

LOCOMOTOR BEHAVIOR OF PALEOCENE MAMMALS: INSIGHTS FROM  
THE SEMICIRCULAR CANALS OF THE INNER EAR

O.C. Bertrand<sup>1\*</sup>, S.L. Shelley<sup>2,3</sup>, T.E. Williamson<sup>4</sup>, J.R. Wible<sup>3</sup>, S.G.B. Chester<sup>5,6,7</sup>,  
L.T. Holbrook<sup>8</sup>, T.R. Lyson<sup>9</sup>, J. Meng<sup>10</sup>, I.M. Miller<sup>9,11</sup>, T. Smith<sup>12</sup>, S.L. Brusatte<sup>2,4</sup>

<sup>1</sup>Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès (Barcelona), Spain.

<sup>2</sup>School of GeoSciences, University of Edinburgh, Grant Institute, EH9 3FE, Edinburgh, Scotland, UK.

<sup>3</sup>Section of Mammals, Carnegie Museum of Natural History, 15213, Pittsburgh, PA, USA.

<sup>4</sup>New Mexico Museum of Natural History and Science, 87104, Albuquerque, NM, USA. <sup>5</sup>Department of Anthropology, Brooklyn College, City University of New York, 11210, Brooklyn, NY, USA.

<sup>6</sup>Department of Anthropology, The Graduate Center, City University of New York, 10016, New York, NY, USA.

<sup>7</sup>New York Consortium in Evolutionary Primatology, New York, NY, USA.

<sup>8</sup>Department of Biological and Biomedical Sciences, Rowan University, Glassboro, NJ, USA.

<sup>9</sup>Denver Museum of Nature & Science, 08028, Denver, CO, USA.

<sup>10</sup>Division of Paleontology, American Museum of Natural History, 10024, New York, NY, USA.

<sup>11</sup>National Geographic Society, 20036, Washington, DC, USA.

<sup>12</sup>Directorate Earth and History of Life, Royal Belgian Institute of Natural Sciences, 1000, Brussels, Belgium.

\*presenting author, ornella.bertrand@icp.cat

Keywords: Paleogene, mammal, agility, vestibular sensitivity, petrosal lobules, ecology

The end-Cretaceous mass extinction triggered the collapse of ecosystems and a drastic turnover in mammalian communities leading to the demise of many ecologically specialized species. While Mesozoic mammals were ecomorphologically diverse, recognizable ecological richness was only truly established in the Eocene. Questions remain about the ecology of the first wave of mammals radiating after the extinction. Here, we use the semicircular canals of the inner ear as a proxy for locomotor behavior. Thirty new inner ear virtual endocasts were generated using high-resolution computed tomography scanning. This sample was supplemented by data from the literature to construct a dataset of 79 fossils spanning the Jurassic to the Eocene alongside 262 extant mammals.

Vestibular sensitivity was measured using the radius of curvature against body mass and the residuals of this relationship were analyzed. The petrosal lobule size relative to body mass were compared with the inner ear data as they have a role in maintaining gaze stabilization during motion.

Paleocene mammals exhibited smaller canal radius of curvature, compared to Mesozoic, Eocene, and extant taxa. In the early Paleocene, canal radius and associated petrosal lobules were relatively smaller on average compared to other temporal groups, suggesting less ability for fast movements.

In: Alba, D.M., Marigó, J., Nacarino-Meneses, C., Villa, A. (Eds.), Book of Abstracts of the 20th Annual Conference of the European Association of Vertebrate Palaeontologists, 26th June – 1st July 2023. *Palaeovertebrata*, Special Volume 1-23. DOI: 10.18563/pv.eavp2023