2 3 4 5 6 7}(1 2)0??10?1011?00?????01000?000000101?00?(0 1){0 1}0?000111?????????????????????????????????0{0 1}0011?0????0????000000000?00?1003?0??10???0?{0 1}-011001?0002101?01????201001(1 2)????001?000?00{0 1}0?00000??(0 1)00?0??200??1{0 1}??{1 2}110100?0??1?01?010000??0000?1????(1 1)

2)0?????1??1????N0?????00?????????1??0?????????????0??00??0?????????????0011?????0??1????
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Achillesaurus

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Alnashetri

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Albertonykus

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Ceratonykus

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101?0001?0?0?001110??????????????{1 2}??{1 2}?0??0?1?????????????????????00?0?-
1????????????????1??????????{2 3}0????00{0
1}0?????????1?1?????????????????????1?????????????????????????1?????????0??101110?03??????1?????????
??0?0?????????0?????????????????0?0?????????11?????0??00?000?????????0?0?0?0?????1?????1?1?
-1?1?1?????2?0?001?????2?????????1?????????????????1?0?11?????0??0??-?????000?0?0
1)??0?0?????????0?0?1?????0?????1?????????2?10?????????????????????????????0??0?0?0?000?--?????
-??0?0?0??1?1??10????-?1?????0?????????0??0??0?????1?1?????1?0????????????{0
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Qiupanykus

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Albinykus

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1010100000{0 1}-?0?11-?????0?????????101?????

Xixianykus

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020110000010000111111?30?????1?????????????????0300?????????0?????010010?0?????????????????1
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0????????0221?????????????????????????????????????21?????????????????????????02100111????32????????-
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?11?????????????????????????????????????010?0?0?0????????????????????????????????????????????
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Falcarius ????1?01?001110{0 1}0?011{0
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200120002111010100000010001000?01?00000000?00?1?????????0?10?1(0 1)021021??02011110000001{1
2}000??11????1001?000?000?01011111(0 1)01011100??0?1{0
1}11121?????????1?01??0?1?00????1??10??0221?01??{0 1}011111(0 1)0020000001-10(0
1}100001102000?10000?000?0?0?0000010?0100?0?1010001101?010110110(0 1)000201?0110111001011000-
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Jianchangosaurus
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2)0?11?00?02001?0000010?????0{0 1}11?0?00?1001?1{0 1}0000??0?1?{0 1}0110?10?100{0 1}01?1{1
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1}1???10?010?0?0?11?001?????????1?1?00?0?0?0?N000?????????0?0?0?00?0?00?0?0?0?0?0?0?0?0?0?0?0?0?
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0?00?00101NN000?????????0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?
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Beipiaosaurus
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1}0?0??10?1000?110?21?0?00?010?1?0110101?0N200001?00(0 1)002{1
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Alxasaurus
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1}0??????0000000?000?????????????????10010010?0?01?0?????011?0?100???{1
2}1?????0?001?1?0?0?0??101110?000100?????0?-????????????1??{2 3}?????????????0??0211(0
1)21??1010101100?00?11?1?0?0?0?0?201011?10?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?
1?01?110?0?10111?210?-
??11110?011?1?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?
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Enigmosaurus
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zheziangensis
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Suzhousaurus
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1}02000100????????????????????????????????????????00102??0?010????00001????????????0?????????1
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1}1?12010000010???1222100101110????????1?????????0?0?0?0?1?????21????????????0?????0?0??????
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1}01000100????????????????0000-000?0010001????????????????????????????????????????????????????????

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Beibeilong

??100?N?????????????????????11?01?0?N?1202?00?????????????????1??2102?2?0?0??11??1---??-
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2}?????????????1?0????000?????????????????????????1?112?0?????-??-?00????000?-
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Gigantoraptor

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1}?????????????????101100021?1011010001011001001000?000{0 1}?????????????????1?0{1
2}??0?????1?011??0?00??{0 1}00000{1 2}??0?00-0000?02?00?0?????-??0?0?0?0?0??0?-
1?????????????1?23?????????????11?-
??0?2??1?10??1????0?????????1?0?????1?1?00?1?1?????1?100?????????00?0?1?0?0??1?0?1?1??0-
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1?10?????????????????????????00--
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2}0?00??-0??-?0????0?????????00??00

Tongtianlong

?10?0??01?????????????????????20?0?101?1?10011202100?01000?0?1?????????????10{1 2}0201?????????1-1-----
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2}0??????0?0?????????00100?0?????????000-?010?00??1-0{0 1 2}{0 1}????10?01?????????????{2 3}??0?{1
2}?????????????00??20??0??-?-?????????0?0-?????????0 1}??{0 1}10?-10????021??102?000100?1?-{1 2}{0
1}1?021?{0 1}01?????????????????1?0??0??2?00??0?0?1?0?????1????010?1?????????????0?????????????1--
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??0?????????0?00????????????????-??0?????????????????00?--??11-?????????100?00?????0?0?

