The genus *Galadi*: three new bandicoots (Marsupialia; Peramelemorphia) from Riversleigh's Miocene deposits, north-western Queensland, Australia.

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SUPPLEMENTARY DATA 2

Analysis 1

Nexus character matrix for the 34 taxa included in our phylogenetic analyses. Outgroup taxa were *Djarthia*, *Barinya wangala* and *Mutpuracinus archibaldi*. ? = missing data; - = inapplicable.

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#NEXUS
BEGIN TAXA;
      DIMENSIONS NTAX=34;
      TAXLABELS
            'P. raffrayana'
            'P. broadbenti'
            M.longicauda
            'M. papuensis'
            'M. ornata'
            'E. rufescens'
            'E. kalubu'
            'E. clara'
            'E. davidi'
            'Rhynchomeles prattorum'
            'I. auratus'
            'I. obesulus'
            'I. macrourus'
            'P. nasuta'
            'P. eremiana'
            'P. gunnii'
            'P. bougainville'
            'C. ecaudatus'
            'M. lagotis'
            'M. leucura'
            Djarthia
            'Barinya wangala'
            'Mutpuracinus archibaldi'
            'Y. burchfieldi'
            'Y. kida'
            'G. speciosus'
            'G. grandis'
            'G. amplus'
            'G. adversus'
            'Ischnodon australis'
            'N. ernielundeliusi'
            'cf. P. tedfordi'
            'cf. P. sp.'
            'P. sobbei'
            ;
ENDBLOCK;

BEGIN CHARACTERS;
```

```
      DIMENSIONS NCHAR=74;
      FORMAT DATATYPE=STANDARD MISSING=? GAP=- SYMBOLS="01234";
      CHARLABELS
            [1] 'Upper incisor number'
            [2] 'Diastema between I4 and I5'
            [3] 'I5 morphology'
            [4] 'Degree of development of lingual shelf on P3'
            [5] 'P3 major cusp development'
            [6] 'Stylar crest on M1'
            [7] 'Anterior cingulum of M1'
            [8] 'Anterior cingulum of M3'
            [9] 'Direction of preparacrista of M1'
            [10] 'Preparacrista of M2 and M3'
            [11] 'Termination of postprotocrista and morphology of
posterior cingulum of M1 and M2'
            [12] 'Termination of the postprotocrista and morphology of
the posterior cingulum of M3'
            [13] 'Degree of development of the metaconule'
            [14] 'Size of stylar cusp E'
            [15] 'Morphology of the centrocrista on M1 and M2'
            [16] 'Morphology of Centrocrista on M3'
            [17] 'Lobation of i3'
            [18] 'Length of p3'
            [19] 'Lower premolar height'
            [20] 'Paraconid-metaconid distance (relative to metaconid-
protoconid distance) on m1-3'
            [21] 'Hypoconulid size and termination of the
posthypocristid'
            [22] Preentocristid
            [23] 'Preentocristid orientation'
            [24] 'Cusp within the hypoflexid region, between the talonid
and trigonid on the buccal side'
            [25] 'Distinction between lower molar crowns and roots'
            [26] 'Cristid obliqua shape and termination'
            [27] 'Posthypocristid direction'
            [28] 'Hypoconulid posterior to entoconid'
            [29] 'Size of talonid on m4'
            [30] 'Snout length and premaxilla size'
            [31] 'Width of nasals'
            [32] 'Position of nasal-frontal suture/maximum posterior
extension of nasals'
            [33] 'Infraorbital canal length'
            [34] 'Jugal-maxilla contact'
            [35] 'Lacrimal orbital rim'
            [36] 'Antorbital fossa'
            [37] Orbitosphenoid
            [38] Alisphenoid
            [39] 'Sphenorbital fissure and foramen rotundum'
            [40] 'Number of vacuities in the palate'
            [41] 'Presence of dividing septa between paired palatal
vacuities'
            [42] 'Postglenoid foramen'
            [43] 'Morphology of the primary foramen ovale'
            [44] 'Morphology of the secondary foramen ovale'
            [45] 'Morphology of the ectotympanic'
            [46] 'Degree of inflation of the alisphenoid tympanic
process'
            [47] 'Alisphenoid tympanic process shape'
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            [48] 'Morphology of the rostral tympanic proccess of the
petrosal'
            [49] 'Composition of the roof of the tympanic cavity'
            [50] 'Epitympanic recess'
            [51] 'Squamosal epitympanic sinus'
            [52] 'Supraoccipital shape'
            [53] 'Postorbital processes'
            [54] 'Left and right parietal suture'
            [55] 'Sagital crest'
            [56] Interparietal
            [57] 'Lambdoid sesamoids'
            [58] 'Number of mental foramen'
            [59] 'Shape of I1'
            [60] 'Upper canine alveolus'
            [61] 'Relative height of P2 and P3'
            [62] 'Posterior crest of P3'
            [63] 'Relative height of p2 and p3'
            [64] 'Hypoconulid notch'
            [65] 'Relative position of hypoconid to protoconid on m3'
            [66] 'Posterior cingulid'
            [67] 'Shape of narial flange of premaxilla'
            [68] 'Position of lacrimal foramen'
            [69] 'Supraoccipital contribution to foramen magnum'
            [70] 'Inferior petrosal sinus opening'
            [71] 'Shape of I2-4'
            [72] 'Shape of upper canine'
            [73] 'Lower molar crown height'
            [74] 'Presence of metaconule'
            ;
      STATELABELS
            1
                  'five incisors present'
                  'four incisors present (I5 lost)',
            2
                  absent
                  present,
            3
                  'I5 similar in morphology to I1-4 '
