

Supplementary material 1. A. Description of characters used in the phylogenetic analysis. Nomenclature of craniomandibular traits follows Hill (1935), Lavocat (1971, 1976), Woods and Howland (1979), Moore (1981), Wahlert (1984), Novacek (1993), Verzi (2001), Olivares and Verzi (2014), Verzi et al. (2014, 2016). Dental nomenclature follows Marivaux et al. (2004) and Antoine et al. (2012); recognition of dental homologies is after Verzi et al (2016) and this work (see Lower molars, and Figs. 4 and 5); **B.** Morphological character matrix; **C.** Sinapomorphies of the three most parsimonious trees.

Character 1. Premaxillary septum separating incisive foramina: with posterior ends of premaxillae joined medially, forming a pointed or rounded projection which may join an anterior apophysis of the maxilla (0); with posterior ends of premaxillae divergent, each one forming a small lateral apophysis (1).

Character 2. Anterior portion of premaxilla anterior to incisive alveolus (Carvalho and Salles 2004; Olivares et al. 2012): low to very low (0); high, forms the ventrolateral side of a tube that is dorsally completed by the nasal (1).

Character 3. Protuberance on maxilla ventral to bottom of alveolar sheath of I1: absent (0); present and located at the level of the external alveolar margin of DP4 (1); present and located at the level of the external alveolar margin between DP4 and M1 (2).

Character 4. Lacrimal foramen: opens into the orbital portion of the lacrimal (0); opens into the maxilla (1).

Character 5. Portion of maxilla surrounding foramen into nasolacrimal canal: with a suture posterior to the foramen (0); continuous around foramen (1).

Character 6. Foramen into nasolacrimal canal: opens into maxilla only (0); surrounded posteriorly by lacrimal (1).

Character 7. Orientation of the proximal portion of nasolacrimal canal (Glanz and Anderson 1990): anteroventrally to ventrally oriented (0); more anteriorly oriented (thus, more dorsal respect to the sphenopalatine fissure) (1).

Character 8. Relationship between zygoma and orbital region: dorsal margin of zygoma concave, not restricting orbital region (0); dorsal margin of zygoma very slightly concave or straight, restricting orbital region (1).

Character 9. Contact among maxilla, lateral palatine plate and alisphenoid in basitemporal region (Verzi 2001): located posterior to the M3 alveolus (0); lateral to the M3 alveolus (1).

Character 10. Masticatory and buccinator foramina: present (0); absent (1).

Character 11. Pterygoid fossa in ventral view (between alisphenoid bridge and anterior margin of lateral palatine plate): subcircular, with anteroposterior and transverse diameters subequal (0); suboval, with anteroposterior diameter greater than transverse one (1).

Character 12. Lateral margin of pterygoid fossa: oriented posterodorsally and not forming a flange extending posteriorly (0); forming a flange level with the medial margin and extending posteriorly toward the bulla (1).

Character 13. Ventral margin of posterior process of squamosal (Olivares et al. 2012): not laterally deflected (0); laterally deflected, thus forming a shelf (1).

Character 14. Posterior process of squamosal (Verzi 2001): straight and deep at its origin, with its posterior portion wide (0); lower (dorsoventrally narrow) at its origin and with posterior portion narrow due to development of the epitympanic recess (petrosal bulla) (1).

Character 15. Tip of lateral process of supraoccipital: located ventral to posteroventral tip of posterior process of squamosal (0); close to or level with posteroventral tip of posterior process of squamosal (1).

Character 16. Lateral process of supraoccipital (Woods 1984: 434; Olivares et al. 2012): short, located dorsal to mastoid process (0); long, ventrally extended overlapping the mastoid process or below the level of the latter (1).

Character 17. Orientation of distal portion of paroccipital process: on a plane parallel or subparallel to occipital plane (0); rotated so that its external margin becomes posterolateral or posterior (1).

Character 18. Origin of masseteric crest of mandible (Verzi 2008; Verzi et al. 2010): from notch for tendon of medial masseter muscle, pars infraorbitalis (and associated fibers; Woods and Howland, 1979) (0); posterior with respect to notch (1).

Character 19. Lateral crest: descending toward masseteric notch following same direction as the anterior margin of coronoid apophysis, or nearly so; mandibular notch for tendon of medial masseter muscle, subhorizontal (0); with trajectory uncoupled from that of the anterior margin of the coronoid apophysis, more ventral along the mandibular body, forming a markedly descending curve that rises at its anterior extreme, which corresponds to the anterior end of the notch (1).