Oviraptor

?1?0?10100?????????????1???10??1?0011???001202?0?111000000?01?0?0??121020201?00??11??1---??-
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2}?????????????????????????????????????????????????????????0?{0 1}0?10?011?01??{0 1}0??001?{1
2}01100?0?????????????????001?0000??2?0?????00-??-?1?????0-0?-
11????0?00010?10?1??211??2?100101?1?-?0??020-
10111?1000200?1000?????????0?2?0?00?00?111????10??0000?0?0?11?0?0?????0?????0?-
00?????0010????10????0?0?????????????????????--??00?0?0-
??11?0?0??10??1?1????????1000??0?101??0?1?0?0??10??000-?11?????????00?????0??????????{1 2 3 4
5}??010-?????-??000????00?????????0?00????{0
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Banji

?1100-1NN01?????????????????{1 2}0?1?????1??NN?120{1
2}????0N100?0?????11?0????21020201?10??11-1-----?
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?110??????1??100?????????1????0?????1?0?{1
2}?????1????????????????????????????????????????????????????????????????????????????????
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Yulong

?111011NN0?????????0?????1101?10????0NN012021?0?1NN00000?1??11?????21020201?0020111-1-----
?-?????0?00?????2?????????0?????{0 1}{1 2}?????????????1?N?0200?21????N?000000(0
1)100?020?0?????????????????0?????????????00?0?0???N?0N?0100{1 2}0??1001-001001100?2-?????{0
1}?????1?0????00????03?????{0 1}?????0?000?000{0 1}2?0?0??-??-??0???0000--??0?110010211?-1001?1{2
3}0101N2111010?11--?????????1?10?????0{0 1}0?00{0 1}{0
1}1?0?100??2100?000?????1?N?11000010??1????01?????100?0?0?0?0--
?????????1?0??0?0?????0?0?????????1?????0?0??-??10--00?0?????????10??1?1??0??-
?1?0?0?0?1?2NN001?????????1?????0??1?????????0N?????1????????????N?????????????????1N?????
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Huanansaurus ?1100-1011?????????????????1
2}011?100?000?1202?????111000?0011?010????121020201?00??11-1-----?
?01?1??10?????????????????????????1?????????????2100?????????0000000111????????????????
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2}??110?????????10?0??2?????10?000??2?0?????-?-??0???00-0-?????-0-1001??-10?1??{2 3}11-
1?2111?101?1-2?????????1????01?1{0 1}00010?????1????0{1
2}00?0?0?????1111?10?1?10?????????????????00?0?????1?0-0?????????1
2}?????1??10????????????????????????-??10--0?-??0?10??0?0?0?1-10?100?-?100?0??????2{1

2)000?????????????0??1?0?0?0??000?????????0?????????????????????????????????????1?0?????????0?????0
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Wulatelong ?11????010???????????????????
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2)?00??0(0 1)?1?????010?????1(0 1)?1?(0 1)??????00?0(0 1)?0(0 1)0010?2100??1????1(0 1)?0?1
2)???2?12?2?0?????01?????????????00??1????002000-??20??????(1 2)?0(0 1)????(0 1)?????{1
2)?2?000000?????00?????????0?0?0?010?????????????????0????00-0?-1??????(0 1)?011?-
?0?????1?????2?1????0??-?0??????10?????????0(0 1)?10??0-1?0?10??2{1
2)?0????0??11????0??00????????????0?????????????????????0??0??????????????(0
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Corythoraptor
?11????01????????????????10111????????????0?????????????????????????????????2?02?20??0????1-1-----?-
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1??1???31??????11?0?0?0?-2??????(0 1)?1?100?0000100{1 2)-10010?00220?00??1?1????(0
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Nomingia
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Rinchenia ?1121100101?01?-?100-2-
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1)?1?01020011110?????????????????01101000?0?????0?00?01?0?00?000-000001?002-
01?0?0??10100?????001?????0??(1 2)????0??100?00102000?????-0-?00????00-0-?1?2?0?1?011?-
1001?131????020110101?11-(1 2)0 1)10?21-0
1)010?????????00??1?1??1?00??201?0?01?1?111001100000??1?????????0?01?0??????10--
?1?0?0?010000000?????001210?????1?1????0?1?-0?00-000-(0 1)?11010?00?111?11?????-?
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??000??0?00?00?0?2(0 1)?????????00?0?0000?00?1?????????-??1-?00????0?????????0?0?1??

Nankangia
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2}1201?00?1101?100?000111?00????????????????????????????????????2?010??(0
1)???1011????01000?????????????1?????0?1021?0??????(0 1)?-
?1??10????0???1221???????????????3?????????????0?0?-?01??21-10?????????????????101??????????(0
1)?????1?????1?0?0?001?????????0?00?0?0?????0-?0000??1010010?10?????0(0 1)?2010-
100?0?0?0?01?00????????0?????1?????21?1?????0?0?0?0?0?000?????????????????????---
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IGM10022 ?11(0 2)1110101?11?-0000-2-21102011110?11?000(0
1)1202000?111000001100110000012102020100020111-1-----1-

1011101100010121011200010000100111?01011001110110000??10000000001110102101{1
2}1110201000111101100?2-0101000000001000000100?0001001-00100010?02-010?(0
2)010010111110001000?20000?1??00001000001121000000-0--110?10010-0--11221101100110-100100311{0
1}102111(0 1)101011--2010021-
10111010012000000101001100?02101000110111101110000000100?0?????0000?000{0 1}0?00--
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Citipati

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Anomalipes

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Shixinggia

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Khaan

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2)?????00100000102000?00??-0--?1001000--0--1(0 1)121100100110-1011?1(2 3)1101020110101?11--2110020-
10111010001000(0 1)(0 1)00-1000100002201?001?0110?10(0 1)110(0 1)0000?100010111?00?01?000?100?0--
?0000000101000?01001?00?0?000-00(0 1)110?00?0?01-00?00--000-??11000?000101?1110000?-
010000?00010100001?01????????000-00?01{1 2}0---?00??30?00?0-0-0????0010-00??0-1?1?0-
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Conchoraptor