                  'I5 pointed and strongly canine-like ',
            4
                  'no shelf'
                  'small/weakly developed shelf'
                  'well-developed lingual shelf'
                  'well-developed lingual shelf that extends to the
buccal side of P3',
            5
                  'P3 major cusp laterally compressed'
                  'P3 major cusp laterally enlarged but not conical'
                  'P3 major cusp large and conical, but P3 is narrower
than M1'
                  'P3 Major cusp large and conical, and P3 is wider than
M1',
            6
                  'stylar crest present on stylar cusp D '
                  'stylar cusp D ',
            7
                  'incomplete '
                  'complete ',
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            8
                  'incomplete '
                  complete,
            9
                  'preparacrista anterobuccally orientated '
                  'preparacrista posterobuccally orientated but not
blade-like.  '
                  'preparacrista posterobuccally orientated and blade-
like, parallel to postparacrista.',
            10
                  'preparacrista terminates at St B on both M2 and M3 '
                  'preparacrista terminates at St B on M2 but connects
to the parastylar tip on M3 '
                  'preparacrista connects to the parastylar tip on both
M2 and M3',
            11
                  'posterior cingulum absent on M1 and M2 '
                  'posterior cingulum present but incomplete on M1 and
M2 '
                  'posterior cingulum complete on M1 but incomplete on
M2'
                  'posterior cingulum complete on both M1 and M2',
            12
                  'no posterior cingulum '
                  ' incomplete posterior cingulum'
                  'complete posterior cingulum',
            13
                  'metaconule minute or absent '
                  'metaconule small but clearly identifiable a discrete
cusp '
                  'metaconule almost the same size as the protocone'
                  'metaconule equal to, or slightly larger than
protocone',
            14
                  'St E present on all molars '
                  'St E or remnant present on at least one molar '
                  'No trace of St E on any molar',
            15
                  'postparacrista and premetacrista contact each other,
forming a complete centrocrista that connects the paracone and metacone
(more bucally)'
                  'postparacrista and premetacrista contact each other,
forming a complete centrocrista that connects the paracone and metacone
(more lingually)'
                  'centrocrista breeches ectoloph but ends at base of
Stylar cusp D on M1 and M2 molars '
                  'centrocrista breeches ectoloph on all molars and
connects to Stylar Cusp D and/or B',
            16
                  'postparacrista and premetacrista contact each other,
forming a complete centrocrista that connects the paracone and metacone
(more labial)'
                  'postparacrista and premetacrista contact each other,
forming a complete centrocrista that connects the paracone and metacone
(more buccally)'
                  'centrocrista breeches ectoloph but ends at base of
Stylar cusp D on M3'
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                'centrocrista breeches ectoloph on all molars and
connects to Stylar Cusp D and/or B',
           17
                'i3 not bilobed '
                'i3 bilobed ',
           18
                'p3 longer or equal in length to p2 '
                'p3 shorter than p2 ',
           19
                'not raised '
                'raised ',
           20
                'wide on all molars'
                'wide on anterior molars, narrow on posterior molars '
                'narrow on all molars'
                'narrow on anterior molars, paraconid lost on m3',
           21
                'hypoconulid is a distinct cuspid, and higher than the
posthypocristid and talonid basin on all molars '
                'hypoconulid is distinct and high on anterior molars
but lower than talonid basin on m3, with the posthypocristid connecting
to the entoconid on this tooth '
                'both m2 and m3 have low hypoconulids, with
posthypocristids connecting to the entoconids',
           22
                present
                absent,
           23
                'anteroposterior (entoconid blade-like)'
                'oblique (entoconid conical)',
           24
                'no median buccal cusp present '
                'median buccal cusp present ',
           25
                'crown distinct from roots '
                'crown and root indistinct (other than for limit of
enamel) ',
           26
                'cristid obliqua straight and never terminates on the
lingual side of the trigonid '
                'cristid obliqua straight and terminates at a lingual
position against the trigonid from m1-4 '
                'cristid obliqua concave on some molars and terminates
at a lingual position against the trigonid from m1-4',
           27
                'oblique to the tooth row axis '
                'oblique on anterior molars, perpendicular on
posterior molars.'
                'perpendicular to the tooth row axis on all molars',
           28
                'hypoconulid positioned posterobuccal to the entoconid
'
                'hypoconulid positioned almost directly posterior to
the entoconid ',
           29
                'entoconid and hypoconid large, talonid relatively
wide, crests clearly identifiable.'
