PALÆO VERTEBRATA

Special Volume 1-2023

EAVP
European Association of Vertebrate Palaeontologists

Book of Abstracts of the 20th Annual Conference
of the European Association of Vertebrate Palaeontologists,
26th June – 1st July 2023, Sabadell (Barcelona), Spain

Book of Abstracts of the 20th Annual Conference of the European Association of Vertebrate Palaeontologists, 26th June – 1st July 2023

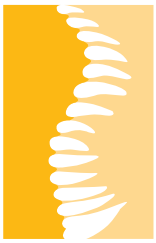
Editors:

David M. Alba, Judit Marigó, Carmen Nacarino-Meneses, Andrea Villa

Palaeovertebrata, Special Volume 1-23

Institut Català de Paleontologia
Miquel Crusafont

Organized by:



ICP

Institut Català de Paleontologia
Miquel Crusafont

CERCA Centres de Recerca de Catalunya

Generalitat de Catalunya

UAB Universitat Autònoma de Barcelona

Sponsored by:

transmitting science

Ajuntament de Sabadell

visitSabadell

CERCA Research Centres of Catalonia

FCS ESPAI CULTURA FUNDACIÓ 1859 CAIXA SABADELL

CATALONIA HOTELS & RESORTS

70th. 1952 2022 pont coffee experts

PeerJ Life & Environment

Recommended citation of an abstract:

Alfieri, F., Botton-Divet, L., Wölfer, J., Nyakatura, J.A., Amson, E., 2023. Evolvability of bone organization levels in repeated acquisitions of slow arboreality in mammals. 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 1-2023: 22. DOI: 10.18563/pv.eavp2023

Convenors

David M. Alba
Judit Marigó
Carmen Nacarino-Meneses
Andrea Villa

Organizing Committee

David M. Alba
Arnau Bolet
Chabier De Jaime-Soguero
Judit Marigó
Raquel Moya-Costa
Leonardo Sorbelli
Andrea Villa
Júlia Arias-Martorell
Soledad De Esteban-Trivigno
Josep Fortuny
Oriol Monclús-Gonzalo
Carmen Nacarino-Meneses
Bernat Vila

Collaborator Committee

Ofanniel Albaladejo Gavira
Sara G. Arranz
David Basanta
Chara Drakopoulou
Àngel Galobart
Paula Logrosán Soriano
Marc Misas-Alcàntara
Albert Navarro-Gil
Elpiniki-Maria Parparousi
Maria Prat-Vericat
Georgina Raventós-Izard
Albert Sellés
Bernat Vázquez
Alexandra Viladot
Carla Argilés-Esturgó
Josep Barber Servera
Isaac Casanovas-Vilar
Pere Figuerola
Laia Garcia-Escolà
Eudald Mujal
Jaume Navarro-Cascalló
Esteve Oromí Soldevila
Alexandre Porcel Barceló
Albert Prieto-Márquez
Pau Segurado
Souzanna Siarabi
Kelly A. Vega-Pagán
Almudena S. Yagüe

Scientific Committee

Juan Abella	Universitat de València
David M. Alba	Institut Català de Paleontologia Miquel Crusafont
Julia Arias-Martorell	Institut Català de Paleontologia Miquel Crusafont
Xènia Aymerich	Institut Català de Paleontologia Miquel Crusafont
Ainara Badiola	Euskal Herriko Unibertsitatea
Nathalie Bardet	Museum National d'Histoire Naturelle
Saverio Bartolini-Lucenti	Università degli Studi di Firenze
Matteo Belvedere	Università degli Studi di Firenze

Filippo Bertozzo	Royal Belgian Institute of Natural Sciences
Ornella Bertrand	Institut Català de Paleontologia Miquel Crusafont
Gabriele Bindellini	Sapienza - University of Rome
Alejandro Blanco	Universidade da Coruña
Fernando Blanco	Museum für Naturkunde
Christine Böhmer	Christian-Albrechts-Universität zu Kiel
Arnau Bolet	Universidad de Granada
Juan L. Cantalapiedra	Universidad de Alcalá
Patricia María Carro-Rodríguez	Museo Nacional de Ciencias Naturales-CSIC
Isaac Casanovas-Vilar	Institut Català de Paleontologia Miquel Crusafont
Omar Cirilli	Howard University
Elena Cuesta	Museo Paleontológico Egidio Feruglio
Soledad De Esteban-Trivigno	Transmitting Science, S.L.
Massimo Delfino	Università degli Studi di Torino
Daniel DeMiguel	Fundación Agencia Aragonesa para la Investigación y el Desarrollo (ARAID)
Ester Díaz-Berenguer	Museo de Ciencias Naturales de la Universidad de Zaragoza
Verónica Díez Díaz	Museum für Naturkunde Berlin
Laura Domingo	Universidad Complutense de Madrid
María Soledad Domingo	Universidad Complutense de Madrid
Matteo Fabbri	The Field Museum Chicago
Anne-Claire Fabre	Naturhistorisches Museum der Burgergemeinde Bern
Humberto Ferrón	Universitat de València
Josep Fortuny	Institut Català de Paleontologia Miquel Crusafont
Marc Furió	Universitat Autònoma de Barcelona
Àngel Galobart	Institut Català de Paleontologia Miquel Crusafont
Antonio García-Alix	Universidad de Granada
Ana Rosa Gómez Cano	Transmitting Science, S.L.
David Groenewald	Institut Català de Paleontologia Miquel Crusafont
Alexandre R. D. Guillaume	Universidade NOVA de Lisboa
Borja Holgado	Universidade Federal do Rio de Janeiro
Femke Holwerda	Royal Tyrrell Museum of Paleontology
Alexandra Houssaye	Muséum national d'Histoire naturelle
Alessio Iannucci	Sapienza - University of Rome
Jeff Liston	Royal Tyrrell Museum of Paleontology
Esther Lizano	Universitat Pompeu Fabra
Adriana López-Arbarello	Ludwig-Maximilians-Universität München
Àngel H. Luján	Institut Català de Paleontologia Miquel Crusafont
Loredana Macaluso	Università degli Studi di Torino
Heinrich Mallison	Palaeo3D
Jordi Marcé-Nogué	Universitat Rovira y Virgili
Judit Marigó	Universitat Autònoma de Barcelona
Carlos Martínez-Pérez	Universitat de València

Rafel Matamales-Andreu	Museu Balear de Ciències Naturals (FJBS-MBCN)
Iris Menéndez	Museum für Naturkunde Berlin
Bastien Mennecart	Naturhistorisches Museum Basel
Feiko Miedema	Staatliches Museum für Naturkunde Stuttgart
Raef Minwer-Barakat	Universidad de Granada
Blanca Moncunill-Solé	Universidade da Coruña
Jorge Morales	Museo Nacional de Ciencias Naturales-CSIC
Raquel Moya-Costa	Institut Català de Paleontologia Miquel Crusafont
Salvador Moyà-Solà	Institut Català de Paleontologia Miquel Crusafont
Eudald Mujal	Staatliches Museum für Naturkunde Stuttgart
Carmen Nacarino-Meneses	Institut Català de Paleontologia Miquel Crusafont
Carmen Nuñez-Lahuerta	Institut Català de Paleoecologia Humana i Evolució Social
Adriana Oliver	Museo Nacional de Ciencias Naturales-CSIC
Judith Pardo-Pérez	Universidad de Magallanes
Marta Pina	London South Bank University
Albert Prieto-Márquez	Institut Català de Paleontologia Miquel Crusafont
Oliver W. M. Rauhut	SNSB-Bayerische Staatssammlung für Paläontologie und Geologie
Emily Rayfield	University of Bristol
María Ríos	Universidade Nova de Lisboa
Taissa Rodrigues	Universidade Federal do Espírito Santo
Valentina Rossi	University College Cork
Oscar Sanisidro	Universidad de Alcalá
Lara Sciscio	JURASSICA Museum
Albert Sellés	Institut Català de Paleontologia Miquel Crusafont
Giovanni Serafini	Università degli Studi di Modena e Reggio Emilia
Alejandro Serrano-Martínez	Institut Català de Paleontologia Miquel Crusafont
Roland B. Sookias	Université de Liège
Leonardo Sorbelli	Institut Català de Paleontologia Miquel Crusafont
Elzbieta Teschner	University of Opole
Emanuel Tschopp	Universität Hamburg
Alessandro Urciuoli	Universitat Autònoma de Barcelona
Lars W. van den Hoek Ostende	Naturalis Biodiversity Center
Alexandra van der Geer	Naturalis Biodiversity Center
Bernat Vila	Institut Català de Paleontologia Miquel Crusafont
Andrea Villa	Institut Català de Paleontologia Miquel Crusafont
Evangelos Vlachos	Museo Paleontológico Egidio Feruglio
Almudena S. Yagüe	Institut Català de Paleontologia Miquel Crusafont
Mark T. Young	University of Edinburgh
Clément Zanolli	University of Bordeaux

INDEX


20TH
EAVP
CONFERENCE
26TH JUNE - 1ST JULY 2023
SABADELL (BARCELONA)

INDEX OF ABSTRACTS

ABSTRACTS


20TH
EAVP
CONFERENCE
26TH JUNE - 1ST JULY 2023
SABADELL (BARCELONA)

GEOMETRIC MORPHOMETRICS AND ANCIENT DNA ANALYSIS: INNOVATING IN SPECIES CLASSIFICATION. A CASE STUDY WITH RODENTS FROM EL MIRÓN CAVE (CANTABRIA, SPAIN)

M.P. Alfaro-Ibáñez[1*], G. Cuenca-Bescós[1], P. Bover[2,3]

[1]Aragosaurus-IUCA, Departamento Ciencias de la Tierra, Facultad de Ciencias, Universidad de Zaragoza, C/ Pedro Cerbuna 12, 50009 Zaragoza, Spain.

[2]ARAID Foundation, Avenida de Ranillas 1-D, planta 2ª, oficina B, 50018 Zaragoza, Spain.