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2)110101110011?00011202100?11100000010111?000112102020101020111-1-----1-10101?1100?1012?0{2
3}120?01?0?0100011?0?01100(0 1)1?021010?0?10001000?10001000 1}01(0 1)11100102010{1 2}111010100011110?00{0
1}??11010100{0 1}000?0000?0000{0 1}00?0002000-00100011002-0??2{0 1}?????1?0
1)11000?1000??000?1?????0?100000112?0?00000-0--?00?10000-0--1122?-0-10011?-100110311-002011(0
1)101?11--2??0?0??0{0 1}?1110?0?0(0 1)0100000?1?0?10??21010?00??011011(0
1)000000????????????????????0?0100?0 1}0010--??0000?000?0000000?0?0??0000000?0?0??00--000-
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Jiangxisaurus

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Nemegtomaia

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2}?????11????????????????????????0?0?001-0010000?12-?{1 2}0?0?????1?01?????0?????1??{1
2}?????0010000112?0?0????-0-?????00-0--1?22?-0-200110-1001??{2 3}11-1020110101?11--
211?????1?01?1000001000?1?1?????0?0{1 2}010?0?0?111(0 1)?1000100?????????????0?0?0?0?????0?00--
0????00?0????00?0?1?0000{1 2}??00?0?0?????????0-??-00--100-1?????0?0?????1?????--
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Heyuannia

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1}?1??1100??000?0?01?0?01?????01100001102100?0?????-??0010????-?10?21????????-
10?10?3?????2?11?01??1--21?002??100010100?001011?0-1?0?10?002{1
2}01?00?0?1?0?011000?11?0?1100?0010?0?0?10?0?????0-?0?????1010000?1???10000?1???-
?00??1?0010?????0???-0???????1?????110??111000?????0?0?0?10?01{1 2}00????????????21????--
-?0?1?1?????0?-0-?????010-?????-010001-??010??0?0?0?00--{0 1}0{0 1}?0000000{0 1}0000--
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yanshini

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2}11010100011110100011(0 1)01110(0 1)0000001101000000?00010?{0 1}-0{0 1}0001?002-
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1)1?0?0?000?0001?011?00001?00001????-???????010010000100000011000-00011100010001-00??--
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Scansoriopteryx

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2}0?2?1200{0 1}-210?0111?1?0?010000?0?00010NNNN000?0300?1?????0?1?1??1-
010012??011300110000000?30?1001?10?0?00-021??100?0?1?0?????1?0--
0??01?1?21???????1?10?????1?????2?1101?01?0(0 1)111?10-001(0
1)1010002N010002?1?0?1001021000010100??0?0000?0?0?0000?0?0?00011?0?????1??????N?00?00?
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Yi

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Epidixpteryx

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1)?20?2?1????0??00????????11?0?????11-0 1}1100?????0??0?1??-000-
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1}2?1?0?13?00?10?0?0?0?N?000?????1?????0?0?0?0?0?1?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?
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Caihong

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2}00?100300?10?????0?021?02?00?1?011?01??0?30?10??1111?000?00?0?0?0?0?0?0?0?0?0?0?000111
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110111??030010?001?0100010000?0?0011010002??1?001?001000000?00000001?0??110?111?1010120?010
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2)?1?0????0????0????????00001?020??1????-?0?1?1??1-0{2 3}1??2?0??1?011001?101?1?0?10??110?(0
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1}010?1??1?12010002001?0??00?0211?11?1011?1?00?2001112?-1?0?101002?0??0001?0?0???(0
1)?00?000????????????0?-
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0020????????????????????????????????????????????????????????????????????????????????
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?N????????????????????????????????????????????????????????????????????????????
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?002010NN0?0??11????011????1100?11?1?N01?202?0?1?1001????1?0?0??0?00?0?2??0?000021{1 2}-
-0020????????????????????????{0 1}?1{1 2}?1????1????????????????????????????????11{1 2}????{0
1}????01?20002{1 2}{1 2}{1 2}001??{1 2}1?1010?00??1?N1?N??20?????11030-100?1????{0 1}-????{1
2}?????0?0????0?00?????0?0?????????1?0?1?0?0?????0{0
1}11??010010?11??1?10000100?010????1010002000101?0?00????????????????????????-
11011????3?????01????00????000????????????????????????????????????????????????????
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Jinfengopteryx ?0?3?000????????????????{1
2)?????0?????????0??102100??01????1?????0?????0?101?0??1?10?000211--(0
1)020??1??????????0?????????1?0212110001---?11111?200?{0 1}??10000100000{0 1}000?1{1
2}??1?????0?2?0??11??10?????????0??????????{0 1}??{0 1 2}0?0010021-00??11?0-0?(0
1)?22?001?2011?0?0101?????{1 2}110?1011?{0 1}?????0?0????????0?10??1?00-
0121?????001000?0??1101101000?00?10??0?00?(0 1)?1?21-0011???0002{0 1}000121?1?0?1????0{2
3}?????0?1?1?0?0??000????????????????1?--
?0????1?????0?1?????????01?00??1????0????????1?????????0????1?????0??00-
????????0????????1?01????0-0????-000?100?00?0?0????0?????????????--?0?01?0?0?1-0---?--??-
000?0?-00010?-??000????????????{0 1}?0000?0{0 1}0000?????0?0????????????1?????????
?0?????0?0????0????
Liaoningvenator ??0200101-0????1????0000??11{1 2}0?01010?1?00????2{1 2}0-
00011??10??110????0?000000010?{1
2}0?????0112100020?00111?00001?0?0?????1?020????????????111011121010????????0000?0{0
1}1??010211????{0 1}?121?0?{1 2 3}{1 2}11????1?01100?0??0??0??1?00??100????11?2?0?1-10??0-03(0
1)?02??0001?01{0 1}?0?0-?0?11?00?????????0?????1001?0?0?00001?11{1 2}010??012?0?{1
2}1000?0?0??1??1?101002?010?1?0??0211?2?11010????00?20000?{1 2}1-
1?011??03100?0000?1?00??1?00?10??1????1????????0????0?????????0001?01?110?0?0?0010?(0
1)??-????????10?0?200?00????0?????0?0??02-
101??100?00101?00?00?01?0000?0?0????????????????????100?1?000?0?0??????????-?1?0?-
??01010????????0?????0????0?0????0000?-??00?0??1?1?????0?0?--??{0 1}-
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IGM1001128 ?1030010??0-10?1-100011110?00101?01100010202010??11--
1010000000????0000000{0 1}0?11?0000?0232--
0220????????????????????0??011?020?1????????????????????1001000?0100011??2?11{1 2}11?{0
1}01100?{2 3}1112121?1?0001????????1?00120020?02102?010?011?0-
????02????002100?10?000111??1?????010010{0 1}0011?0?0?100????{0