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                'entoconid and hypoconid smaller than in state 0,
talonid smaller'
                'Further reduction of entoconid and hypoconid, talonid
very small, crest poorly defined ',
          30
                'premaxilla taller than it is long; maxilla-nasal
contact longer than premaxilla-nasal contact (usually correlated with a
relatively short snout) '
                'premaxilla longer than it is tall; premaxilla-nasal
contact longer than maxilla-nasal contact (usually correlated with a
relatively elongate snout) ',
          31
                ' broad nasals'
                'slender nasals ',
          32
                'posterior to the anterior rim of the orbit when
viewed laterally '
                'nasals terminate just anterior to the orbit when
viewed laterally (associated with a wide maxilla-frontal suture) '
                'nasals terminate well anterior to the anterior margin
of the orbit',
          33
                'long infraorbital canal '
                'short infraorbital canal ',
          34
                'jugal invades the maxilla and extends onto the facial
region of the skull '
                'maxilla invades the zygomatic arch so that the jugal
has two thin wings around the posterior maxillary flange ',
          35
                ' lacrimal crest absent'
                'Partially developed lacrimal crest '
                'Fully developed lachrimal crest',
          36
                'antorbital fossa absent '
                'weak or partial fossa development '
                'very deep antorbital fossa',
          37
                'orbitosphenoid identifiable in lateral view as a
large ossification '
                'orbitosphenoid identifiable in lateral view as a
small ossification '
                'orbitosphenoid is very small or absent and not
obvious in lateral view',
          38
                'alisphenoid-parietal contact '
                'squamosal-frontal contact ',
          39
                'sphenorbital fissure slightly larger than foramen
rotundum. Both canals are tubelike in shape, especially the foramen
rotundum '
                ' sphenorbital fissure is enlarged and more widely
open, and there is a reduction in the length of the ''tube'' leading to
the foramen rotundum'
                'sphenorbital fissure is further enlarged and open,
and there is no ''tube'' leading to the foramen rotundum, which instead
appears',
          40
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                'one set of vacuities in the incisal region (the
incisive foramina) and one in the molar region (the maxillopalatine
fenestrae). '
                'one set of vacuities in the incisal region (the
incisive foramina), one set in the premolar region (''accessory
vacuities'' sensu Lyne and Mort, 1981) and one set in the molar region
(the maxillopalatine fenestrae) ',
           41
                ' all pairs of palatal vacuities are separated by
septa'
                ' the paired maxillopalatine fenestrae lack a dividing
septum',
           42
                'foramen bound by squamosal or squamosal and
alisphenoid '
                ' foramen bounded medially by the petrosal',
           43
                'primary foramen ovale is between alisphenoid and
petrosal '
                prim,
           44
                'secondary foramen ovale absent'
                'secondary foramen ovale defined by a complete strut
or bridge formed by the alisphenoid, but the primary foramen ovale is
still visible'
                'secondary foramen ovale present, and extensive
ossification of the alisphenoid means that the primary foramen ovale is
no longer visible in intact skulls',
           45
                'thin '
                'somewhat thickened '
                'further thickened'
                'heavily thickened',
           46
                'alisphenoid tympanic process small, lateral and
medial walls open. '
                'alisphenoid tympanic process largely open but medial
wall enclosed greater than in state 0, and hypotympanic sinus is also
enlarged relative to state 0 '
                'alisphenoid tympanic process and hypotympanic sinus
further enlarged.relative to state 1; hypotympanic sinus walled
posteriorly by the alisphenoid'
                'alisphenoid tympanic process and hypotympanic sinus
greatly hypertrophied',
           47
                'flattened '
                'ventrally rounded, anterior boundary rounded does not
extend as far as the transverse foramen or foramen ovale '
                'ventrally rounded, anterior boundary pointed and
extends as far as the transverse foramen'
                'ventrally angular, anterior boundary pointed and
terminates anterior to the transverse foramen',
           48
                'rostral tympanic process of the petrosal absent or
very small '
                'rostral tympanic process of the petrosal forms a
distinct projecting process that partially walls the posteromedial
margin of the hypotympanic sinus . '
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                'rostral tympanic process of the petrosal further
enlarged, forming elongate crestlike process that extends the length of
the promontorium and forms posteromedial wall of the hypotympanic
sinus; medial margin of petrosal overlaps basioccipital.'