[3]Instituto Universitario de Investigación en Ciencias Ambientales (IUCA) – Grupo Aragosaurus, Universidad de Zaragoza, C/ Pedro Cerbuna 12, 50009 Zaragoza, Spain.

*presenting author, alfaromp@unizar.es

Keywords: *Rodentia, Arvicolinae, geometric morphometrics, aDNA,* Terricola pyrenaicus

Fossil microvertebrate assemblages are important for advancing our understanding of past environments and the environmental conditions that shaped their evolution and distribution. Particularly, small mammal communities are important for biostratigraphy and climate reconstructions during the Quaternary. The Arvicolinae species (Cricetidae, Rodentia) are one of the important groups for these studies, due to their high evolutionary rates and morphological adaptations to different climate conditions. However, the main diagnostic anatomical element in fossil arvicolines, the lower first molar (m1), has close morphological similarities among many of these species, which hinders their classification. Here we combine geometric morphometrics and ancient DNA (aDNA) analyses to differentiate between two morphologically similar species in El Mirón Cave, *Terricola pyrenaicus* and *T. lusitanicus*. We performed two principal component analyses (PCA) using geometric morphometric data (16 landmarks and 80 semilandmarks) from the m1 of 686 specimens of Arvicolinae (PCA1) and a smaller dataset (PCA2) with only the *Terricola* species, the latter also used for a linear discriminant analysis (LDA). We identified through aDNA analysis one individual of *T. pyrenaicus*, from level 130 of El Mirón Cave (50.900–39.280 cal BP modelled age). This led us to identify as such a larger group of individuals within the PCA1. Although PCA2 did not clearly discriminate between the *Terricola* species, the LDA showed a complete separation. The combination of these techniques allowed us to verify the presence of *T. pyrenaicus*. Thus, we suggest that the integration of molecular and morphological data can be useful to identify species with high morphological similarities.

Acknowledgements: MPAI is supported by a FPU grant (FPU20/02030) from the Ministerio de Universidades (Gobierno de España).

THE MACROEVOLUTIONARY 'COMMON-GARDEN' EXPERIMENT: EVOLVABILITY OF BONE ORGANIZATION LEVELS IN REPEATED ACQUISITIONS OF SLOW ARBOREALITY IN MAMMALS

F. Alfieri[1*], L. Botton-Divet[1], J. Wölfer[1], J.A. Nyakatura[1], E. Amson[2]

[1]Comparative Zoology, Institute for Biology, Humboldt-Universität zu Berlin, Unter den Linden 6, 10117, Berlin, Germany.

[2]Paleontology Department, Staatliches Museum für Naturkunde, Rosenstein 1-3, 70191, Stuttgart, Germany

*presenting author, fabio_alfieri@yahoo.it

***Keywords**: convergence, evolvability, mosaicism, bone morphology, slow arboreality*

Ecomorphological convergence—i.e., similar phenotypes independently evolved in similar ecological contexts—replicates a 'common-garden experiment'. This experimental setting, i.e., extrinsic ecological drivers that are kept constant, allows to elucidate how morphology is driven by intrinsic factors. The latter explain differential evolvability that, when occurs among individual anatomical parts, causes 'mosaic evolution', a major driver of phenotypic diversification. Mosaicism was never studied among different bone anatomical spatial scales. We sampled 109 humeri and 108 femora across convergent slow arboreal mammals, i.e., 'tree-sloths', silky anteater, koala, lorisids, palaeopropithecids, *Megaladapis*, and their non-slow arboreal close relatives. Through indices of convergent strength (C-indices, R package 'convevol') we compared this feature, as indicator of evolvability, between external shape and internal structure, quantified through 3D geometric morphometrics and diaphyseal cross-sectional properties plus epiphyseal trabecular parameters, respectively. We posited that external shape should exhibit weaker evolvability and convergence, compared to inner structure. We corroborated our hypothesis, as suggested by a set of convergent traits especially coming from internal structure, e.g., lower trabecular anisotropy, higher diaphyseal compactness, and by the C-indices results. The ecological signal in many of these structural traits is supported by potential functional explanations. Our results suggest that bone inner structure better predicts ecology, i.e., it is more evolvable, than external shape, with the latter proved to be more phylogenetically conserved. Different developmental patterns may explain the differential evolutionary patterns shown by shape and structure. The stronger ecological signal in bone inner structure may be exploited for trait selection when inferring lifestyle in extinct taxa.

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

THE LOCOMOTION OF THE SUBFOSSIL LEMURS *MESOPROPITHECUS* AND *MEGALADAPIS* (MADAGASCAR): A 3D GEOMETRIC MORPHOMETRIC STUDY OF THE PROXIMAL HUMERUS

C. Argilés-Esturgó[1,2*], J. Arias-Martorell[1], S. Almécija[3,4], A.-C. Fabre[5,6,7], J. Marigó[2,1]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Departament de Geologia, Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[3]Division of Anthropology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024, USA.

[4]New York Consortium in Evolutionary Primatology, New York, NY 10024, USA.

[5]Naturhistorisches Museum Bern, 3005 Bern, Switzerland.

[6]Institute of Ecology and Evolution, University of Bern, 3012 Bern, Switzerland.

[7]Life Sciences Department, Vertebrates Division, Natural History Museum, London SW7 5BD, UK.

*presenting author, Carla.ArgilesE@autonoma.cat

Keywords: *primates, positional behavior, functional morphology, glenohumeral joint, convergence*

The subfossil lemurs of Madagascar present morphological convergences with other primates (hominoids) as well as other mammals such as *Megaladapis* with koalas and *Palaeopropithecus* with sloths in their postrcranial anatomy. These are especially noticeable in the forelimb, likely due to their similar suspensory postural behaviors. Although the wrist, hand, and elbow anatomy of these subfossil lemurs has been studied before, the morphological affinities of the shoulder joint remain largely unknown. In this work, to refine the locomotor and postural behavior of these subfossil lemurs, we present a 3D geometric morphometric analysis of the proximal humerus. We compare one specimen of the genus *Mesopropithecus* and three of the genus *Megaladapis* with 31 extant primate genera (including hominoids, cercopithecoids, platyrrhines, and strepsirrhines) together with a stem hominoid (*Nyanzapithecus,* KNM-MB 21206). Our results show that the proximal humerus of *Mesopropithecus* and *Megaladapis* does not overlap with extant hominoids, hylobatids, or the platyrrhine *Ateles,* all of which converge in humeral head shape. Instead, in proximal humeral morphology both *Megaladapis* and *Mesopropithecus* fall between platyrrhines and modern lemuroids. Both are also close to the nyanzapithecid included in our sample, hence possibly resembling the hominoid ancestral condition for glenohumeral joint shape. A possibility explaining these results is that *Mesopropithecus* and *Megaladapis* exhibited a locomotor repertoire similar to those of modern strepsirrhines and slow platyrrhines. Specifically, the analyzed specimens of both genera are more similar to *Alouatta* and lorisoids, thus possibly combining slow arboreal quadrupedal locomotion with the below-branch suspensory postures inferred from other anatomical regions.

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

Acknowledgements: Funded by project PID2020-116908GB-I00 (MCIN/AEI/10.13039/501100011033/); consolidated research group 2022 SGR 01188 (Generalitat de Catalunya); AGAUR (BP-H2020 MSCA-Cofund No. 801370 to J.A.M.); and "Ramón y Cajal" grant (RYC2021-034366-I to J.M.), funded by MCIN/AEI/10.13039/501100011033 and by the European Union NextGenerationEU/PRTR.

ECOMORPHOLOGICAL CORRELATES OF THE SHOULDER AND PELVIC GIRDLES IN TURTLES

F.A.M. Arnal[1*], S.W. Evers[2], R.B.J. Benson[3], M.A. Wills[1]

[1]Department of Life Sciences, University of Bath, Claverton Down, BA2 7AX, Bath, UK.

[2]Department of Geosciences, University of Fribourg, Chem. du Musée 4, 1700, Fribourg, Switzerland.

[3]Division of Paleontology, American Museum of Natural History, 200 Central Park West, NY 10024-5102, New York, USA.

*presenting author, fama25@bath.ac.uk

Keywords: *ecomorphology, scapulocoracoid, pelvis, morphometrics, ecology*

The shoulder and pelvic girdles are key skeletal structures for locomotion in vertebrates since they serve as articulation and anchor points for the musculoskeletal system of the forelimbs and the hindlimbs. In Testudines, girdles evolved quite distinctively from other groups due to the mechanical constraints inherent to the most defining anatomical trait of the group, the turtle shell. Its influence on habitat use and locomotion is well known. However, the relationships between the morphology of their appendicular skeleton (limbs plus girdles) and their ecology remain understudied. Here we investigate the morphology of the shoulder and pelvic girdles of Testudines using 3D geometric morphometrics from µCT data of 55 species from all 14 extant families and representative of their ecological diversity. We explore how the shape of these skeletal structures correlates with several ecological variables that relate to habitat use, preferred way of locomotion, and other ecological proxies. Our preliminary results show that the overall effect of these variables on girdle shape is lower than expected, with exceptions (e.g., slight expansion of the coracoid blade associated with terrestrial habits), and with body size and phylogeny playing a significantly greater role in influencing girdle morphology. However, these relationships require further testing and more conclusive results will be presented shortly. This study is part of a larger project that aims to establish an ecomorphological comparative framework from extant Testudines to infer the palaeoecology of extinct taxa from their appendicular bones morphology. In the future, we will test its predictive power in fossil specimens.

Acknowledgements: This project was funded by The Leverhulme Trust. We are also grateful to the National History Museum of London, the Oxford Museum of Natural History, and the Museum of Zoology of the University of Cambridge for allowing us access to the specimens used in this study.