1)01?00001{0 1}???(1 2 3 4 5){0 1}010?000?0101????1?11??????10001????????????????000-
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LP 4450 IEI ?1?---

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?10??11??{0 1}-??????1?0?0?10?0????????????????????1????00?0?00?0-00?????1????????11?111????-0-
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??2101101??0?002??1????11??10100N0?11??????????????10?00?0????????00?01??1??1????????????
??????0?0?0?????001?10??????10????????????????????????1???-0??-?????--????????-??????-0?-
01????1??02?00????????????0?????0?????1?0????????????????????0?00?0?0?0?10?00????N??0??1?
00?????N00??1?0????????????????????????????????????????????????????????1?00?0?0?????1??

Concornis

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21211{1 2 3}????10??2100?????1?1110?00030?0{0 1}????????????????030?1?1101?3010?????0?0?0?1-
1{1 2}??11????0??????{0 1}?-??0?????0?0?0--
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1000101??3?0?000????0????????0????1?0??????????{1
2}????0?0?????????????????1?0?0?000?10?????0?0?0????00????????????????????????????????1?0?0?????1?0
0??0?0??1????0??{1
2}????????????????????????????????????????111????0?0?1?01010001?00100?00?110?0102????0??1121??
10????1?0??0?????????00?1?0?00??10?000?10-?????1?100110?0?0?????

Cruralispennia

1?0????0????????????????????????????????????????????????????????????????????????????????????
10????????????????????????????????????--3?-??1?{2 3}1????02??200?0?????0?????1????????1?????21?--
2?3?1{1 2}1{2 3}20????1???11????????1111??0?0{2 3}010{0 1}103????????????1??(2 3)1??-?01?2?{0
1}0?????0?{2 3}0?1?2?1100-01????????{0 1}-?????????0?0??--?11??{1
2}12????????0?0?????1110?0?2100?????????1?11?11-??10?????0{0 1}1?????-1?0?1??1?3?0{0 1}100-
?0????????0?????10?1????000????????-??00?1?1?????01?0?000????0?????0-0?????000?????
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2}?????1????01??0?0?1?0?1?0?0?????????????????0 1}?????00?-????????????????????0?0????2{0 1}-
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Bohaiornis

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2}12?1121????1?001{1 2}00?01?1110?0?0200001030-?1????1?0-?200{0 1}-1101?3010--1100?30?1-12?11??-
00-?210?-?0-?0?0????(0 1)000?0--?(0 1)(0 1)?31211{1 2}??1-0-01200?0?-??1110--00210110??0-10022??1(1 2)1-
211(0 1)1?10(0 1)00211(0 1)(0 1)-2-1?0?1110-210{0 1}000-00?0?NN?-0????111??1????0002?0?1???-
????0?0?????????0?1?1?000??101?{0 1}2??0-??1?1?100????(0 1)1?-?0?0?0?0?1?????1?00?0?-0110?0?-(0
1)0-011??1?00210001????????11????????????000----?02??111??00000?12?1000001?00001-
?00001?010102??1?1?10??1?2-000(0 1)101?00??-1?10?0001????0?0????(0 1)10?00(0 1){0 1}1 2}1-0-
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Parabohaiornis

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N????????????????????0????????N?0202??0?0????????????????????????11000-??0????010201--012?-
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2?2{1 2}0{1 2 3}121210????1?011?00101011NN010?0{2 3}00011031-?{1 2}??1????0-?(1 2)10(1 2)-1101?3010---
0?100?30?1-120????-00??210?-?0-?0?0?1??0(0 1)0??0--211?3?2112?1-0-01?0?0????1110--0N210010?0?-
?00221?11-2?11?1010010110-2-1?0?1110-2{1 2}000000-00?0????0-0?????1?0?1?????01?1?0?????1?
????01?????0001?10?00????0101{0 1}2??0-10??1?1000?0?00-?0?0????????????????1?0020?-?(0 1)100(0 1)?-
?0-011?N10??2?N001????????????????????????----?N?021110N0000??1401000?01?00000?100?110?N0-
101011000????20N001111{0 1}NNN-??0?10?0?01?0011??0?10?001010??-??1?0?01110-000?0000

Longunguis

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1}??{0 2}2??{1 2 3}12?2?2-210?011?0?011N1NN010?0{1 2}000{0 1}1031-?1??????0-?2(0 1)??-?10103?10--
?????0?30?1??2?11?0-00??210??{0 1}0-?0?0????(0 1)0?000??1103?21?2-1-0-01?0?0????11110--0N2?0????0-
?00{1 2}1?111-211(0 1)1?10(0 1)001?111-??1?0?1?1?-2?010101-00?0?0??-0?????1??1?????01?1????????-
????0?0?00?0?1011?11000????0010?????-1??1????0?0?0-0-?????0?????????1?0????-0110?0?-?0-
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1}00?0?1?00?1??110001?00N??0?0?0?0?0??21N001?1?{0 1}0?NN-??????0?10?00?20?00?0?0?????1?0-
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Shenqiornis