                'ventral margin of the rostral tympanic process of the
petrosal extends laterally and slightly dorsally, resulting in the
formation of a distinct hypotympanic sinus within the rostral tympanic
process itself'
                'further dorsal extention of the ventral margin of the
rostral tympanic process relative to state 3, resulting in lateral wall
to the hypotympanic sinus within the process ',
            49
                'alisphenoid, squamosal, and petrosal all contribute
to the roof of the tympanic cavity '
                'only the alisphenoid and petrosal contribute to the
roof of the tympanic cavity; there is no squamosal contribution ',
            50
                'poorly defined and shallow '
                'wider and deeper than the plesiomorphic state but
still relatively poorly defined '
                'deep sinus with enclosing walls that is well
distinguished from remainder of auditory cavity'
                'wide and deep sinus that extends posterolaterally',
            51
                'absent '
                'present, poorly defined '
                'wide with high posterior wall'
                'deep and round',
            52
                'supraoccipital about as tall as it is wide '
                'supraoccipital taller than it is wide ',
            53
                'absent or indistinct'
                present,
            54
                'median suture present'
                'partially or completely co-ossified suture',
            55
                'no sagittal crest'
                'sagittal crest small, not extending to frontals'
                'sagittal crest large and extending to frontals',
            56
                absent
                present,
            57
                absent
                present,
            58
                'one mental foramen'
                'two mental foramina'
                'three or more mental foramina',
            59
                'Styliform or chisellike'
                'mesiodistally expanded and flat-crowned',
            60
                'occupies premaxillary-maxillary suture'
                'entirely contained within maxillary',
            61
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                'P2 taller than P3'
                'P2 and P3 subequal in height'
                'P3 taller than P2',
          62
                'well-developed posterior cutting edge'
                'lacking posterior cutting edge',
          63
                'p2 taller than p3'
                'p2 and p3 subequal in height'
                'p3 taller than p2',
          64
                'present in anterior cingulum of m2-4'
                absent,
          65
                'labially salient to protoconid'
                'subequal to protoconid'
                'lingual to salient protoconid',
          66
                absent
                present,
          67
                'no distinct process'
                '''wing-like'' narial processes present',
          68
                'within lacrimal'
                'within lacrimal-maxillary suture',
          69
                'contributes to superior margin of foramen magnum'
                'exoccipitals contact each other medially, excluding
the supraoccipital from the foramen magnum ',
          70
                'open slit in ventral view between petrosal and
basioccipital'
                'enclosed by petrosal and basioccipital so not open
ventrally',
          71
                'rhomboidal crowns'
                'mesiodistally expanded and flat-crowned',
          72
                'single-rooted unicuspid upper canine'
                'accessory cusps are present on either side of the
major cusp of C1',
          73
                'Lower molars are as high on the buccal side as they
are on the lingual side'
                'Lower molar height is significantly higher on buccal
side than lingual side',
          74
                'Metaconule present on all molars'
                'Metaconule absent on all molars and protocone is
shifted anteriorly',
     ;
     MATRIX
          'P. raffrayana'             0111101021 0010221000
0000010111 1101112100 0011000000 0000001110 1011100100 1000
          'P. broadbenti'             0110201111 0010111010
0000010101 1111122100 0000?00100 0001201110 2121100010 1000
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           M.longicauda                0111100021 0010221001
0000021121 1211111101 0011000100 0000001111 1011101000 1000
           'M. papuensis'              0111100021 0010331100
0000020121 1211111101 00???00??? ?001001?11 2021101002 1000
           'M. ornata'                 0111100020 0011221100
0000020121 1211111101 0011000100 0000001111 2011101000 1000
           'E. rufescens'              1--1101021 1110331011
0000010111 1111102100 00?2010110 0101001111 2021201001 1100
           'E. kalubu'                 1--2201121 1122331011
0000011111 1111111100 001(12)010110 0101001111 2021101001 1000
           'E. clara'                  1--2301021 0012331011
0000112111 1111121100 0011010110 0101(02)01111 2021101010 1000
           'E. davidi'                 1--2201022 2020331000
0000012101 1?11111?0 00??0??11? 0?01001111 20212010?? 1000
           'Rhynchomeles prattorum'    1--??01022 1012221001
0000011101 121101(12)110 00111111?? 0001001111 20?1201100 1000
           'I. auratus'                0113211122 3230331112
1010122101 1201211111 01?2232412 3100001111 2021201000 1010
           'I. obesulus'               0113211122 3230331002
1011122101 1111211111 01?2232412 3101(01)01111 2021101010 1010
           'I. macrourus'              0103211122 3230331012
1011121101 1111211110 01?2232412 3101201111 2021201010 1010
           'P. nasuta'                 0112110022 2122231012
2011022111 1201212120 1111121211 1101(01)01211 2021201000 1000
           'P. eremiana'               0103110022 2022331102
1010022121 1201222121 0111131211 1101001111 20?120100? 1000
           'P. gunnii'                 0112210022 1120221112
2010022111 1201222121 1111131211 1100001111 201120100? 1000
           'P. bougainville'           0102110022 1121221112
1010022111 1201222121 11?2131211 2100001(12)11 2011201000 1000
           'C. ecaudatus'              00022100(02)2 1021331102
0010022101 1111221121 1111131213 2100001111 20?110000? 0110
           'M. lagotis'                0000010120 00-2221113
0011122101 1111220101 11?2333313 3101(02)01211 2001100100 1011
           'M. leucura'                0101210020 00-2221113
1010122101 1111220100 11??333313 3100001211 2021201100 1011
           Djarthia                    ???0001101 001000?100
000000000? ?????????? ???????0?0 ?????????? ???011???? ??00
           'Barinya wangala'           1--0100000 000000?100
0000000000 0010200010 0000221210 2110210101 2100210?0 0000
           'Mutpuracinus archibaldi'   1--0001102 000000?000
0000000000 001020?0?0 0001???000 1000210??1 2?1011???? ?000
           'Y. burchfieldi'            ???(01)001121 0001111010 01-
001012? 1001110001 ?100???201 000?2011?1 ?02100?10? ?000
           'Y. kida'                   ?????01021 000111???0
00?001012? ?????????? ?????????? ?????????? ???110???? ??00
           'G. speciosus'              00?1201112 101112?001
0000010110 1011110000 0100???111 1002011?1 2021200000 ?000
           'G. grandis'                ?????01102 301111??00
000001011? ?????????? ?????????? ????????1?? ??2110???? ??00
           'G. amplus'                 ???1201112 211122??11
000001011? 101111???1 0????????? ??002??1?1 ?01120?0?? ?000
           'G. adversus'                ?????01112 101021????
?????????? ??11?1???? ?????????? ?????????? ?????????? ??00
           'Ischnodon australis'       ?????????? ?????????2
00110201?? ?????????? ?????????? ?????????? ???120???? ??1?