FUNCTIONAL DENTAL TRAITS PROVIDE NEW CLUES ABOUT THE PALEOENVIRONMENT OF THE EARLIEST VALLESIAN SITE OF CASTELL DE BARBERÀ (NE IBERIAN PENINSULA)

S.G. Arranz[1*], I. Casanovas-Vilar[1], I. Žliobaitė[2,3], D. DeMiguel[4,1], S. McKenzie[1], M. Pina[5,1], I.M. Sánchez[1], S. Moyà-Solà[1,6,7], S. Almécija[8,9,1], D.M. Alba[1]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Department of Computer Science, University of Helsinki, P.O. Box 68, 00014 Helsinki, Finland.

[3]Department of Geosciences and Geography, University of Helsinki, P.O. Box 64, 00014 Helsinki, Finland.

[4]ARAID Foundation/Universidad de Zaragoza, Departamento de Ciencias de la Tierra, and Instituto Universitario de Investigación en Ciencias Ambientales de Aragón (IUCA), c/ Pedro Cerbuna 12, 50009 Zaragoza, Spain.

[5]Division of Mechanical Engineering and Design, South Bank Applied BioEngineering Research (SABER), South Bank Applied BioEngineering Research, London South Bank University, London, UK.

[6]Institució Catalana de Recerca i Estudis Avançats, 08010 Barcelona, Spain.

[7]Unitat d'Antropologia Biològica (Dept. BABVE), Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[8]Division of Anthropology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024, USA.

[9]New York Consortium in Evolutionary Primatology, New York, NY 10016, USA.

*presenting author, sara.arranz@icp.cat

***Keywords**: ecometrics, paleoecology, fossil primates, Late Miocene, Spain*

The earliest Vallesian (~11.2 Ma) site of Castell de Barberà (CB), in the Vallès-Penedès Basin (NE Iberian Peninsula), records one of the few co-occurrences of hominoids and pliopithecoids in the Miocene of Europe. To refine previous paleoenvironmental inferences about this site, we applied an ecometric approach based on functional crown type (FCT) dental variables, which capture functional traits of herbivorous large-mammal molars and are correlated to environmental parameters. FCT scorings were based on an updated faunal list of CB. Paleotemperature and paleoprecipitation were estimated based on published regressions and used to classify CB in Whittaker's biome system. This classification was further assessed using a canonical variate analysis (CVA) based on FCT variables for a dataset of extant localities. The results were compared with those previously derived for the younger (~9.8 Ma) hominoid-bearing site of Can Llobateres 1 (CLL1). Estimates of mean annual temperature and precipitation for CB (26°C and 837 mm) and CLL1 (26 °C and 907 mm) are very similar, suggesting a tropical seasonal forest/savanna biome. The CVA classifies CB as a tropical rain forest with the highest probability (56%) and second as a tropical seasonal forest/savanna (33%), as in the case of CLL1. Our results indicate that CB and CLL1 record similar local

paleoenvironments (characterized by warm, humid, and densely forested conditions linked to the presence of permanent waterbodies) despite differing in time by almost 1.5 Myr. Comparisons should be extended to early Vallesian sites without recorded primates to assess whether they significantly differed from a paleoenvironmental viewpoint.

Acknowledgements: Funded by R+D+I project PID2020-117289GB-I00 (MCIN/AEI/10.13039/501100011033/), Generalitat de Catalunya/CERCA Programme, AGAUR (2021 SGR 00620 and 2021 SGR 01188), Departament de Cultura of the Generalitat de Catalunya (CLT0009_22_000018), INVESTIGO Program 2022 (100027TC1, Next Generation EU) to S.G.A., and a predoctoral fellowship from the Confederated Tribes of Grand Ronde (CTGR) to S.M.

SYNCHROTRON AND CT SCANNING PROVIDE INSIGHT INTO THE ANATOMY AND EVOLUTION OF EXCEPTIONAL MESOZOIC FISHES

J. Atterby[1*], M. Friedman[2], Z. Johanson[3], S. Giles[1]

[1]University of Birmingham, School of Geography, Earth and Environmental Sciences, B15 2TT, Birmingham, UK.

[2]University of Michigan, Department of Earth and Environmental Sciences, MI 48109, Ann Arbor, US

[3]Natural History Museum, SW7 5BD, London, UK.

*presenting author, JXA973@student.bham.ac.uk

Keywords: *Actinopterygii, tomography, endocast, phylogeny, Jurassic*

Teleost fishes comprise more than half of all living vertebrate species. They are exceptionally diverse and occupy a wide range of aquatic ecosystems. However, despite their overwhelming success, taxa outside of the living radiation—stem teleosts—remain poorly understood. They include a plethora of iconic fossil groups, such as pholidophorids, aspidorhynchids, and pachycormids. However, efforts to understand their phylogenetic placement have been hampered by inappropriate outgroups, poorly constructed characters, and outdated descriptions—based almost entirely on external anatomy. Ultimately, fossil teleost fishes lack a solid phylogenetic foundation, which has undermined attempts to investigate macroevolutionary patterns on the stem. Here, we present a series of remarkably preserved fossil specimens from British Jurassic localities, including potentially new taxa. This includes a new, three-dimensionally preserved specimen of *Dorsetichthys bechei* (Teleostei incertae sedis), a herring-like fish from Early Jurassic Lyme Regis, and the crania of a new genus of Caturidae (Amiiformes) from the Late Jurassic Great Oolite Limestone (Northamptonshire) previously misidentified as an aspidorhynchid. Crucially, through high-resolution CT and synchrotron scanning, we have been able to resolve and code their internal anatomy, including the braincase and endocast. This has informed a markedly strengthened phylogeny of the teleost stem, which sets in motion a wide range of future macroevolutionary studies and will allow us to far better understand the origins of this exceptionally important vertebrate group.

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

VARIATION IN METAPODIAL MORPHOLOGY IN THE INSULAR BOVID *MYOTRAGUS*

N. Balan[1*], L. Holt[1], J.J. Hennekam[1,2]

[1]Maastricht Science Programme, Maastricht University, Paul-Henri Spaaklaan 1, 6200 MD, Maastricht, The Netherlands.

[2]Naturalis Biodiversity Center, Darwinweg 2, 2333 CR, Leiden, The Netherlands.

*presenting author, n.balan@student.maastrichtuniversity.nl

***Keywords**: island evolution, geometric morphometrics,* Myotragus*, functional morphology*

Myotragus is an extinct bovid genus endemic to the Gymnesic Islands (Mallorca and Menorca, Western Mediterranean, Spain). It adapted to a depauperized insular environment characterized by the absence of mammalian predators, relatively low species diversity, and limited food resources. These adaptations include the reduction in body size, together with the development of short, stout metapodials with limited flexibility, which impacts the shock-absorption capacity. Two of the primary hypothesized reasons for the drastic change in shape are the absence of mammalian predators, which renders flexible joints needed for escape maneuvers unnecessary, and the stabilization of the carpo-metapodial and metapodial-phalangeal joints to avoid injuries on steep grounds. Here, the intra- and interspecific divergence in metapodial morphology of the anagenetic *Myotragus* lineage (*M. palomboi, M. pepgonellae, M. kopperi*, and *M. balearicus*) is analyzed by means of 3D geometric morphometrics. Preliminary results show that the geologically older chronospecies *M. kopperi* has relatively smaller metapodials, which deviate from the common allometric trajectory when compared to *M. balearicus*. In addition, a relative decrease in metapodial size for *Myotragus* specimens from Menorca can be noticed. Due to the number of samples included in the database (n=86) and the method of analysis, it is possible to assess different potential variables, such as island and cave locality, as factors driving island dwarfism in the *Myotragus* lineage.

Acknowledgements: We thank Josep Antoni Alcover (IMEDEA) and Carol Constantino de la Peña (Museu Balear de Ciències Naturals, Sóller) for providing access to the skeletal material.

CAUSES OF TOPOLOGICAL INCONGRUENCE IN PHYLOGENETIC HYPOTHESES OF HADROSAURID RELATIONSHIPS

J. Barber Servera[1*], A. Prieto-Márquez[1,2]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, c/ Escola Industrial 23, 08201 Sabadell, Barcelona, Spain.

[2]Museu de la Conca Dellà, c/ Museu 4, 25650 Isona i Conca Dellà, Lleida, Spain.

*presenting author, josepbarberservera@gmail.com

***Keywords**: phylogeny, taxonomic sampling, character data, Hadrosauridae*

Over the past decade, there has been a surge of phylogenetic studies of hadrosaurid dinosaurs, a nearly cosmopolitan diverse clade of Late Cretaceous herbivorous ornithischian ornithopods. These animals are unique in combining complex dental batteries, hypertrophied nasal passages, and iconic cranial ornaments. Although analyses agree in the split of hadrosaurids into two major clades, the relationships of lower-rank taxa within each of these clades differ. This project aims at evaluating the causes behind these discrepancies via the implementation of comparative cladistics. This approach allows quantifying the differences existing in various parameters relating to the nature and distribution of characters and character states of a selection of character-taxon matrices used in recent phylogenetic analyses. All phylogenetic studies of hadrosaurid relationships published over the past decade are variations of three other datasets, which, for that reason, were chosen for this comparative analysis. The major sources of discrepancy among datasets consist of: (1) character selection (nearly half of the characters present in one matrix are absent in the other and vice versa); (2) character state delimitation among those characters that are common in the datasets; and (3) taxonomic sampling (up to 25% of the selected taxa differ among datasets). This study highlights the major variables affecting the results of primary homology assessment of hadrosaurid skeletal variation, particularly regarding the choice and definition of phylogenetically informative characters, as well as how their variation becomes discretized into character states.

Acknowledgements: This work was supported by R+D+I project PID2020-119811GB-I00 funded by MCIN/AEI/10.13039/501100011033. Additional support was provided by the CERCA Programme/Generalitat de Catalunya and OSIC grant CLT0009_22_000021 from the Departament de Cultura of the Generalitat de Catalunya.