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NN0????1????????????0?0?1????N????2?1?0?0????????1010?00?????????11000-?????0000201--
0210????0?01?1?2??1????{1 2 3 4 5 6 7}????0?0?????1?1?{2 3}1?2?1?N2??210?0?1?NN?02000-(0 1)100-
?????1??????21--21220{1 2 3}12?(1 2)10????????????010?N1NN?0?0?0{2 3}0??{0 1}1030-?{1 2}0?1??0?0-
031??110?3?{1 2}0--????0?30?????11?0?00?02?0????0-00000?1?{0 1}0????--?11-1{2 3}111?2?1-0-
0100?0?1?1?110-0?21?1?011??000{1 2}1?1?21?2110?10021111-?-??0?1?1?-2
3}00?000?00?0??N?0?000????????????0?01????????00?1?1?????0?001?10?????010?????0-
000?0?0????????1?????N??-?????????0?0?????1?0?-00-01????10002NN001?????????????????01?0---
?0N0??101?000?0??13?N000?01?0?0?0?100?11?N?0?0??1????1??{0 1}N001111?ONNN-
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Sulcavis

?10??0?NN0????????????????0010?????????????????111????????0100????????{0 1}??10?0????????00020{0
1}--0110?10????1??{0 2}1?????{2 3}????2??--3--1N11??2?1?N2??210?0??1NN003000-0100-?2{1
2}??102??1?????????{1 2 3}?????????1?0?1??0101?N11N010?020001??1??{1 2}1?????0-0?01-110??3010--

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1)0??????0?0????????????1100?0(0 1){0 1}-? ???????????0????0???

Jibeinia

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0?2????????????(0 2)????????3????-??-3?-
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1)?0{2 3}00?(0 1)1????0????????(0 1)-????-?10??3010---?????30?1-1(0 1)?1100-0?????????0-
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2}?11??1010010??-??1?0?10?00{2 3}?00?0?-
0????????0????????????????0????0????????????????0?1?0????????10????????????1????????0??-
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Hebeiornis

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0?1????????0????2????{1 2 3}12??1??10?1????????111?NNO?0?020001????-????1??0?0-??0????10??2?10--
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?02??1{1 2}1?2?11?10?00110??-?1?0?1010-3?010000?00????N?-
010????????1????12?0??01????0?0?0????????0?1?0?10?0?0110????0-
0????0?0????????0????????????10?0?0??-??1001?-??-?0?0?1??2?N00????0????01????????00---
??2??1?0?0?000?????1000001?0?0?0?100?100?N12?101?1??????1N001111?0N?N---????????00??(0 1)?(0
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Gobipipus

?10????????????0????????00????????N????????????1??11????????????1?(0 1)1????????1-1-----
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2}0????????????????????00??10?1(0 1)2-?01?0??-?0????????-??-????2?????
??1?100??0N????????0??-?{1 2}??1(0 1)-2111??1000?N??????1????????????2?0?0(0
1)????????0?00?10?1????10?0????????0?1-????????(0 1){0 1}0?0????????1?0????????0?1????0?-
0????-?00????????1?1????????1????-0????????1????2{1 2}N0?0?????????????????????---
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Gobipteryx

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5}10?0?0????????????20?102-1?(0 1)?????????3??-????-
2222?02010??????????13??1????1??1011010111110000020001?03--00????1??1-??0-????113?1?--
101????00??21??-??00?10?1?2-10?1?0-0-0?0??11103--?1??1-0-0120??-??-111{1 2}0-00?1?10??1-0--
2??121-?111????00??{1 2}????-1?101101?-210?00?000-??1??-??????1?0110??????0?0?1?0?01--
0?????10????0?0????0?1011-????????11000?0-0?0?0-?00?10????0100?0110-?1?020--?0?110?1?-21(0
1)(0
1)0100010011?????120??00?0????0??10?0?11????????00010?000001?0????????0?0?0?0??212?00?
??10000??-?000?0????00101110?00?01020-0????0??1?1?0?00?0??0

Nanantius

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Gurilynia

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?1????????????????????????10????????????????????????????????????????????????????????111
1?1????????????????????????????????????????????????????????????????????????????????????
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Holbotia

??????N????????????????????0????????????????????????????????????????0??01?1????0??0?20{1 2}-
220????????????????????0????????1??2????????????????????????????????????????(1
2)????????????????????0?1?????N?N?100?0?0001?03????????????0-
22????1????0????????0?01??1?1????????0?0?0??1????(0
1)0?????11????2????????0?????(0 1 2)0?0????????0??1????1????????????1{1
2}????????0?10??3?0?0????????????????????????????????????0?0?0?0????????????
????????0????0?????????????????????1??1?20??01?????????1????0??N?00????????????
????00---?????11?0?0?????{1 2 3 4
5}??0?0????????????????????????????????????0N?N????0????????{0
1}?????11??0?0?11????????????0?0?1?????

