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Supplemental information

Neurosensory anatomy and function in *Dimetrodon*, the first terrestrial apex predator

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Taxon	Flexure	Flocculus	SCC	Cochlea	Source(s)
Aerosaurus	17	1	1	0	Bazzana et al 2021 J Anatomy
Mesenosaurus	18	1	1	0	Bazzana et al 2021 J Anatomy
Dimetrodon	43	1	1	0	this paper
Lemurosaurus	85	1	0	0	Benoit et al 2017 Palaeontologia Africana; Benoit et al 2017 Brain Behaviour Evolution
Herpetoskylax	72	1	0	0	Benoit et al 2017 Palaeontologia Africana
Hipposaurus	66	1	0	0	Benoit et al 2017 Palaeontologia Africana
Moschops	58	1	1	0	Benoit et al 2017 PeerJ; Benoit et al 2017 Brain Behaviour Evolution
Lystrosaurus	59	0	1	0	Hopson 1979 Biology of the Reptilia; Benoit et al 2017 Palaeontologia Africana
Pristerodon	46	1	1	1	Benoit et al 2017 Palaeontologia Africana; Laass 2015 J Morphology
Choerosaurus			2	1	ear endocast STL provided by Julien Benoit
Microgomphodon			1	1	Benoit et al 2017 Palaeontologia Africana
Galesaurus	44	1	1	1	Pusch et al 2019 J Anatomy
Thrinaxodon	37	1	1	1	Macrini 2006 PhD dissertation; Benoit et al 2017 Palaeontologia Africana
Diademodon	31	1		1	Watson 1913 Ann Mag Natural History; Macrini 2006 PhD dissertation
Exaeretodon	22	0			Pavanatto et al 2019 J Morphology
Massetognathus	59	1	1	1	Benoit et al 2017 Palaeontologia Africana; Hoffmann et al 2021 Historical Biology
Trirachodon	25	1	1	1	Hopson 1979 Biology of the Reptilia; Pavanatto et al 2019 J Morphology
Probainognathus	33	0	1	1	Quiroga 1980 Ameghiniana; Hoffman 2018 MSc thesis
Pseudotherium	42	1	1	1	Wallace 2018 PhD dissertation
Riograndia	39	0	1	1	Rodrigues et al 2019 Historical Biology; ear endocast segmented for this study
Brasilodon	52	1	1	1	Rodrigues et al 2013 J Mammalian Evolution, Rodrigues et al 2014 Palaontologische Zeitschrift
Tritylodon	59	1	1	1	Du Plessis 2010 MSc thesis; ear endocast STL provided by Julien Benoit
Hadrocodium	26	1	1	1	Macrini 2006 PhD dissertation; ear endocast segmented for this study
Megazostrodon			1	1	ear endocast STL provided by Julien Benoit
Morganucodon	45	1	2	1	Rowe et al 2011 Science; Luo et al 2016 Evolution of the Vertebrate Ear

Data S1. Data used in the ancestral state reconstructions, including source information. Related to Figures 4 and 5, and to the code provided in the STAR Methods.

References

1. Bazzana, K.D., Evans, D.C., Bevitt, J.J., and Reisz, R.R. (2021). Neurosensory anatomy of Varanopidae and its implications for early synapsid evolution. J Anat 240, 833-849.