ON A COMPLETE SPECIMEN OF *OENOSAURUS* FROM THE LATE JURASSIC OF THE SOLNHOFEN ARCHIPELAGO, WITH IMPLICATIONS FOR ITS PALAEOECOLOGY

V. Beccari[1*], F. Glaw[2,3], O.W.M. Rauhut[1,3,4]

[1]SNSB-Bayerische Staatssammlung für Paläontologie und Geologie, Munich, Germany.
[2]SNSB-Zoologische Staatssammlung, Munich, Germany.
[3]GeoBioCenter, Ludwig-Maximilians-Universität, Munich, Germany.
[4]Department of Earth and Environmental Sciences, Ludwig-Maximilians-Universität, Munich, Germany.

*presenting author, victor.beccari@gmail.com

***Keywords**: Rhynchocephalia, Lepidosauria, comparative osteology, Germany*

Rhynchocephalians, the sister group of Squamata (lizards and snakes), were highly diverse during the Mesozoic. The Late Jurassic of the Solnhofen Archipelago alone has yielded nine species so far, but recent revisions and new specimens show that the actual number is probably higher. Among the rhynchocephalians from the Archipelago, *Oenosaurus* is a puzzling taxon, bearing highly modified tooth plates in both its upper and lower jaws. The holotype consists of an articulated skull, with no postcranial material associated. A new complete specimen of *Oenosaurus* provides new information on the postcranial anatomy and the palaeoecology of this taxon. The specimen was CT-scanned and compared to other rhynchocephalians and lepidosaurs. It shares many features with *Oenosaurus muehlheimensis*, including the medial process at the posterior end of the maxilla, a high coronoid, a lateral groove on the dentary with large foramina, and tooth plates formed by numerous small, pencil-like teeth. However, it differs from *O. muehlheimensis* in having longitudinal striations at the ventral surface of the dentaries. The postcranial anatomy show striking features, like metacarpal and metatarsal I being the most robust, reduced hook of metatarsal V, unossified epiphyses of the limb bones, and unfused astragalus and calcaneum. Its limbs are short compared to the presacral series length, although not to the same extend as in pleurosaurids. The dentition and overall appendicular morphology of the new specimen of *Oenosaurus* argue for a semiaquatic or aquatic lifestyle with a possible diet of hard-shelled crustaceans or molluscs.

Acknowledgements: We would like to thank Gabriel S. Ferreira (SHEP, Tübingen) for the CT-scan of the specimen, and the Deutsche Forschungsgemeinschaft for financing this project (DFG grant RA 1012/28-1).

UPDATING THE ICHNOLOGICAL MESOZOIC RECORD OF NORTHERN CHILE: NEW DATA FROM LATE JURASSIC–EARLY CRETACEOUS TRACKSITES

M. Belvedere[1], V. Gesualdi[1*], M. Yurac Diaz[2], J. Mendez[3], N. Hurem[4], D. Hippler[4], C. Salazar[3], C.A. Meyer[5]

[1]Dipartimento di Scienze della Terra, Università degli Studi di Firenze, 50121 Firenze, Italy.
[2]Unidad de Patrimonio Paleontológico, Consejo de Monumentos Nacionales, 7500000 Providencia, Santiago de Chile, Chile.
[3]Facultad de Ciencias, Escuela de Geología, Universidad Mayor, 7500000 Providencia, Santiago de Chile, Chile.
[4]Graz University of Technology, Institute of Applied Geosciences, 8010 Graz, Austria.
[5]Department of Environmental Sciences, University of Basel, 4056 Basel, Switzerland.

*presenting author, vincenzo.gesualdi@stud.unifi.it

***Keywords**: dinosaur ichnology, paleoenvironment, Late Jurassic, Early Cretaceous, Chile*

The potential of the ichnological record of dinosaurs from Chile is still to be fully explored. While studies of the bone record have seen a renaissance in the last few years, the studies of the track record are still in their infancy. Tracksites are common in the Late Jurassic to Early Cretaceous formations between the Tarapaca and Atacama regions in northern Chile. These formations display different depositional setting, ranging from transitional terrestrial/marine to deltaic or fluvial environments, providing an excellent set up for paleoecological studies of the coeval ichnocoenoses, in combination with investigations on the paleoenvironmental conditions. Such studies have never been carried out for the western margin of Gondwana, especially at these palaeolatitudes (around 25° S). A first exploratory field campaign carried out in 2022 in the Quebrada Huatacondo (Tarapacá Basin) provided several new dinosaur (therapod and sauropod) tracksites, highlighting the potential of new finds in the Late Jurassic Majala and Early Cretaceous Chacarilla Formations. Following the success of this expedition, a new campaign has been carried out in 2023 in the same formations cropping out in the Quebrada Arca and Quebrada Quehuita. Here we present the preliminary result of these expeditions, reviewing known tracksites and showing the new discoveries, abundant in dinosaur and possibly also other tetrapod (e.g., possible turtle) tracks.

Acknowledgements: Consejo de Monumentos Nacionales for the research permits in the study areas.

A DUGONGINE SIRENIAN FROM THE MIOCENE OF VENEZUELA WITH SHARK–CROCODYLIAN INTERACTIONS

A. Benites-Palomino[1*], G. Aguirre-Fernandez[1], R. Sánchez[2], J. Carrillo-Briceño[1], M. Sánchez-Villagra[1]

[1]Department of Paleontology, University of Zurich, Karl-Schmid-Strasse 4, 8006 Zürich, Switzerland.

[2]Museo Paleontológico de Urumaco, Urumaco, Estado Falcón, Venezuela.

*presenting author, aldo.benitespalomino@uzh.ch

***Keywords**: sharks, sirenians, bite marks, crocodilians, Venezuela*

The Caribbean has been recognized as one of the largest hotspots for the diversification of sirenians, as several fossil species have been unearthed in the region from the Eocene to the Miocene. Here, we report a new dugongine sirenian from the Miocene Coro Fm. of Venezuela based on a partial skeleton, including a fragmentary skull and associated ribs. Preliminary observations indicate that it corresponds to a medium to large-sized animal with strong affinities with *Culebratherium* from the early Miocene of Panama, but ambiguous cranial and postcranial characters referred to the paraphyletic *Dioplotherium*. The sirenian skeleton exhibits a series of bite marks, left by sharks and possibly crocodilians. The shark bite marks display a slightly curved and non-serrated outline, resembling those left by mako sharks (*Isurus*) and requiem sharks (*Galeocerdo*). A similarly interacted sirenian specimen was previously reported from the Miocene of Austria, with shark bites attributed to *Galeocerdo*. Additionally, the sirenian of Coro Fm. presents a series of pits across the rostral bones, which we attribute to a possible crocodilian interaction. The pits are rounded and have perforated the epiphysis of the premaxillary and maxillary bones. We attribute these to a small to medium-sized caiman, due to the pit morphology and the lack of transverse compression of the bone, as done by larger crocodilians. Due to the fragmentary state of the specimen, it cannot be assessed whether marks are attributable to active predation or scavenging events, although the irregular distribution of part of the shark bites suggests the latter.

Acknowledgements: This research was supported by funds to A.B-P by the UZH Candoc Grant (FK-22-082).

MORPHOLOGY OF THE SKULL OF *MANTELLISAURUS ATHERFIELDENSIS* (DINOSAURIA, ORNITHOPODA) FROM THE BERNISSART SINKHOLE, BELGIUM

F. Bertozzo[1*], C. Mallet[2], M.A.D. During[3], V. Fischer[2], P. Godefroit[1]

[1]Operational Directorate Earth and History of Life, Royal Belgian Institute of Natural Sciences, Rue Vautier 29, 1000 Bruxelles, Belgium.

[2]Evolution & Diversity Dynamics Lab, UR Geology, University of Liège, Quartier Agora, Allée du six Août 14, 4000 Liège, Belgium.

[3]Department of Organismal Biology, Uppsala University, Norbyvägen 18A, 752 36 Uppsala, Sweden.

*presenting author, fbertozzo@naturalsciences.be

***Keywords**: Styracosterna, Bernissart, Iguanodontia, osteology, computed tomography*

In 1878, a large group of iguanodontian dinosaurs was discovered in Lower Cretaceous deposits in Bernissart (Belgium). Most of the specimens were identified as belonging to *Iguanodon bernissartensis,* but a smaller and slender individual (RBINS R57) was referred to as *Iguanodon mantelli*, based on similarities with more fragmentary material from England. Norman subsequently described RBINS R57 in detail and highlighted great similarities between this skeleton and the holotype of *Mantellisaurus atherfieldensis* (NHMUK R5764) from the Isle of Wight. However, recent dismounting and digitizing of RBINS R57 revealed novel anatomical data, especially in the skull. The narial fenestra and the dorsal ramus of the premaxilla are longer than previously established. The latter articulates in a V-like contact with the short rostral process of the nasal. The coupled nasals are mediolaterally flat, and their distalmost horizontal margin is set above the orbit level, forming a crest-like structure. Although this feature might have been exaggerated by the diagenetic compression of the skull, the contact with the prefrontals and frontals and the caudal shape of the narial fenestra appear genuine, supporting the hypothesis that the paired nasals did indeed form a crest. The dorsal margin of the external naris is broken and displaced, but we were able to reconstruct its original morphology through CT scanning, showing that it linearly extended from the nasal body to arch down to the premaxillae. Our results highlight significant differences between RBINS R57 and NHMUK R5764, and the taxonomy and phylogeny of the Belgian specimen therefore require extensive re-evaluation.

Acknowledgements: Thanks to Belspo BRAIN-be 2.0 for funding the project. Thanks to the RBINS and Musée de l'Iguanodon (Bernissart) staff for logistical help with the moving, handling, and restoration of the specimens. Thanks to Dr. Jamie McLaren (Universiteit Antwerpen) and Dr. Aurore Mathys (RBINS) for digitization aid.

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

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

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

[2]School of GeoSciences, University of Edinburgh, Grant Institute, EH9 3FE, Edinburgh, Scotland, UK.

[3]Section of Mammals, Carnegie Museum of Natural History, 15213, Pittsburgh, PA, USA.

[4]New Mexico Museum of Natural History and Science, 87104, Albuquerque, NM, USA.

[5]Department of Anthropology, Brooklyn College, City University of New York, 11210, Brooklyn, NY, USA.