Character 20. Anterior margin of base of coronoid apophysis: close to the alveolar edge of molars (0); more lateral and ventral with respect to alveolar edge of molars, even extending anteriorly as a more or less marked rim distinct from the lateral crest (1).

Character 21. Lower incisor (Olivares et al. 2012): long, bottom alveolar sheath at level of posterior or posterolateral portion of m3 or more posterior (0); short, bottom alveolar sheath at level of m2 or m3 but not reaching posterior portion of m3 (1); extremely short, bottom of alveolar sheath at level of Dp4 (2).

Character 22. Anteroloph on DP4: with no inflection on anterior or anterolingual surface (0); with weak inflection on anterior or anterolingual surface, from which point the orientation of this loph changes slightly to become more anterolabial (1).

Character 23. Mesolophule on DP4 (Patterson in Patterson and Wood 1982): transversely oriented, independent or partially fused to posteroloph (or posteroloph + metaloph) (0); represented by a posteriorly oriented short crest or spur contacting the posteroloph (or posteroloph + metaloph) (1); spur reduced or absent (2).

Character 24. Lingual extreme of the protocone area (or posterior outgrowth of the protocone) in M1-2 of non-senile adults: oriented posteriorly (0); oriented more lingually (1).

Character 25. Protoloph on M1–2 (Carvalho and Salles 2004; Olivares et al. 2012): present as a complete loph, independent or fused to anteroloph (0); reduced to its labial portion, forming a tubercle isolated or fused to the anteroloph (1).

Character 26. Mesoflexus (or meso- + metaflexus) of M1-2: with bottom (lingual extreme) and labial extreme approximately equal in depth (0); markedly deeper at lingual extreme (1).

Character 27. Anterior side of m1-2 (metalophulid I – protoconid area): straight or convex especially at level of the protoconid (0); with a convexity at level of the bottom of the anteroflexid (or antero- + mesoflexid) and a concavity at level of the protoconid area (generally more marked in m2), the latter with a pointed lateral extension (2).

Character 28. Metalophulid II of m1–2: originating from the protoconid area (0); originating from the metalophulid I (1).

Character 29. Lophids posterior to metalophulid I: metalophulid II and mesolophid present as complete crests (0); root of metalophulid II joined to or even submerged into middle portion of metalophulid I, mesolophid present as a complete crest or joined to the previous composite crest forming two (see Carvalho and Salles 2004) to one crest/s (1); metalophulid II present as a complete crest, or interrupted in its middle and represented by a proximal spur and a distal portion, mesolophid absent or rarely present during early ontogeny; a very small portion may be joined to lingual extreme of metalophulid II in adults, forming a composite crest (2); metalophulid II as a reduced, short crest joined to or integrated into the distal portion of metalophulid I (+ lingual extension of the metaconid) so that the lingual end of the first crest is usually expanded, mesolophid as a reduced crest or a spur that does not join the relictual metalophulid II or corresponding distal thickening of the first crest (3); mesolophid present as a complete crest, or interrupted in its middle and represented by a proximal spur and a distal portion, metalophulid II absent or present as a reduced, short crest forming a bridge between metalophulid I and mesolophid at the middle portion of these crests (4).

Character 30. Lophids anterior to the hypolophid in non-senile m1-2: not forming a lobe (0); forming a lobe due to early fusion (relative to posterior lophids) (1).

Character 31. Enamelled margins of hypolophid: both essentially straight or moderately concave anteriorly, extreme of lophid subrounded or truncated (0); more markedly concave, especially the posterior one, extreme of lophid pointed (1).

Character 32. Flexids (or the corresponding fossettids) of lower molars (Verzi et al. 2010): present (0); only hypo- and mesoflexid/fossettid (or their corresponding striids) are present (1).

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B. Morphological character matrix.