           'N. ernielundeliusi'        ???????0?? ?12??-???0 01-00-
011? ?????????? ?????????? ????????0?? ??2100???? ??10
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```
            'cf. P. tedfordi'             ?????00021 001033???1
000000101?? ?????????? ?????????? ?????????? ???120???? ??00
            'cf. P. sp.'                  ??????00?2? 0?1?3????1
000000221?? ?????????? ?????????? ?????????? ???120???? ??00
            'P. sobbei'                   ?????????? ???????002
201002211? ?????????? ?????????? ???????1?? ??1110???? ??00
      ;
ENDBLOCK
```

Analysis 2

Nexus character matrix for the 28 taxa included in our phylogenetic analyses. Outgroup taxa were *Djarthia*, *Barinya wangala* and *Mutpuracinus archibaldi*. ? = missing data; - = inapplicable.

```
#NEXUS

BEGIN TAXA;
      DIMENSIONS NTAX=28;
      TAXLABELS
            'P. raffrayana'
            'P. broadbenti'
            M.longicauda
            'M. papuensis'
            'M. ornata'
            'E. rufescens'
            'E. kalubu'
            'E. clara'
            'E. davidi'
            'Rhynchomeles prattorum'
            'I. auratus'
            'I. obesulus'
            'I. macrourus'
            'P. nasuta'
            'P. eremiana'
            'P. gunnii'
            'P. bougainville'
            'C. ecaudatus'
            'M. lagotis'
            'M. leucura'
            Djarthia
            'Barinya wangala'
            'Mutpuracinus archibaldi'
            'Y. burchfieldi'
            'Y. kida'
            'G. speciosus'
            'G. grandis'
            'G. amplus'
            ;
ENDBLOCK;

BEGIN CHARACTERS;
      DIMENSIONS NCHAR=74;
      FORMAT DATATYPE=STANDARD MISSING=? GAP=- SYMBOLS="01234";
      CHARLABELS
            [1] 'Upper incisor number'
            [2] 'Diastema between I4 and I5'
            [3] 'I5 morphology'
```

```
            [4] 'Degree of development of lingual shelf on P3'
            [5] 'P3 major cusp development'
            [6] 'Stylar crest on M1'
            [7] 'Anterior cingulum of M1'
            [8] 'Anterior cingulum of M3'
            [9] 'Direction of preparacrista of M1'
            [10] 'Preparacrista of M2 and M3'
            [11] 'Termination of postprotocrista and morphology of
posterior cingulum of M1 and M2'
            [12] 'Termination of the postprotocrista and morphology of
the posterior cingulum of M3'
            [13] 'Degree of development of the metaconule'
            [14] 'Size of stylar cusp E'
            [15] 'Morphology of the centrocrista on M1 and M2'
            [16] 'Morphology of Centrocrista on M3'
            [17] 'Lobation of i3'
            [18] 'Length of p3'
            [19] 'Lower premolar height'
            [20] 'Paraconid-metaconid distance (relative to metaconid-
protoconid distance) on m1-3'
            [21] 'Hypoconulid size and termination of the
posthypocristid'
            [22] Preentocristid
            [23] 'Preentocristid orientation'
            [24] 'Cusp within the hypoflexid region, between the talonid
and trigonid on the buccal side'
            [25] 'Distinction between lower molar crowns and roots'
            [26] 'Cristid obliqua shape and termination'
            [27] 'Posthypocristid direction'
            [28] 'Hypoconulid posterior to entoconid'
            [29] 'Size of talonid on m4'
            [30] 'Snout length and premaxilla size'
            [31] 'Width of nasals'
            [32] 'Position of nasal-frontal suture/maximum posterior
extension of nasals'
            [33] 'Infraorbital canal length'
            [34] 'Jugal-maxilla contact'
            [35] 'Lacrimal orbital rim'
            [36] 'Antorbital fossa'
            [37] Orbitosphenoid
            [38] Alisphenoid
            [39] 'Sphenorbital fissure and foramen rotundum'
            [40] 'Number of vacuities in the palate'
            [41] 'Presence of dividing septa between paired palatal
vacuities'
            [42] 'Postglenoid foramen'
            [43] 'Morphology of the primary foramen ovale'
            [44] 'Morphology of the secondary foramen ovale'
            [45] 'Morphology of the ectotympanic'
            [46] 'Degree of inflation of the alisphenoid tympanic
process'
            [47] 'Alisphenoid tympanic process shape'
            [48] 'Morphology of the rostral tympanic proccess of the
petrosal'
            [49] 'Composition of the roof of the tympanic cavity'
            [50] 'Epitympanic recess'
            [51] 'Squamosal epitympanic sinus'
            [52] 'Supraoccipital shape'
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            [53] 'Postorbital processes'
            [54] 'Left and right parietal suture'
            [55] 'Sagital crest'
            [56] Interparietal
            [57] 'Lambdoid sesamoids'
            [58] 'Number of mental foramen'
            [59] 'Shape of I1'
            [60] 'Upper canine alveolus'
            [61] 'Relative height of P2 and P3'
            [62] 'Posterior crest of P3'
            [63] 'Relative height of p2 and p3'
            [64] 'Hypoconulid notch'
            [65] 'Relative position of hypoconid to protoconid on m3'
            [66] 'Posterior cingulid'
            [67] 'Shape of narial flange of premaxilla'
            [68] 'Position of lacrimal foramen'
            [69] 'Supraoccipital contribution to foramen magnum'
            [70] 'Inferior petrosal sinus opening'
            [71] 'Shape of I2-4'
            [72] 'Shape of upper canine'
            [73] 'Lower molar crown height'
            [74] 'Presence of metaconule'
            ;
      STATELABELS
            1
                  'five incisors present'
                  'four incisors present (I5 lost)',
            2