[6]Department of Anthropology, The Graduate Center, City University of New York, 10016, New York, NY, USA.

[7]New York Consortium in Evolutionary Primatology, New York, NY, USA.

[8]Department of Biological and Biomedical Sciences, Rowan University, Glassboro, NJ, USA.

[9]Denver Museum of Nature & Science, 08028, Denver, CO, USA.

[10]Division of Paleontology, American Museum of Natural History, 10024, New York, NY, USA.

[11]National Geographic Society, 20036, Washington, DC, USA.

[12]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

Our results support previous work on tarsal morphology and locomotor behavioral ancestral state reconstructions suggesting that ground dwelling mammalian species were more common than arboreal taxa during the Paleocene. Ultimately, this may indicate that the collapse of forested environments immediately after extinction led to the preferential survivorship of more terrestrially adapted mammals.

Acknowledgements: CERCA Programme/Generalitat de Catalunya; H2020-MSCA-IF-2018-2020, 792611, Beatriu de Pinós, 2021 BP 00042; ERC Starting Grant 756226, Philip Leverhulme Prize; NSF DEB 1654952; NSF DEB 1654949; NSF DEB 1456826; Belgian Science Policy Office project BRAIN BR/121/A3/ PalEurAfrica, DMNS NoWalls Community Initiative.

LIMITED EVIDENCE OF DIETARY PARTITIONING BETWEEN TRIASSIC DINOSAURS AND OTHER ARCHOSAUROMORPHS

J. Bestwick[1*], S. Lautenschalger[1], S. Nesbitt[2], P. Barrett[3], L. Porro[4], R. Butler[1]

[1]School of Geography, Earth and Environmental Sciences, University of Birmingham, Edgbaston, B15 2TT, Birmingham, UK.

[2]Department of Geoscience, Virginia Tech, 926 West Campus Drive, 24601, Blacksburg, Virginia, USA.

[3]Department of Earth Sciences, The Natural History Museum, Cromwell Road, SW7 5DB, London, UK.

[4]Centre for Integrative Anatomy, Department of Cell and Developmental Biology, University College London, Gower Street, WC1E 6BT, London, UK.

*presenting author, jordan.bestwick92@gmail.com

***Keywords**: archosauromorph, diet, dinosaur, microwear, Triassic*

The Triassic Period was a key time in the evolutionary history of vertebrates that saw the origin and radiation of Archosauria, the reptile group that includes dinosaurs and crocodylians (part of Pseudosuchia). Dinosaurs evolved around 230 Ma but for the first 30 Myr of their history they were relatively minor components of Triassic ecosystems. It is hypothesized, albeit from qualitative evidence, that Triassic dinosaurs competed with other reptile groups for food resources which prolonged their rise to dominance. Here, we use dental microwear texture analysis—quantitative examination of the submicron scale tooth textures that form during feeding—to constrain the diets of Triassic archosauromorphs (including stem archosaurs) and to test hypotheses of competition between unrelated groups. We find large degrees of textural, and thus dietary, overlap between major archosauromorph clades and generally subtle partitioning between distantly related taxa that likely belonged to the same broad dietary guild (e.g., herbivory, faunivory). For example, similar dental textures between the stem archosaur *Azendohsaurus*, the psudeosuchian *Revueltosaurus*, and sauropodomorph dinosaurs (*Lufengosaurus*, *Massospondylus*) indicate that these taxa all consumed foods of a similar dietary abrasiveness, while rougher tooth textures from heterodontosaurids (*Abrictosaurus*, *Heterodontosaurus*) indicate more abrasive diets. We also find limited phylogenetic signals in archosauromorph microwear in multivariate space. Our results tentatively suggest that Triassic dinosaurs possibly competed with pseudosuchians for food and that both groups filled dietary roles previously occupied by stem archosaurs. Dietary diversity is therefore deemed an unlikely factor behind why dinosaurs survived the end-Triassic mass extinction that wiped out most pseudosuchians.

Acknowledgements: Thanks to Clare Browning (Cape Town), Martín Ezcurra (Buenos Aires), Harry Jones (Birmingham), Randall Irmis (Salt Lake City), Alexander Kupfer and Rainer Schoch (Stuttgart),

Susannah Maidment (London), Bill Simpson (Chicago), Matthew Smith, and Deborah Wagner (Petrified Forest) for assistance with specimen access and data collection.

UNEXPECTED DISCREPANCY BETWEEN BONE MICROANATOMY AND PRESUMED LIFESTYLE REVEALED IN CARBONIFEROUS TETRAPODS

S. Bijl[1*], P. Tafforeau[2], P. Ahlberg[1], A. Clement[3], P. Bishop[4,5], J. Clack[6†], S. Sanchez[1,2]

[1]Department of Organismal Biology, Uppsala University, 75236 Uppsala, Sweden.
[2]European Synchrotron Radiation Facility, 38043 Grenoble Cedex, France.
[3]College of Science and Engineering, Flinders University, SA 5042 Adelaide, Australia.
[4]Museum of Comparative Zoology and Department of Organismic and Evolutionary Biology,Harvard University, MA 02138 Cambridge, Massachusetts, USA.
[5]Geosciences Program, Queensland Museum, Queensland 4101, Brisbane, Australia.
[6]University Museum of Zoology, CB2 3EJ Cambridge, UK.

*presenting author, sifra.bijl@ebc.uu.se
†deceased.

Keywords: *Carboniferous, stem tetrapods, humeri, synchrotron scanning, microstructure*

The terrestrialisation of vertebrates is a major evolutionary event that involved drastic changes in the limb bones. It has been an area of great interest in the palaeontological community. However little focus has been put on the patterns of ossification of these bones, mostly due to the scarcity of the fossil material. This study aims to map in detail the diversity of bone patterns in the humeri of a wide variety of early tetrapods from the Carboniferous, based on a non-destructive method: propagation phase-contrast synchrotron microtomography. We looked at the internal bone architecture of the following Carboniferous genera: *Baphetes*, *Pederpes*, *Ossinodus*, and *Crassigyrinus*. We investigated, among others, their ossification patterns and bone microanatomy. Unexpectedly, our results reveal that they all retain a very spongy microanatomy, regardless of their varying lifestyles (from aquatic to terrestrial). They all have an unossified anterior margin where muscles are expected to connect and play a major role, even in terrestrial locomotion. This discrepancy between bone compactness, ossification pattern, and lifestyle suggests that cartilaginous entheses probably played a function in the adaptation of Carboniferous tetrapods to land. This further indicates that a shift in microanatomy towards a more tubular long-bone structure in terrestrial locomotion is probably a more derived feature than expected.

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

DEEP-TIME ECOLOGICAL TRANSITIONS OF LARGE HERBIVORE FAUNAS REVEALED BY NETWORK ANALYSIS

F. Blanco[1,2,3*], I.A. Lazagabaster[4], Ó. Sanisidro[5] , F. Bibi[3], N. Heckeberg[6], M. Ríos[7], B. Mennecart[8] , M.T. Alberdi[9], J.L.Prado[10], J. Saarinen[11] , D. Silvestro[1,2,12], J. Müller[3], J. Calatayud[13], J.L. Cantalapiedra[5]

[1]Department of Biological and Environmental Sciences, University of Gothenburg, Medicinaregatan 18, 405 30 Gothenburg, Sweden.

[2]Gothenburg Global Biodiversity Centre, Box 461, Gothenburg, Sweden.

[3]Museum für Naturkunde, Invdralidenstrasse 43, 10549 Berlin, Germany.

[4]National Research Center on Human Evolution (CENIEH), Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain.

[5]Universidad de Alcalá, Plaza San Diego s/n, 28801 Alcalá de Henares, Madrid, Spain.

[6]Staatliches Museum für Naturkunde, Erbprinzenstraße 13, 76133 Karlsruhe, Germany.

[7]Universidade Nova de Lisboa, 1099-085 Lisboa, Portugal.

[8]Naturhistorisches Museum Basel, Augustinergasse 2, CH – 4051 Basel, Switzerland.

[9]Museo Nacional de Ciencias Naturales (CSIC), C/ José Gutiérrez Abascal 2, 28006 Madrid, Spain.

[10]Universidad Nacional del Centro de la Provincia de Buenos Aires, Del Valle 5737, B7400JWI-Olavarría, Argentina.

[11]Helsingin Yliopisto, Yliopistonkatu 4, 00100 Helsinki, Finland.

[12]Department of Biology, University of Fribourg and Swiss Institute of Bioinformatics, Ch. du Musée 10, 1700 Fribourg, Switzerland.

[13]Universidad Rey Juan Carlos, Calle Tulipán s/n, Móstoles, 28933 Madrid, Spain.

*presenting author, fblancosegovia@gmail.com

***Keywords**: network analysis, macroecology, large herbivores, Cenozoic*

Understanding functional transitions is crucial for comprehending the evolution of ecosystems over deep time. Paleontological data allows us to study past ecosystems and how they changed over millions of years. We used network analysis over a new dataset of worldwide large herbivores spanning the last 60 Myr, to characterize ecosystem functional structure. We found that large mammalian herbivore communities underwent long periods of stability interrupted by abiotic-driven reassembly. There was an initial trend to increase in functional diversity, mediated by a net gain in functional richness, fueled by the formation of the *Gomphotherium* landbridge around 20 Ma, when the system experienced a first reassembly. This natural corridor brought about the interchange of faunas between Eurasia and Africa, creating new opportunities to explore new functionalities in new environments. After this moment, there was stability until the system started to accumulate species with similar ecological roles (functional saturation), which provoked the functional collapse of the large herbivore ecosystems around 10 Ma, coinciding with the spread of C4 dominated grasslands.

This event came from a trend to a more arid and cold world, which affected the vegetation and the animals that feed on them, forcing the species to functionally change. From that point onwards, the system never regained a positive trend in functional diversity, even experiencing an acceleration of the decrease around 2.5 Ma during the onset of Plio-Pleistocene glaciations. Nevertheless, this continuous decay had no effect on the functional structure, which remained unaltered throughout the last 10 Myr.