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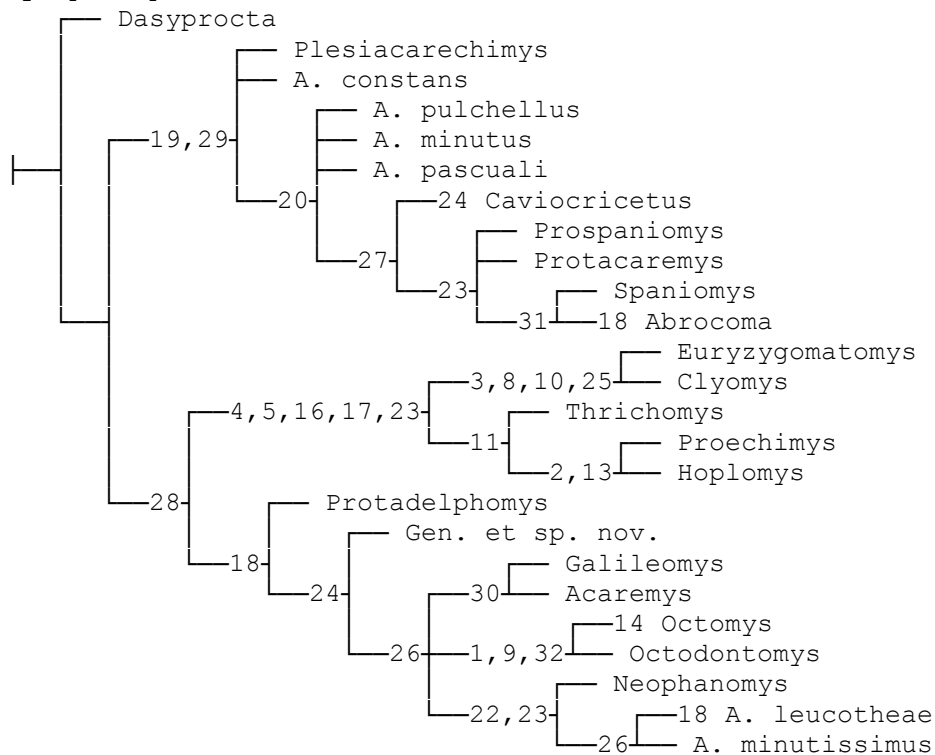
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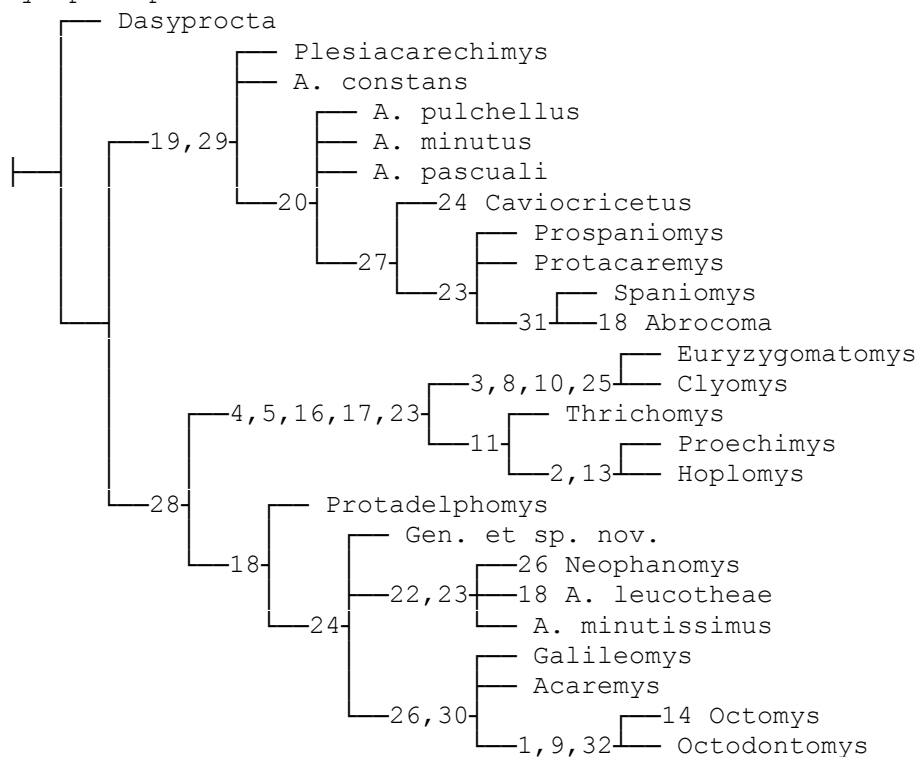
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C. Sinapomorphies for the three most parsimonious trees.

Synapomorphies for tree 0



Synapomorphies for tree 1



Synapomorphies for tree 2