                  absent
                  present,
            3
                  'I5 similar in morphology to I1-4 '
                  'I5 pointed and strongly canine-like ',
            4
                  'no shelf'
                  'small/weakly developed shelf'
                  'well-developed lingual shelf'
                  'well-developed lingual shelf that extends to the
buccal side of P3',
            5
                  'P3 major cusp laterally compressed'
                  'P3 major cusp laterally enlarged but not conical'
                  'P3 major cusp large and conical, but P3 is narrower
than M1'
                  'P3 Major cusp large and conical, and P3 is wider than
M1',
            6
                  'stylar crest present on stylar cusp D '
                  'stylar cusp D ',
            7
                  'incomplete '
                  'complete ',
            8
                  'incomplete '
                  complete,
            9
                  'preparacrista anterobuccally orientated '
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                'preparacrista posterobuccally orientated but not
blade-like.  '
                'preparacrista posterobuccally orientated and blade-
like, parallel to postparacrista.',
           10
                'preparacrista terminates at St B on both M2 and M3 '
                'preparacrista terminates at St B on M2 but connects
to the parastylar tip on M3 '
                'preparacrista connects to the parastylar tip on both
M2 and M3',
           11
                'posterior cingulum absent on M1 and M2 '
                'posterior cingulum present but incomplete on M1 and
M2 '
                'posterior cingulum complete on M1 but incomplete on
M2'
                'posterior cingulum complete on both M1 and M2',
           12
                'no posterior cingulum '
                ' incomplete posterior cingulum'
                'complete posterior cingulum',
           13
                'metaconule minute or absent '
                'metaconule small but clearly identifiable a discrete
cusp '
                'metaconule almost the same size as the protocone'
                'metaconule equal to, or slightly larger than
protocone',
           14
                'St E present on all molars '
                'St E or remnant present on at least one molar '
                'No trace of St E on any molar',
           15
                'postparacrista and premetacrista contact each other,
forming a complete centrocrista that connects the paracone and metacone
(more bucally)'
                'postparacrista and premetacrista contact each other,
forming a complete centrocrista that connects the paracone and metacone
(more lingually)'
                'centrocrista breeches ectoloph but ends at base of
Stylar cusp D on M1 and M2 molars '
                'centrocrista breeches ectoloph on all molars and
connects to Stylar Cusp D and/or B',
           16
                'postparacrista and premetacrista contact each other,
forming a complete centrocrista that connects the paracone and metacone
(more labial)'
                'postparacrista and premetacrista contact each other,
forming a complete centrocrista that connects the paracone and metacone
(more buccally)'
                'centrocrista breeches ectoloph but ends at base of
Stylar cusp D on M3'
                'centrocrista breeches ectoloph on all molars and
connects to Stylar Cusp D and/or B',
           17
                'i3 not bilobed '
                'i3 bilobed ',
           18
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                'p3 longer or equal in length to p2 '
                'p3 shorter than p2 ',
          19
                'not raised '
                'raised ',
          20
                'wide on all molars'
                'wide on anterior molars, narrow on posterior molars '
                'narrow on all molars'
                'narrow on anterior molars, paraconid lost on m3',
          21
                'hypoconulid is a distinct cuspid, and higher than the
posthypocristid and talonid basin on all molars '
                'hypoconulid is distinct and high on anterior molars
but lower than talonid basin on m3, with the posthypocristid connecting
to the entoconid on this tooth '
                'both m2 and m3 have low hypoconulids, with
posthypocristids connecting to the entoconids',
          22
                present
                absent,
          23
                'anteroposterior (entoconid blade-like)'
                'oblique (entoconid conical)',
          24
                'no median buccal cusp present '
                'median buccal cusp present ',
          25
                'crown distinct from roots '
                'crown and root indistinct (other than for limit of
enamel) ',
          26
                'cristid obliqua straight and never terminates on the
lingual side of the trigonid '
                'cristid obliqua straight and terminates at a lingual
position against the trigonid from m1-4 '
                'cristid obliqua concave on some molars and terminates
at a lingual position against the trigonid from m1-4',
          27
                'oblique to the tooth row axis '
                'oblique on anterior molars, perpendicular on
posterior molars.'
                'perpendicular to the tooth row axis on all molars',
          28
                'hypoconulid positioned posterobuccal to the entoconid
'
                'hypoconulid positioned almost directly posterior to
the entoconid ',
          29
                'entoconid and hypoconid large, talonid relatively
wide, crests clearly identifiable.'