Acknowledgements: This study was funded by Deutsche Forschungsgemeinschaft (LO 2368/1-1) and by Gothenburg University via the Swedish Research Council (VR: 2019-04739).

NEW SPECIMENS AND CT DATA OF THE LONGIROSTRINE CROCODYLIAN *THORACOSAURUS ISORHYNCHUS* FROM THE MAASTRICHTIAN OF MONT-AIMÉ (PARIS BASIN, FRANCE)

S.A. Boerman[1,2*], J. Vellekoop[1,2], S. Jouve[3], T. Oudoire[4], T. Smith[2]

[1]Earth and Environmental Sciences, Katholieke Universiteit Leuven, Celestijnenlaan 200E, 3001, Leuven, Belgium.

[2]Directorate Earth and History of Life, Royal Belgian Institute of Natural sciences, Vautierstreet 29, 1000, Brussels, Belgium.

[3]CR2P, Sorbonne Université, CRNS-MNHN-Sorbonne Université, 4 Place Jussieu, 75005, Paris, France.

[4]Collections & Muséographie, Musée d'Histoire Naturelle de Lille, 23 Rue Gosselet, 59000, Lille, France.

*presenting author, sophie.boerman@kuleuven.be

Keywords: *Crocodylia, Mont-Aimé, microCT, Eusuchia, phylogeny*

Thoracosaurs are a polyphyletic group of Cretaceous–Paleogene longisrostrine crocodylians from Europe and North America. Traditionally perceived as gavialoids, phylogenetically closer to Gavialinae than to Tomistominae, they play a key role in the gharial problem: their old age and seemingly close relationship to Gavialinae is inconsistent with molecular clock estimates indicating a far younger origin of Gavialoidea. Moreover, the phylogenetic position of thoracosaurs is debated, as recent studies suggested thoracosaurs are non-crocodylian eusuchians instead. Here we describe thoracosaur material from Mont-Aimé, France, rediscovered in the collections of the Musée d'Histoire Naturelle de Lille. The Mont-Aimé is famous for its richness in fossil vertebrates, among which the longirostrine species *Thoracosaurus isorhynchus* (formerly *T. macrorhynchus*). Confusion about the age of the vertebrate layers has recently been solved, indicating that they are Maastrichtian in age instead of Danian. The new material most likely belongs to *T. isorhynchus* based on a flexure in the ectopterygoid–pterygoid suture, a distinctive character found in adults of this taxon. Our study reveals new characters not visible on previously known material. An example is the short posterior non-dentigerous process of the maxilla, a character shared with early Paleogene longirostrines and tomistomines but not with gavialines. Furthermore, microCT data of the skull reveal for the first time endocranial characters of this taxon, such as the presence of an internal recess in the parietal. Together with redescribed *T. isorhynchus* material from the Muséum d'Histoire Naturelle, Paris, this leads to an updated phylogenetic position of this taxon.

LIZARDS AND AMPHISBAENIANS FROM THE MIDDLE EOCENE OF MAZATERÓN (ALMAZÁN BASIN, SORIA, SPAIN)

A. Bolet[1,2,3*]

[1]Departamento de Estratigrafía y Paleontología, Universidad de Granada, Avda. Fuente Nueva s/n, 18071 Granada, Spain.

[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[3]School of Earth Sciences, University of Bristol, Life Sciences Building, 24 Tyndall Avenue, Bristol, BS8 1TQ, UK.

*presenting author, arnau.bolet@icp.cat

Keywords: *Reptilia, Squamata, herpetofauna, microvertebrates, Iberian Peninsula*

The Iberian Peninsula has yielded some of the most important Paleogene vertebrate assemblages of Southern Europe, but herpetofaunas remain comparatively poorly known in comparison to mammals. This is especially true for small reptiles and amphibians that are often recovered alongside micromammals in screen-washing concentrates. The new collection of lizards and amphisbaenians from the middle Eocene locality of Mazaterón (Almazán Basin, Spain) reported here fills a gap between previously known early and late Eocene squamate faunas. The assemblage is, accounting for the limited available material, moderately diverse, as it contains two forms of scincids, a lacertid, an iguanid (possibly *Geiseltaliellus*), an anguine and two glyptosaurine (tribes Glyptosaurini and "Melanosaurini") anguids, and a blanid amphisbaenian. This identified faunal association is congruent with the hypothesized disappearance of Iberian Paleogene agamids and "necrosaurs", which are restricted to the early Eocene, and the persistence of lacertids, iguanians, anguids and, apparently, scincids through most of the Iberian Eocene. Among the latter, one form bears a characteristic dental morphology that hints at the presence of a new taxon. The amphisbaenian from Mazaterón is one of the oldest records of the group in Europe after a period of temporary retrieval from the continent that lasted the greatest part of the middle Eocene. These additions to the faunal list from Mazaterón confirm its importance as one of the most diverse Iberian middle Eocene vertebrate assemblages, and are expected to contribute valuable data to paleobiogeographical and paleonvironmental discussions of questions raised by the study of other groups of vertebrates.

Acknowledgements: A.B. holds a María Zambrano Junior Fellowship funded by the Ministerio de Universidades (Spain) and the NextGenerationEU programme. This work is part of the projects AL\221010 (Royal Society, UK) and PID2020-116908GB-I00 (Ministerio de Universidades, Spain). Support of the RNM190 group (UGR) and the CERCA Programme/Generalitat de Catalunya (ICP) are acknowledged.

LIZARDS, AMPHISBAENIANS, AND SNAKES FROM THE LATEST MIOCENE LOCALITY OF ZORRERAS (SORBAS BASIN, ALMERÍA, SPAIN)

A. Bolet[1,2,3*], A. García-Alix[1], E. Martín-Suárez[1], M. Freudenthal[1], R. Minwer-Barakat[1,2]

[1]Departamento de Estratigrafía y Paleontología, Universidad de Granada, Avda. Fuente Nueva s/n, 18071 Granada, Spain.

[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[3]School of Earth Sciences, University of Bristol, Life Sciences Building, 24 Tyndall Avenue, Bristol, BS8 1TQ, UK.

*presenting author, arnau.bolet@icp.cat

Keywords: *Squamata, Reptilia, herpetofauna, Iberian Peninsula, microvertebrates*

Zorreras is a latest Miocene section situated in southeastern Iberian Peninsula (Sorbas Basin) containing two microvertebrate sites known as ZOR2B and ZOR3A. The described faunas are important in recording an episode of vertebrate dispersal from Africa to Europe during the Messinian Salinity Crisis, as shown by the presence of gerbilids of African origin (*Debruijnimys*). We report here a small collection (25 specimens) of squamates (lizards, amphisbaenians, and snakes) from ZOR2B and ZOR3A sites that has allowed the identification of a lacertid, two anguines (possibly *Pseudopus* and *Ophisaurus*), an agamid, the amphisbaenian *Blanus*, and two snakes. Among the latter, a single partial vertebra points to the presence of an indeterminate scolecophidian at ZOR2B. This faunal list is highly similar to that reported from the contemporaneous locality of Salobreña, and small incongruences (e.g., the lack of gekkotans at Zorreras or the lack of lacertids at Salobreña) are interpreted as the result of the small sample size, and not necessarily evidence of true differences in composition of the assemblages. The indeterminate snake from Zorreras could correspond to one of the non-scolecophidian taxa recovered at Salobreña, and it cannot be discounted the possibility that a scincid could be present among the indeterminate lizard material. Although the paleoherpetofaunal material available from Zorreras is extremely scarce in concordance with the limited collections of micromammals, it provides insights on a relatively poorly known episode, representing a valuable addition to the ongoing study of the evolution of Miocene and Pliocene vertebrate assemblages in southern Spain.

Acknowledgements: A.B. holds a María Zambrano Junior Fellowship funded by the Ministerio de Universidades (Spain) and the NextGenerationEU programme. This work is part of the project P20_00066 funded by the Junta de Andalucía (Spain). Support of the RNM190 group (UGR) and the CERCA Programme/Generalitat de Catalunya (ICP) are acknowledged.

ANALYSIS OF FOSSIL REMAINS FROM FIVE KEM KEM LOCALITIES (SOUTH-EASTERN MOROCCO) WITH INFERENCES ON PALEOECOLOGY. PRELIMINARY RESULTS

F. Borchi[1,2*], S. Maganuco[3,4], S. Zouhri[5], M. Belvedere[1,2], L. Rook[1,2]

[1]Dipartimento di Scienze della Terra, Università di Firenze, Via G. La Pira 4, 50121, Firenze, Italy.
[2]NBFC, National Biodiversity Future Center, Piazza Marina 61, Palermo 90133, Italy
[3]Sezione di Paleontologia dei Vertebrati, Museo di Storia Naturale di Milano, Corso Venezia 55, 20121, Milan, Italy.
[4]Associazione Paleontologica Paleoartistica Italiana, Via Nicolò Paganini 19, 43121, Parma, Italy.
[5]Department of Geology and Health and Environment Laboratory, Hassan II University of Casablanca, Km 8 Route d'El Jadida, Casablanca 20000, Morocco.

*presenting author, francesca.borchi@unifi.it

Keywords: *paleoecology, Cenomanian, fossil assemblage, Kem Kem*

The “Kem Kem strata” (?Albian–Cenomanian), located in southeastern Morocco, are known to be rich in fossils. Alongside the cryptic theropod *Spinosaurus aegyptiacus*, a striking number of carnivorous taxa have been found, from pterosaurs and crocodylomorphs to fully aquatic organisms like the sawskate *Onchopristis numidus* and the coelacanth *Axelrodichthys lavocati*. The high percentage of carnivorous compared to herbivorous taxa has long been object of debate amongst researchers. Because a trophic chain mainly composed of carnivorous species has no equivalent in the fossil record nor in extant ecosystems, it has been suggested that the Kem Kem fossil assemblage is biased, either in terms of stratigraphy and/or sampling. Here, we test the “bias hypothesis” by analyzing fossil remains from five Kem Kem localities. This material was collected during research expeditions and are housed at the Universitée Hassan II (Casablanca, Morocco). Although most of these remains are poorly preserved isolated fragments of little taxonomical relevance, they provide an interesting dataset for paleoecological analysis. These materials were collected directly by researchers and not local fossil dealers, minimizing the collection bias and providing stratigraphic information. Simple statistical analysis were carried out for all localities to test if the relative abundance of taxa differed from those of museum collections and fossil shops. Even so, an overabundance of carnivorous taxa was found in all five fossil localities, suggesting that other factors, such as niche partitioning, may have been involved in this singular paleoenvironment. Further analysis of this fossil collection will help shed more light on the matter.