1)0???02???0????????????????111?10000200?1?2?1?0?11?2?3?10??0?-??0?????00????????????1
2)00?0?1??-? ?????????????1?1?100????101?{1 2}2????01??1?0?00??0??-
?????0????????????00?0??11?00????????????2{0 1}0?01?????????????--
??0????????000????1????0?0?0????0????????????????210000101?0000????0????????????
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aberransis

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3)??????1????????1????????????????????????????????????????????1?????0 1)?????-??0??3?{1
2)??????0????????????-??????0??0-??????????0????????????????????????????????????11{0
1)?????????0?????0?????1??111?10?????????????????????????????????0-
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??0????????????????????????????????????????????????????????????????????????????????
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Cathayornis_yandica

?102????????????????????????0?0?1?1?0?0??0?00????????????????????????????12?00????????00020{1 2}-
0-????????????????????????3????2?--3?-1??210201?02-120000??1111030{0 1}0-010?-222?11?????02????{0 1
2}??{1 2 3}??2{0 1}??2-21??110?0????111110?0?0??01031??{1 2}??11??0-0310?-11?1?3110--
11100??????0????-00?200?1{0 1}1-?0??1???10?0????11??-1?1?-?0??0????0??11110?{0
1}0020?1?0?0??0?11??11-211101000010101-2?1?0?1??-2 3}1010?00-
00?0??1?0?0??1111??1?1?0110?0?1?10?-??0??0????001?10000?0010???2?????0??100000?0?-
?0????0????0?0?0?1?1?1?1????0?0?1??1?02{0 1}0?01?????????????????????0?--
??0??111?0000?0??{2}??10?0001?0000??110001100010201?10?01??2?210000011{0
1}0000????0??00?1?0?00?0?0?0????{1 2}??-????????01?00-??0????

Sinornis

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1}202--201{1 2}1112121??210?0?1????????1111??0?0{2 3}0000????????????????????03??(1 2)-11??3?20--
??100?3001-1{0 1}????-00?1??1????0?0????????1?0-?1????111??0?0????????????1?{0
1}????????????????????11??2??11?1000010?01?-1?0?1010-220??10?-
0??????0?0????????????1????11?0?211??-????????????0??0??0?0?0?0 1}??2100-00????????0?????
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?????0?0????????????????????????????????????????????10100111{0 1}0000-100????????????????10??1011-0-
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Linyiornis

?00????0????????????????0????0????????????????????1?1?0?0?????0?10?????0????????????????0000?????0?
?0?0????????-2????????2????2?0--3?-10??{1 2 3}1?2?1?02-
1210?0?1010100?0?0?00?0?1222110?111211??03?121{1 2}??2?02-??0?10?0??10111000?0??001102??{0
1}????1?{0 1}????-?101130{1 2}0??01100?30?1?1{1 2}????-001?11??1{0 1}-
0?0?0?0?0?000?0????????12-?????0?0????11{0 1}0?00?0?1110?0??????{1 2}??111-
2111?1010020?0?2?1?0111?0?22000?0-00?0?0?10?0?0??11??1?0?0?10??001?0?-
?????0?0?????1010?0??0?0?101{0 1}0 1}2?00-0?0?0?00?0??0??-
??0????0101????01?0020????010000????????-100?210?0????????????????????--
??0003111?0000????????0000001000000?1100??1?0102?00101??10{0 1}1?200?0001{0 1}000-
1000?0?0?0??010?100?0?0?011-?-1????????10?00-0100?0?1

Gracilornis

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????1??{0 1}????{0 2}??????{3 4}0?0?2??--3?-?01?2??2?1?02??200?0??1?10030?{0 1}-?{0 1}??-
1}2?????21?020??{0 2}????{1 2 3}0{1 2}??21????1?0?12?0??01111000?02000{1 2}113????0 1}??????0?0{1 2
3}01-?10?3?00?????10??30??-12????0-00????0?1{0 1}-
????0????????0??11????112??0?0?0?0??????1100??02?01?0?0??{1 2}??12??2?1(0
1)1?10?2010?0?0??1?0?1101?3{0 1}01?00?-?1?????0?0?0?0?1?????2????????1?-
?????????????0?1?0?0?0?0?0?10??{1 2}000?0??1?0?0?????
?????0?0????????????0????01?01?????0??-1??2?0?00?0????????????????????0--
??00??11??00?0??1??0?0?01?0?0?0??0?10?0102??11??0?0?1?20001?01?0000??0?0?10????0?0?00
10????010-?-????1????110-00????

Alethoalaornis

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1}1????????????????????????????1????????12?0????????-
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1}0--?????{2 3}??1?0??11??-00????-
????????????????????1????0??????0????11??0?0?1?1?0????????????1?1-2?1????01{0 1}{1 2}0??-
??1?{0 1}10?1-2?01?0?-
?????????0????????????????????????????????????????1?1?10????????0?????????????????????
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2)????????0????????0?0?1?0?0????????????0??1?1????????1?0??1????????????????????????
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Cuspirostrisornis

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1}0????????????????????????????????????0?0?0{1
2}????????????????????????{2 3 4}2?????--3-????{2
3}10??????200?0??11????????????????1????????????????{1 2 3}1{1 2}21????????1?1?????1?11??{0
1}2{2 3}0?0{0 1}????????????{0 1}????-????3?0????????30??-??????-
?????????1????0????????0????????????????????????0??1?1????????0????????????11?10?0?
????????1?0?11??{2 3}0{1 2}??0-0????????????0??0????????????1?0?-????????????{0

4)?????10?0?01?????????????0??1?0?0?????????????111--?1010?11?0111{1 2}??0?0111?111-1?????????????0?0?0?10