2. Benoit, J., Fernandez, V., Manger, P.R., and Rubidge, B.S. (2017) Endocranial casts of pre-mammalian therapsids reveal an unexpected neurological diversity at the deep evolutionary root of mammals. Brain Behav Evol 90, 311-333.
3. Benoit, J., Manger, P.R., Fernandez, V., and Rubidge, B.S. (2017). The bony labyrinth of late Permian Biarmosuchia: Palaeobiology and diversity in non-mammalian Therapsida. Palaeontol Afr 52, 58-77.
4. Benoit, J., Manger, P.R., Norton, L., Fernandez, V., and Rubidge, B.S. (2017). Synchrotron scanning reveals the palaeoneurology of the head-butting *Moschops capensis* (Therapsida, Dinocephalia). PeerJ 5, e3496.
5. Du Plessis, D. (2010). An examination of non-mammalian cynodont cranial endocasts. MSc thesis, University of the Free State.
6. Hoffmann, S., O'Conner, P.M., Kirk, E.C., Wible, J.R., and Krause, D.W. (2014). Endocranial and inner ear morphology of *Vintana sertichi* (Mammalia, Gondwanatheria) from the Late Cretaceous of Madagascar. J Vert Paleontol 34, 110-137.
7. Hoffman, E.A. (2018). Large clutch of Jurassic mammaliamorph perinates and evolution of mammalian reproduction and growth. MSc thesis, University of Texas at Austin.
8. Hoffmann, C.A., Rodrigues, P.G., Soares, M.B., and Andrade, M.B. (2021). Brain endocast of two non-mammaliaform cynodonts from southern Brazil: an ontogenetic and evolutionary approach. Hist Biol 33, 1196-1207.
9. Hurum, J.H. (1998). The inner ear of two Late Cretaceous multituberculate mammals, and its implications for multituberculate hearing. J Mamm Evol 5, 65-93.
10. Kielan-Jaworowska, Z., Presley, R., and Poplin, C. (1986). The cranial vascular system in taeniolabidoid multituberculate mammals. Phil Trans R Soc Lond B: Biol Sci 313, 525-602.
11. Laass, M. (2015). Virtual reconstruction and description of the cranial endocast of *Pristerodon mackayi* (Therapsida, Anomodontia). J Morph 276, 1089-1099.
12. Luo, Z.-X., and Ketten, D.R. (1991) CT scanning and computerized reconstructions of the inner ear of multituberculate mammals. J Vert Paleontol 11, 220-228.
13. Macrini, T.E. (2006). The evolution of endocranial space in mammals and non-mammalian cynodonts. PhD Dissertation, University of Texas at Austin.
14. Macrini, T.E., Rowe, T., and Archer, M. (2006). Description of a cranial endocast from a fossil playtpus, *Obdurodon dicksoni* (Monotremata, Ornithorhynchidae), and the relevance of endocranial characters to monotreme monophyly. J Morph 267, 1000-1015.
15. Macrini, T.E., Rougier, G.W., and Rowe, T. (2007). Description of a cranial endocast from the fossil mammal *Vincelestes neuquenianus* (Theriiformes) and its relevance to the evolution of endocranial characters in therians. Anat Rec 290, 875-892.
16. Pavanatto, A.E.B., Kerber, L., and Dias-da-Silva, S. (2019) Virtual reconstruction of cranial endocasts of traversodontid cynodonts (Eucynodontia: Gomphodontia) from the upper Triassic of Southern Brazil. J Morph 280, 1267-1281.
17. Quiroga, J.C. (1980) Sobre un molde endocraneano del cinodonte *Probainognathus jenseni* Romer, 1970 (Reptilia, Therapsida) de la Formacion Ischichuca (Triasico Medio), La Rioja, Argentina. Ameghiniana 17, 181-190.
18. Rodrigues, P.G., Ruf, I., and Schultz, C.L. (2013) Digital reconstruction of the otic region and inner ear of the non-mammalian cynodont *Brasilitherium riograndensis* (Late

Triassic, Brazil) and its relevance to the evolution of the mammalian ear. J Mamm Evol 20, 291-307.
19. Rodrigues, P.G., Ruf, I., and Schultz, C.L. (2014) Study of a digital cranial endocast of the non-mammaliaform cynodont *Brasilitherium riograndensis* (Later Triassic, Brazil) and its relevance to the evolution of the mammalian brain. PalZ 88, 329-352.
20. Rodrigues, P.G., Martinelli, A.G., Schultz, C.L., Corfe, I.J., Gill, P.G., Soares, M.B., and Rayfield, E.J. (2019). Digital cranial endocast of *Riograndia guaibensis* (Late Triassic, Brazil) sheds light on the evolution of the brain in non-mammalian cynodonts. Hist Biol 31, 1195-1212.
21. Ruf, I., Luo, Z.-X., Wible, J.R., and Martin, T. (2009) Petrosal anatomy and inner ear structures of the Later Jurassic *Henkelotherium* (Mammalia, Cladotheria, Dryolestoidea): Insight into the early evolution of the ear region in cladotherian mammals. J Anat 214, 679-693.
22. Wallace, R.V.S. (2018) A new close mammal relative and evolution of the mammalian central nervous system. PhD Dissertation, University of Texas at Austin.
23. Watson, D.M.S. (1913) XXV. - Further notes on the skull, brain, and organs of special sense of Diademodon. Ann Mag Nat Hist 12, 217-228.