Acknowledgements: NBFC to University of Florence, funded by the Italian Ministry of University and Research, PNRR, Missione 4 Componente 2, “Dalla ricerca all’impresa”, Investimento 1.4, Project CN00000033.

THE ANTERIOR DENTITION OF ARTIODACTYL MAMMALS, MORPHOLOGICAL DIVERSITY AND PHYLOGENETIC SIGNAL

H. Bouaziz[1*], M. Orliac[1], M. Waqas[1], R. Weppe[1]

[1]Institut des Sciences de l'Évolution de Montpellier, Université de Montpellier, Place Eugène Bataillon, 34095 Montpellier Cedex 5, France.

*presenting author, hugo.bouaziz@umontpellier.fr

***Keywords**: incisor, canine, Artiodactyla, cladistics*

Artiodactyls are a very diverse group of mammals. Their incredible evolutionary success makes them the most abundant group of ungulates on the planet today. Their current familial diversity even places them second behind rodents and third in terms of generic and specific diversity. The modern representatives of the group have very different ecologies and diets, from herbivorous to omnivorous, and even piscivorous, and consequently exhibit highly diverse dental morphologies. The phylogenetic relationships of the clade are overall well resolved from molecular data but remain highly problematic when past diversity is considered, as evidenced by the lack of consensus for the position of fossil taxa. Dental characters remain widely used in morphological analyses, for obvious reasons of conservation bias and overrepresentation of dental material in paleontological collections. However, these characters mainly concern the cheek dentition whereas the anterior dentition is generally only little considered in large-scale analyses. This work therefore undertakes the comparison of anterior teeth (canine and incisors) at the scale of Artiodactyla, which include the modern and extinct clades: Suoidea, Cetacea, Hippopotamoidea, Tylopoda, Ruminantia, Cainotherioidea, Entelodontidae, Anoplotherioidea, Xiphodontidae, Amphimerycidae, Mericoidodontoidea, and Dichobunoidea. Incisor morphology supports the major clades Cainotheriidae, Anoplotheriidae, Ruminantia, Suina, and Cetancodonta. Our results also indicate a basal position of Cetacea + Raoellidae, challenging the findings of molecular phylogenies. We show that Artiodactyla have a significant morphological disparity in their anterior dentition, which provides a promising new source of relevant phylogenetic characters.

OSSIFICATION PATTERNS IN THE PECTORAL MESOMERES OF *GLYPTOLEPIS GROENLANDICA* (SARCOPTERYGII, POROLEPIFORMES) AND IMPLICATIONS FOR THE EVOLUTION OF THE LUNGFISH APPENDICULAR SKELETON

M.K. Branigan[1,2,3*], S. Bijl[1], P. Ahlberg[1], P. Tafforeau[4], A. Clement[5], S. Sanchez[1,4]

[1]Department of Organismal Biology, Uppsala University, Norbyvägen 16, 75236, Uppsala, Sweden.
[2]Department of Earth Sciences, University of Lille, Avenue Paul Langevin, Cité Scientifique Bâtiment SN5, 59655, Villeneuve D'Asq, France.
[3]Department of Earth Sciences, Uppsala University, Villavägen 16, 75236, Uppsala, Sweden.
[4]European Synchrotron Radiation Facility, 71 Av. des Martyrs, 38043, Grenoble Cedex, France.
[5]College of Science and Engineering, Flinders University, Sturt Rd, Bedford Park SA, 5042, Adelaide, Australia.

*presenting author, mbranigan@nevada.unr.edu

***Keywords**: fin development, paleohistology, Devonian, sarcopterygian*

The Devonian porolepiform *Glyptolepis groenlandica* (Sarcopterygii) is a key taxon for understanding the early evolution of lungfish fins. However, due to technical limitations, past research on the species has focused on the external morphology of the appendicular skeleton, and no histological analysis of the internal bone structure has been conducted thus far. Investigating the bone microstructure of this taxon is essential to shed light on the early evolutionary steps of the lungfish (and more generally, sarcopterygian) fin skeleton. Using propagation phase-contrast synchrotron microtomography, the pectoral fin of *Glyptolepis groenlandica* (NHMD 152554) was scanned. These scans were used to create a three-dimensional model of the fin segments—called mesomeres—to reveal their internal patterns and structures. Segmentation shows that the trabeculae of the proximal mesomeres of the fin are oriented longitudinally with denser trabecular mesh present in the distal and proximal ends of the mesomere. The core of the mesomeres has been infilled with sediment around three-dimensionally preserved short vascular canals. The three-dimensional preservation of these canals suggests that the inner core of the mesomere is intact, and the sediment infilling has replaced formerly unmineralized tissue such as cartilage. The trabecular organization and density distribution around this core suggests that, as in tetrapod long bones, appendicular skeletal elongation took place and implies that the framework for a complex long-bone spongiosa and the elongation process were already established in stem lungfishes. This is significant for our understanding of the evolutionary pathways that led to the derived condition of the lungfish skeleton.

Acknowledgements: We thank the vertebrate paleontology collection manager at the Natural History Museum of Denmark, Bent Erik Kramer Lindow, for specimen access. Beamtime was

allocated thanks to a proposal accepted by the European Synchrotron Radiation Facility (LS2832, S.S.). This research was supported by a grant from the Vetenskaprådet (2019-04595, S.S.).

THE PELVIC GIRDLE OF THE SIMOSAURID *PALUDIDRACO MULTIDENTATUS* HOLOTYPE (SAUROPTERYGIA)

A. Cabezuelo-Hernández[1*], C. de Miguel Chaves[1], F. Ortega[1], A. Pérez-García[1]

[1]Grupo de Biología Evolutiva, Departamento de Física Matemática y de Fluidos, Facultad de Ciencias, Universidad Nacional de Educación a Distancia (UNED), Avda. Esparta s/n, 28232 Las Rozas, Madrid, Spain.

*presenting author, paleo.alb@gmail.com

***Keywords**: Eosauropterygia, Nothosauroidea, Simosauridae, pelvic anatomy, Iberian Peninsula*

Simosauridae is a clade of nothosauroid eosauropterygians ranging from the Anisian or Ladinian (Middle Triassic) to the Carnian (Late Triassic) of the Western Tethys region (Middle East and Europe). This group is exclusively composed by *Simosaurus gaillardoti* (from the Ladinian of France and Germany), defined more than a century ago, and the recently named *Paludidraco multidentatus* (from the Carnian of Spain). *Simosaurus gaillardoti* was recognized as an active predator, in contrast with *P. multidentatus*, these significantly different lifestyles being reflected in both the cranial and postcranial skeleton. In this context, the latter species shows anatomical features of the postcranium interpreted as associated with adaptations for slow movement near the marine bottom and, hence with a radically different type of locomotion. Nonetheless, the postcranial anatomy of simosaurids is poorly known. The pelvic region in particular is only known for *S. gaillardoti*, which is represented by numerous and well-preserved remains of ilia, ischia, and pubes of several individuals. The holotype of *P. multidentatus* corresponds to a relatively complete skeleton, which preserves most pelvic bones, so far not described. Morphological differences in the pelvic region between both taxa, associated with their locomotion and derived from their interpreted radically different ecological roles, are expected. A preliminary anatomical description of the pelvic elements preserved in the holotype of *P. multidentatus* and their comparison with those of its sister taxon and other sauropterygians is presented here.

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

PECTORAL ANATOMY OF THE SAUROPOD DINOSAUR *DICRAEOSAURUS HANSEMANNI*

A. Campbell[1,2*], D. Schwarz[1]

[1]Museum für Naturkunde, Invalidenstr. 43, 10115, Berlin, Germany
[2]Humboldt-Universität zu Berlin, Unter den Linden 6, 10117, Berlin, Germany

*presenting author, amy.campbell@mfn.berlin

***Keywords**: myology, biomechanics, sauropods*

Dicraeosaurus hansemanni is a flagellicaudatan sauropod from the Late Jurassic Tendaguru Formation in Tanzania. As a group, the Dicraeosauridae are unusual amongst sauropods, with many species being smaller in size, having reduced vertebral pneumaticity, shorter necks, and tall vertebral neural spines. While the anatomy of the pelvic girdle of sauropods has been the subject of numerous studies, the pectoral girdle has so far received notably less attention. Here we present a reconstruction of the anatomy of the pectoral girdle and associated musculature of *D. hansemanni.* Musculature has been reconstructed based on direct observations of osteological correlates and comparisons with the extant phylogenetic bracket. Digitisation of the *D. hansemanni* material in the collections of Museum für Naturkunde, Berlin was carried out using structured-light scanning. From these scans, articulated models of the pectoral girdle have been produced. A combination of a short neck, large skull, and short forelimbs result in an increased amount of weight being carried on the pectoral girdle of *D. hansemanni*. More developed osteological correlates suggest increased stresses at attachment sites anchoring the muscles and ligaments involved in the support of the head and neck, such as at the apices of the anterior dorsal neural spines. The work presented here contributes to the overall understanding of the functional anatomy of the sauropod neck and pectoral girdle. With its unusual morphology, *D. hansemanni* is an important point of comparison when investigating the influences of changes in both osteology and myology within Sauropoda.

Acknowledgements: This research is funded by the Deutsche Forschungsgemeinschaft (DFG), project number 130176.