Hesperornis -10---0--?--01?1-10-1?21111100101-01?-0000202--0?-11--
1010001100?0110102001-?(0 1}1?1101-02{2 3}1--(0 1)020--10100110-221000016100000?003--111-110-
0100111200-----102201021-2002--20120312-2212-01-111{0 1}11??00111301100{1 2}0??1113--2--
1?00?0-0210(0 1 2)01101?30----0110012001-000??-0--0-01100000000?1001-110--2110311-12-?0-112010----
111000-00200000-11-0-0(1 2)01-020-101-----1-1101111?-320001-0--1?-101(0 1)0--00-000-----10-00-0112-
0??00(0 1)(0 1)00000(0 1)11010110001-0--00{0 1}1?100-?11101001000?1??-0--00011?-1?00?000?00-0011000-
(0 1)0-01-0-000-10011?01?022111??01100110000----10213010000(0 1)21-000(2 3)00110210000?10101-10010-00-
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Xinghaiornis ?0?{1 2
3)??010?????????????????0?11????0?20????????????????????????????????02?21??????1-1-----?
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20??{2 3}?????0?0?1{1 2}?????111{0 1}??0{1 2}000?113-??2?????0-????-?1?1?3?1?--0?1????1?-
0{0 1}11??-?????0?12-20????-?-????-?11-3--?????0?0?00??-????1100????2?0?10?????--
2??1212111?????21????-1-1?0??00-{2 3}{0 1}00?000-1?????????????1?????????????--????--
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Eogranivora
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021??1????00?--(1 2){0 1}1?{2 3}?????????1??1?2?????1112?0?1--001113-?-????????{0 1}0?0??0-
11??3?00--011?1?30?0--0?110?00??{1 2}?????-??0?0??{0 1}??1?0--?????-11?????0?0?0?
??21110?00?101?????-?{1 2}??1?????111?000?021010-{1 2}-1?1?11--2101?-0?-0??-
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??-?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?0?
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Qinornis
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Sylvionris ?00---0---?-?10?-1000??1?1100101-011-1000--2-100-01001000110101--11-
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Meleagris 110---0-----10-1-10-2-2011100101-111-1010202-000-01001100110110--11-
0112020--0021101-1-----101011?0-221000{0 1}171000200---3--111-310211002-12000011111003-----
112211021-2011--21{1 2}20313-0212-010111111??001113{0 1}11002000?113---1-0110000-02102-110103{0 1}10---
0110111011-(0 1)11100-00001001102-100001?0--100--2--03--112-?-0-2120-1----11100-00210110-10-0--211-121-
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Cerebavis ??????0?0??--?1?1-
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END;

BEGIN ASSUMPTIONS;

OPTIONS DEFTYPE = UNORD POLYTCOUNT = MINSTEPS;
TYPESET * UNTITLED = unord: 1- 3 5- 21 23 27 29- 43 45 47- 70 72- 73 75 77- 79 81 83- 88 92- 94 97-
113 115- 116 118 120- 121 123- 125 129 131- 134 136- 137 139- 142 144- 145 148- 149 151- 157 160 164 166- 168
173- 175 177- 178 184 186-189\3 193-196\3 198 200- 204 206- 215 217- 218 220- 221 223- 225 227- 228 230- 232
234- 240 242- 243 245- 246 249- 253 255 259- 266 268- 271 274- 283 285- 289 291- 299 301- 305 307- 308 310- 312
314 316- 317 320- 323 325 327- 336 338- 339 341- 342 344- 355 358- 360 362- 363 365- 373 376- 379 383- 384 386-
391 394 396- 413 415- 424 426- 427 429 431- 437 439- 455 457- 469 473- 490 492- 495 497- 514 516- 523 525- 539
542- 545 547- 551 553- 555 557- 559 561- 566 568- 576 578- 582 584 586 588- 589 592 594- 596 598- 617 620- 629
631- 632 634- 635 637- 640 642- 657 659 661 663 665- 668 670- 672 676- 700, ord: 4 22 24- 26 28 44 46 71-74\3 76
80 82 89- 91 95- 96 114-117\3 119-122\3 126- 128 130 135-138\3 143-146\3 147-150\3 158- 159 161- 163 165 169-
172 176-179\3 180- 183 185 187- 188 190- 192 194- 195 197 199 205 216-222\3 226-229\3 233 241-247\3 248 254
256- 258 267 272- 273 284 290 300 306-309\3 313 315-318\3 319 324 326 337-343\3 356- 357 361-364\3 374- 375
380- 382 385 392- 393 395 414 425-428\3 430 438 456 470- 472 491 496 515 524 540- 541 546 552 556 560 567 577
583 585 587-590\3 591 593 597 618- 619 630-636\3 641 658 660 662 664 669 673- 675;
TYPESET default = unord: 1- 3 5- 21 23 27 29- 43 45 47- 70 72- 73 75 77- 79 81 83- 88 92- 94 97- 113 115- 116 118
120- 121 123- 125 129 131- 134 136- 137 139- 142 144- 145 148- 149 151- 157 160 164 166- 168 173- 175 177- 178
184 186-189\3 193-196\3 198 200- 204 206- 215 217- 218 220- 221 223- 225 227- 228 230- 232 234- 240 242- 243
245- 246 249- 253 255 259- 266 268- 271 274- 283 285- 289 291- 299 301- 305 307- 308 310- 312 314 316- 317 320-
323 325 327- 336 338- 339 341- 342 344- 355 358- 360 362- 363 365- 373 376- 379 383- 384 386- 391 394 396- 413
415- 424 426- 427 429 431- 437 439- 455 457- 469 473- 490 492- 495 497- 514 516- 523 525- 539 542- 545 547- 551
553- 555 557- 559 561- 566 568- 576 578- 582 584 586 588- 589 592 594- 596 598- 617 620- 629 631- 632 634- 635
637- 640 642- 657 659 661 663 665- 668 670- 672 676- 700, ord: 4 22 24- 26 28 44 46 71-74\3 76 80 82 89- 91 95- 96
114-117\3 119-122\3 126- 128 130 135-138\3 143-146\3 147-150\3 158- 159 161- 163 165 169- 172 176-179\3 180-