                'entoconid and hypoconid smaller than in state 0,
talonid smaller'
                'Further reduction of entoconid and hypoconid, talonid
very small, crest poorly defined ',
          30
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                'premaxilla taller than it is long; maxilla-nasal
contact longer than premaxilla-nasal contact (usually correlated with a
relatively short snout) '
                'premaxilla longer than it is tall; premaxilla-nasal
contact longer than maxilla-nasal contact (usually correlated with a
relatively elongate snout) ',
           31
                ' broad nasals'
                'slender nasals ',
           32
                'posterior to the anterior rim of the orbit when
viewed laterally '
                'nasals terminate just anterior to the orbit when
viewed laterally (associated with a wide maxilla-frontal suture) '
                'nasals terminate well anterior to the anterior margin
of the orbit',
           33
                'long infraorbital canal '
                'short infraorbital canal ',
           34
                'jugal invades the maxilla and extends onto the facial
region of the skull '
                'maxilla invades the zygomatic arch so that the jugal
has two thin wings around the posterior maxillary flange ',
           35
                ' lacrimal crest absent'
                'Partially developed lacrimal crest '
                'Fully developed lachrimal crest',
           36
                'antorbital fossa absent '
                'weak or partial fossa development '
                'very deep antorbital fossa',
           37
                'orbitosphenoid identifiable in lateral view as a
large ossification '
                'orbitosphenoid identifiable in lateral view as a
small ossification '
                'orbitosphenoid is very small or absent and not
obvious in lateral view',
           38
                'alisphenoid-parietal contact '
                'squamosal-frontal contact ',
           39
                'sphenorbital fissure slightly larger than foramen
rotundum. Both canals are tubelike in shape, especially the foramen
rotundum '
                ' sphenorbital fissure is enlarged and more widely
open, and there is a reduction in the length of the ''tube'' leading to
the foramen rotundum'
                'sphenorbital fissure is further enlarged and open,
and there is no ''tube'' leading to the foramen rotundum, which instead
appears',
           40
                'one set of vacuities in the incisal region (the
incisive foramina) and one in the molar region (the maxillopalatine
fenestrae). '
                'one set of vacuities in the incisal region (the
incisive foramina), one set in the premolar region (''accessory
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vacuities'' sensu Lyne and Mort, 1981) and one set in the molar region
(the maxillopalatine fenestrae) ',
            41
                  ' all pairs of palatal vacuities are separated by
septa'
                  ' the paired maxillopalatine fenestrae lack a dividing
septum',
            42
                  'foramen bound by squamosal or squamosal and
alisphenoid '
                  ' foramen bounded medially by the petrosal',
            43
                  'primary foramen ovale is between alisphenoid and
petrosal '
                  prim,
            44
                  'secondary foramen ovale absent'
                  'secondary foramen ovale defined by a complete strut
or bridge formed by the alisphenoid, but the primary foramen ovale is
still visible'
                  'secondary foramen ovale present, and extensive
ossification of the alisphenoid means that the primary foramen ovale is
no longer visible in intact skulls',
            45
                  'thin '
                  'somewhat thickened '
                  'further thickened'
                  'heavily thickened',
            46
                  'alisphenoid tympanic process small, lateral and
medial walls open. '
                  'alisphenoid tympanic process largely open but medial
wall enclosed greater than in state 0, and hypotympanic sinus is also
enlarged relative to state 0 '
                  'alisphenoid tympanic process and hypotympanic sinus
further enlarged.relative to state 1; hypotympanic sinus walled
posteriorly by the alisphenoid'
                  'alisphenoid tympanic process and hypotympanic sinus
greatly hypertrophied',
            47
                  'flattened '
                  'ventrally rounded, anterior boundary rounded does not
extend as far as the transverse foramen or foramen ovale '
                  'ventrally rounded, anterior boundary pointed and
extends as far as the transverse foramen'
                  'ventrally angular, anterior boundary pointed and
terminates anterior to the transverse foramen',
            48
                  'rostral tympanic process of the petrosal absent or
very small '
                  'rostral tympanic process of the petrosal forms a
distinct projecting process that partially walls the posteromedial
margin of the hypotympanic sinus . '
                  'rostral tympanic process of the petrosal further
enlarged, forming elongate crestlike process that extends the length of
the promontorium and forms posteromedial wall of the hypotympanic
sinus; medial margin of petrosal overlaps basioccipital.'
