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Revisiting the brain anatomy of the early Oligocene eutherian mammal *Leptictis* based on virtual endocasts

Carl C. Van Gent, John R. Wible, Stephen L. Brusatte, Lawiza Kamran, and Ornella C. Bertrand
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Leptictidae are an extinct early Cenozoic group of mammals that has been challenging to place phylogenetically within Eutheria. They have been considered closely related to various crown placental groups such as Lipotyphla, Macroscelidea, or Euarchontoglires based on their "insectivore-grade" features, or as very early placentals or even non-placental eutherians because of their plesiomorphies. Since the 1920s their brain anatomy has been studied using natural endocasts, and oftentimes they are viewed as a model for the ancestral neurosensory conditions of placentals. Here, we use computed tomography (CT) for the first time to generate digital endocranial casts of two species of the canonical early Oligocene leptictid genus, *Leptictis* . Both species present similar endocranial anatomies with variation in the number of condyloid canals and the enclosure of the inferior petrosal sinus. Critically, we find differences compared to descriptions of natural endocasts, most notably that the rhinal fissure is more dorsally positioned, suggesting that *Leptictis* did not have a particularly expanded neocortex compared to Lipotyphla, Afrosoricida, and Macroscelidea. Furthermore, *Leptictis* was not particularly encephalized, and its brain size relative to body size was within the range of modern insectivorous taxa and Eocene mammals generally. Similar endocranial features in *Leptictis* and *Eoryctes* are likely plesiomorphic and do not represent a close phylogenetic relationship, and brain anatomy does not clarify the troublesome relationships of leptictids. The small neocortex and petrosal lobules might reflect fossorial adaptations in *Leptictis*, but more endocranial data from other Leptictidae will be fundamental to better understand any neurosensory shift that may have occurred within this group.

Key words: Mammalia, Eutheria, Leptictidae, endocranial anatomy, neocortex, olfactory bulbs, petrosal lobules, inferior colliculi, Orellan, Oligocene.

Carl C. van Gent [carl.v.gent@gmail.com; ORCID: https://orcid.org/0009-0001-8609-5922], School of GeoSciences, University of Edinburgh, Grant Institute, Edinburgh, Scotland, EH8 9XP, UK. John R. Wible [WibleJ@CarnegieMNH.Org ; ORCID: https://orcid.org/0000-0002-0721-1228], Section of Mammals, Carnegie Museum of Natural History, Pittsburgh, 15206 PA, USA. Stephen L. Brusatte [stephen.brusatte@ed.ac.uk; ORCID: https://orcid.org/0000-0001-7525-7319], School of GeoSciences, University of Edinburgh, Grant Institute, Edinburgh,

Scotland, EH8 9XP, UK; Section of Mammals, Carnegie Museum of Natural History, Pittsburgh, 15206 PA, USA; New Mexico Museum of Natural History and Science, Albuquerque, 87104 NM, USA. Lawiza Kamran [lawizak23@gmail.com ; ORCID: https://orcid.org/0009-0008-8740-3772], School of Biosciences, University of Sheffield, Sheffield S10 2TN, UK Ornella C. Bertrand [ornella.bertrand@icp.cat ; ORCID: https://orcid.org/0000-0003-3461-3908] (corresponding author), School of GeoSciences, University of Edinburgh, Grant Institute, Edinburgh, Scotland, EH8 9XP, UK; Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, Campus de la UAB, 08193 Cerdanyola del Vallès (Barcelona), Spain.

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