183 185 187- 188 190- 192 194- 195 197 199 205 216-222\3 226-229\3 233 241-247\3 248 254 256- 258 267 272- 273
284 290 300 306-309\3 313 315-318\3 319 324 326 337-343\3 356- 357 361-364\3 374- 375 380- 382 385 392- 393
395 414 425-428\3 430 438 456 470- 472 491 496 515 524 540- 541 546 552 556 560 567 577 583 585 587-590\3 591
593 597 618- 619 630-636\3 641 658 660 662 664 669 673- 675;

END;

BEGIN PAUP;

pset msTaxa = variable opt = deltran;

END;

BEGIN MESQUITECHARMODELS;

ProbModelSet * UNTITLED = 'Mk1 (est.): 1- 700;

END;

BEGIN NOTES;

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TEXT TAXON = 289 CHARACTER = 223 TEXT = 0;

END;

Begin MESQUITE;

MESQUITESCRIPTVERSION 2;
TITLE AUTO;
tell ProjectCoordinator;
timeSaved 1605990840904;
getEmployee #mesquite.minimal.ManageTaxa.ManageTaxa;
tell It;

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tell It;
    setDefaultOrder 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61
62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99
100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126
127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153
154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180
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208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234
235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261
262 263 264 265 266 267 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 501
268 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314
315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341
342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368
369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395
396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422
423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449
450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476
477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500;
    attachments ;
endTell;
endTell;
getEmployee #mesquite.charMatrices.ManageCharacters.ManageCharacters;
tell It;
    setID 0 8922971771042771389;
    mqVersion 361;
    checksumv 0 3 714075737 null getNumChars 700 numChars 700 getNumTaxa 502
numTaxa 502 short true bits 2305843009213695231 states 1279 sumSquaresStatesOnly 1.036131643E9
sumSquares -1.9784133019052957E22 longCompressibleToShort false usingShortMatrix true NumFiles 1
NumMatrices 1;
    mqVersion;
endTell;
getWindow;
tell It;
    suppress;
    setResourcesState false false 100;
    setPopoutState 300;
    setExplanationSize 0;
    setAnnotationSize 0;
    setFontIncAnnot 0;
    setFontIncExp 0;
    setSize 1315 541;
    setLocation 31 49;
    setFont SanSerif;
    setFontSize 10;
    getToolPalette;
    tell It;
    endTell;
    desuppress;
endTell;
getEmployee #mesquite.charMatrices.BasicDataWindowCoord.BasicDataWindowCoord;
tell It;
    showDataWindow #8922971771042771389
#mesquite.charMatrices.BasicDataWindowMaker.BasicDataWindowMaker;
tell It;
    getWindow;
    tell It;
        setExplanationSize 30;
        setAnnotationSize 20;
        setFontIncAnnot 0;
        setFontIncExp 0;
        setSize 1215 469;
        setLocation 31 49;
        setFont SanSerif;
        setFontSize 10;
        getToolPalette;
        tell It;
            setTool
mesquite.charMatrices.BasicDataWindowMaker.BasicDataWindow.ibeam;
endTell;
setActive;
setTool
mesquite.charMatrices.BasicDataWindowMaker.BasicDataWindow.ibeam;
colorCells #mesquite.charMatrices.NoColor.NoColor;

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        colorRowNames
#mesquite.charMatrices.TaxonGroupColor.TaxonGroupColor;
        colorColumnNames
#mesquite.charMatrices.CharGroupColor.CharGroupColor;
        colorText #mesquite.charMatrices.NoColor.NoColor;
        setBackground White;
        toggleShowNames on;
        toggleShowTaxonNames on;
        toggleTight off;
        toggleThinRows off;
        toggleShowChanges on;
        toggleSeparateLines off;
        toggleShowStates on;
        toggleReduceCellBorders off;
        toggleAutoWCharNames on;
        toggleAutoTaxonNames off;
        toggleShowDefaultCharNames off;
        toggleConstrainCW on;
        toggleBirdsEye off;
        toggleShowPaleGrid off;
        toggleShowPaleCellColors off;
        toggleShowPaleExcluded off;
        togglePaleInapplicable on;
        togglePaleMissing off;
        toggleShowBoldCellText off;
        toggleAllowAutosize on;
        toggleColorsPanel off;
        toggleDiagonal on;
        setDiagonalHeight 80;
        toggleLinkedScrolling on;
        toggleScrollLinkedTables off;
    endTell;
    showWindow;
    getWindow;
    tell It;
        forceAutosize;
    endTell;
    getEmployee #mesquite.charMatrices.AlterData.AlterData;
    tell It;
        toggleBySubmenus off;
    endTell;
    getEmployee #mesquite.charMatrices.ColorByState.ColorByState;
    tell It;
        setStateLimit 9;
        toggleUniformMaximum on;
    endTell;
    getEmployee #mesquite.charMatrices.ColorCells.ColorCells;
    tell It;
        setColor Red;
        removeColor off;
    endTell;
    getEmployee #mesquite.categ.StateNamesStrip.StateNamesStrip;
    tell It;
        showStrip off;
    endTell;
    getEmployee #mesquite.charMatrices.AnnotPanel.AnnotPanel;
    tell It;
        togglePanel off;
    endTell;
    getEmployee #mesquite.charMatrices.CharReferenceStrip.CharReferenceStrip;
    tell It;
        showStrip off;
    endTell;
    getEmployee #mesquite.charMatrices.QuickKeySelector.QuickKeySelector;
    tell It;
        autotabOff;
    endTell;
    getEmployee #mesquite.charMatrices.SelSummaryStrip.SelSummaryStrip;
    tell It;
        showStrip off;
    endTell;
    getEmployee
#mesquite.categ.SmallStateNamesEditor.SmallStateNamesEditor;
    tell It;
        panelOpen true;
    endTell;

```

```
end;
endTell;
endTell;
endTell;
```