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                'ventral margin of the rostral tympanic process of the
petrosal extends laterally and slightly dorsally, resulting in the
formation of a distinct hypotympanic sinus within the rostral tympanic
process itself'
                'further dorsal extention of the ventral margin of the
rostral tympanic process relative to state 3, resulting in lateral wall
to the hypotympanic sinus within the process ',
           49
                'alisphenoid, squamosal, and petrosal all contribute
to the roof of the tympanic cavity '
                'only the alisphenoid and petrosal contribute to the
roof of the tympanic cavity; there is no squamosal contribution ',
           50
                'poorly defined and shallow '
                'wider and deeper than the plesiomorphic state but
still relatively poorly defined '
                'deep sinus with enclosing walls that is well
distinguished from remainder of auditory cavity'
                'wide and deep sinus that extends posterolaterally',
           51
                'absent '
                'present, poorly defined '
                'wide with high posterior wall'
                'deep and round',
           52
                'supraoccipital about as tall as it is wide '
                'supraoccipital taller than it is wide ',
           53
                'absent or indistinct'
                present,
           54
                'median suture present'
                'partially or completely co-ossified suture',
           55
                'no sagittal crest'
                'sagittal crest small, not extending to frontals'
                'sagittal crest large and extending to frontals',
           56
                absent
                present,
           57
                absent
                present,
           58
                'one mental foramen'
                'two mental foramina'
                'three or more mental foramina',
           59
                'Styliform or chisellike'
                'mesiodistally expanded and flat-crowned',
           60
                'occupies premaxillary-maxillary suture'
                'entirely contained within maxillary',
           61
                'P2 taller than P3'
                'P2 and P3 subequal in height'
                'P3 taller than P2',
           62
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                'well-developed posterior cutting edge'
                'lacking posterior cutting edge',
          63
                'p2 taller than p3'
                'p2 and p3 subequal in height'
                'p3 taller than p2',
          64
                'present in anterior cingulum of m2-4'
                absent,
          65
                'labially salient to protoconid'
                'subequal to protoconid'
                'lingual to salient protoconid',
          66
                absent
                present,
          67
                'no distinct process'
                '''wing-like'' narial processes present',
          68
                'within lacrimal'
                'within lacrimal-maxillary suture',
          69
                'contributes to superior margin of foramen magnum'
                'exoccipitals contact each other medially, excluding
the supraoccipital from the foramen magnum ',
          70
                'open slit in ventral view between petrosal and
basioccipital'
                'enclosed by petrosal and basioccipital so not open
ventrally',
          71
                'rhomboidal crowns'
                'mesiodistally expanded and flat-crowned',
          72
                'single-rooted unicuspid upper canine'
                'accessory cusps are present on either side of the
major cusp of C1',
          73
                'Lower molars are as high on the buccal side as they
are on the lingual side'
                'Lower molar height is significantly higher on buccal
side than lingual side',
          74
                'Metaconule present on all molars'
                'Metaconule absent on all molars and protocone is
shifted anteriorly',
     ;
     MATRIX
          'P. raffrayana'              0111101021 0010221000
0000010111 1101112100 0011000000 0000001110 1011100100 1000
          'P. broadbenti'              0110201111 0010111010
0000010101 1111122100 0000?00100 0001201110 2121100010 1000
          M.longicauda                 0111100021 0010221001
0000021121 1211111101 0011000100 0000001111 1011101000 1000
          'M. papuensis'               0111100021 0010331100
0000020121 1211111101 00???00??? ?001001?11 202110100? 1000
```

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            'M. ornata'                  0111100020 0011221100
0000020121 1211111101 0011000100 0000001111 2011101000 1000
            'E. rufescens'               1--1101021 1110331011
0000010111 1111102100 00?2010110 0101001111 2021201001 1100
            'E. kalubu'                  1--2201121 1122331011
0000011111 1111111100 001(12)010110 0101001111 2021101001 1000
            'E. clara'                   1--2301021 0012331011
0000112111 1111121100 0011010110 0101(02)01111 2021101010 1000
            'E. davidi'                  1--2201022 2020331000
0000012101 1?11111?0 00??0??11? 0?01001111 20212010?? 1000
            'Rhynchomeles prattorum'     1--??01022 1012221001
0000011101 121101(12)110 0011111?? 0001001111 20?1201100 1000
            'I. auratus'                 0113211122 3230331112
1010122101 1201211111 01?2232412 3100001111 2021201000 1010
            'I. obesulus'                0113211122 3230331002
1011122101 1111211111 01?2232412 3101(01)01111 2021101010 1010
            'I. macrourus'               0103211122 3230331012
1011121101 1111211110 01?2232412 3101201111 2021201010 1010
            'P. nasuta'                  0112110022 2122231012
2011022111 1201212120 1111121211 1101(01)01211 2021201000 1000
            'P. eremiana'                0103110022 2022331102
1010022121 1201222121 0111131211 1101001111 20?120100? 1000
            'P. gunnii'                  0112210022 1120221112
2010022111 1201222121 1111131211 1100001111 201120100? 1000
            'P. bougainville'            0102110022 1121221112
1010022111 1201222121 11?2131211 2100001(12)11 2011201000 1000
            'C. ecaudatus'               00022100(02)2 1021331102
0010022101 1111221121 1111131213 2100001111 20?110000? 0110
            'M. lagotis'                 0000010120 00-2221113
0011122101 1111220101 11?2333313 3101(02)01211 2001100100 1011
            'M. leucura'                 0101210020 00-2221113
1010122101 1111220100 11??333313 3100001211 2021201100 1011
            Djarthia                     ???0001101 001000?100
000000000? ?????????? ????????0?0 ?????????? ???011???? ??00
            'Barinya wangala'            1--0100000 000000?100
0000000000 0010200010 0000221210 2110210101 21002100?0 0000
            'Mutpuracinus archibaldi'    1--0001102 000000?000
0000000000 001020?0?0 0001???000 1000210??1 2?1011???? ?000
            'Y. burchfieldi'             ???(01)001121 0001111010 01-
001012? 1001110001 ?100???201 000?2011?1 ?02100?10? ?000
            'Y. kida'                    ?????01021 000111???0
00?001012? ?????????? ?????????? ?????????? ???110???? ??00
            'G. speciosus'               00?1201112 101112?001
0000010110 1011110000 0100???111 1000201l?1 2021200000 ?000
            'G. grandis'                 ?????01102 301111??00
000001011? ?????????? ?????????? ????????1?? ??2110???? ??00
            'G. amplus'                  ???1201112 211122??11
000001011? 101111???1 0????????? ??002??1?1 ?01120?0?? ?000
            ;
ENDBLOCK;
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