THE LARGEST HERBIVORES COLLAPSED FIRST DURING THE PLIO-PLEISTOCENE DIVERSITY CRISIS OF AFRICAN MAMMALIAN FAUNAS

J.L. Cantalapiedra[1*], I.A. Lazagabaster[2,3], F. Blanco[4], F. Bibi[2], M. Ríos[5], B. Mennecart[6], J. Saarinen[7], T. Hauffe[9], D. Silvestro[4,9], O. Sanisidro[1]

[1]Universidad de Alcalá, GloCEE - Global Change Ecology and Evolution Research Group, Department of Life Sciences, 28805, Alcalá de Henares, Madrid, Spain.

[2]Centro Nacional de Investigación sobre la Evolución Humana, CENIEH, Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain.

[3]University of Liverpool, Department of Evolution, Ecology & Behaviour, University of Liverpool L69 3BX, UK.

[4]Gothenburg Global Biodiversity Centre, Department of Biological and Environmental Sciences, University of Gothenburg, 40530 Gothenburg, Sweden.

[5]Department of Earth Sciences, GeoBioTec, Nova School of Science and Technology, Universidade NOVA de Lisboa, Campus de Caparica, 2829-516, Caparica, Portugal.

[6]Naturhistorisches Museum Basel, Augustinergasse 2, 4001, Basel, Switzerland.

[7]Department of Geosciences and Geography, University of Helsinki, FI-00014, Helsinki, Finland.

[9]Department of Biology, University of Fribourg and Swiss Institute of Bioinformatics, 1700 Fribourg, Switzerland.

*presenting author, juan.cantalapiedra@uah.es

Keywords: *megaherbivores, extinction, diversification, mammals, environmental forcing*

Extinction selectivity of large mammals in the last 120 kyr has been waved as evidence for a major role of human activities in the decline of the megafauna. Yet, new evidence suggests that the abundance, biomass, and species richness of African megaherbivores were in decline long before humans acquired suitable hunting capabilities, pointing to long-term environmental forcing as culpable. Can size-dependent speciation and extinction patterns explain such scenario of protracted attrition of the largest herbivores? We show that low speciation and an earlier hastening of extinction produced net diversity losses of African megaherbivores above 5,000 kg from ~4.6 Ma onwards. Herbivores between 500 and 5,000 kg began their decline ~3.4 Ma. Despite a buoyant phase between 10 and 3 Ma, diversification of lineages between 50 and 500 kg also plunged into negative values around 1.4 Ma. The observed pattern shows that size-selective extinction was a core feature of the megaherbivores demise, and the timing of the decline suggests that the new Plio-Pleistocene environmental settings were the triggering factor. Energetic equivalence dictates that the largest herbivores must sieve over vast stretches of land, feeding on seasonally available pyramids, in order to sustain their low-abundance populations. Under environmental disturbances and decreased net primary productivity (NPP), these giants are more vulnerable to resource fluctuations and starvation dynamics, with browsers feeding on highly clustered sustenance paying a higher toll. Since larger

endotherms are more efficient biomass producers, the decimation of megaherbivores exacerbated the negative impact of decreasing NPP on large carnivore diversity.

Acknowledgements: Talent Attraction Program of the Madrid Government and the Universidad de Alcalá grant 2017-T1/AMB5298.

THE LATE LADINIAN ALCOVER MARINE PALAEOBIOTA (MIDDLE TRIASSIC, CATALONIA, NE IBERIAN PENINSULA)

J. Cartanyà[1,2*], E. Pons[2]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.
[2]Cooperativa Reboll, c/ Pedrera 2, 43400 Montblanc, Tarragona, Spain.

*presenting author, joan.cartanya@icp.cat

***Keywords**: soft bodied, anoxic basins, food web, Triassic recovery, modern marine fauna*

The diverse assemblage of marine taxa from the late Ladinian Alcover outcrops (Catalonian Basin, NE Iberian Peninsula) is here described in detail. In general, the Middle Triassic epoch witnessed a flourishing of ecosystems, with the radiation of several taxa, especially vertebrate lineages. The Alcover outcrops, considered Konservat-Lagerstätte, have answered unresolved questions regarding the evolution of fauna and their significance in the recovery during the aftermath of the end-Permian mass extinction. On the other hand, although only the impressions of fossil organisms have been preserved, the palaeobiota from the Alcover outcrops is the most diverse of the whole Middle Triassic record of the Iberian Peninsula, and is a mixture of marine animals, including invertebrates such as mollusks, jellyfish, arthropods, brachiopods, echinoderms, as well as three groups of vertebrates: actinopterygians (the most diverse and abundant clade), sarcopterygians, and reptiles. Moreover, continental plants and arthropods from the nearby terrestrial settings are also present. The fine dolomitized laminated limestones of the Alcover deposits are interpreted as representing a restricted basin with oxygen-depleted bottom waters, separated from the open sea by ancient microbialites of the la Riba Unit. We have reconstructed the palaeoenvironment and hypothesised the trophic food web based on direct and indirect evidence from the fossil record of the Alcover outcrops. The Alcover biota represents a recovery of the marine ecosystem prior to the end-Permian extinction, but with a different composition of taxa, due to the evolutionary radiations experienced from the extinction until the late Ladinian.

Acknowledgements: We acknowledge the CERCA Programme/Generalitat de Catalunya. Financed by research project CLT0009_22_000020 (Culture Department, Generalitat de Catalunya).

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

NEW DATA ON THE IDENTIFICATION OF DINOSAUR TRACKMAKERS IN THE LATE JURASSIC OF THE MAESTRAZGO BASIN (TERUEL, SPAIN)

D. Castanera[1*], A. Guarido[1], L. Mampel[1], E. Espilez[1], A. Cobos[1]

[1]Fundación Conjunto Paleontológico de Teruel-Dinópolis/Museo Aragonés de Paleontología, Avenida de Sagunto s/n, 44002 Teruel, Spain.

*presenting author, castanera@fundaciondinopolis.org

***Keywords**: footprints, stegosaur,* Deltapodus*, theropod, ornithopod*

The distinction between quadrupedal (e.g., sauropods/stegosaurs) and tridactyl (theropods/ornithopods) dinosaur trackmakers can be problematic in certain Late Jurassic settings where different dinosaur groups cohabited. A remarkable case is the Aguilar 3 tracksite (Tithonian, Aguilar del Alfambra, Teruel province, Spain) where the same dinosaur tracks have been interpreted either as sauropod/stegosaur and theropod/ornithopod. The footprints are preserved as casts at the base of a vertical limestone layer, hindering the trackmaker identification in the field. Laser scanning and photogrammetric models of the tracksite have allowed a better characterization of individual footprints providing clues for the subsequent identification of the trackmakers. False-colour depth maps of each footprint suggest that all the quadrupedal tracks are manus-pes sets of *Deltapodus*, based on the morphology of the pes impression (tridactyl blunt-toed tracks with absence of sharp claw impressions). This is a common ichnotaxon from the Late Jurassic–Early Cretaceous referred to stegosaur trackmakers. Two additional tridactyl morphotypes have been distinguished, suggesting that ornithopods (in higher proportion) and theropods crossed the area. Both tridactyl morphotypes are small-sized. They mainly differ in the length/width ratio (higher in the theropod tracks), and in the heel pad impression, which is symmetric and rounded in the ornithopod tracks. The theropod morphotype is similar to grallatorid tracks whereas the ornithopod one resembles *Dinehichnus*-like tracks. The three identified morphotypes are common in Upper Jurassic deposits of the Iberian Peninsula. In addition, *Deltapodus* and the *Dinehichnus*-like trackways are arranged subparallelly showing possible evidence of gregarious behavior among individuals of the same species.

Acknowledgements: This work was funded by Research Group E04_20R FOCONTUR financed by Departamento de Ciencia, Universidad y Sociedad del Conocimiento (Gobierno de Aragón), the Instituto Aragonés de Fomento, and Unidad de Paleontología de Teruel (Ministerio de Ciencia e Innovación, Gobierno de España).

SOFT TISSUE PRESERVATION IN THE EARLY CRETACEOUS CROCODYLOMORPH *MONTSECOSUCHUS DEPERETI*

O. Castillo-Visa[1,2*], A. Sellés[1,2], P.R. Bell[3], A. Gil-Delgado[2,4], À. Galobart[1,2]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, c/ Escola Industrial 23, 08201 Sabadell, Barcelona, Spain.

[2]Museu de la Conca Dellà, c/ Museu 4, 25650 Isona, Lleida, Spain.

[3]School of Environmental and Rural Science, University of New England, Armidale, NSW 2351, Australia.

[4]Universitat Autonoma de Barcelona, Facultat de Ciencies, Departament de Geologia, 08193 Bellaterra, Spain.

*presenting author, oscarcasvi25@gmail.com

***Keywords**: skin, Atoposauridae, Iberian Peninsula, Pedrera de Meià, Barremian*

Alligatorium depereti Vidal, 1915 was originally described based on an exceptionally well-preserved crocodylomorph individual from the fossiliferous lithographic limestone of Montsec (Lleida, Spain). The holotype was discovered during the industrial exploitation of La Pedrera de Meià, a Lower Barremian *Konservat-Lagerstätten* site, between the end of the 19th and the beginning of the 20th centuries. In 1990, A. Buscalioni and J.L. Sanz redescribed the holotype, including the type species in a different genus (*Montsecosuchus depereti*). Nevertheless, its atoposaurid affiliation remains uncertain. A new investigation of the holotype under UV light revealed the preservation of previously unseen soft tissues distributed across the skeleton. The most recognizable tissues are epidermal scales that form discontinuous patches on the arms, thorax, legs, and tail. The best-preserved skin occurs in the forelimb and thoracic regions, showing pebbly-like morphologies, although those on the forelimbs are smaller than the thoracic. At the autopodium ends, some digits retain the keratinous claw sheaths. Other preserved soft tissues include probable cartilaginous joint capsules associated with the articular ends of some long limb bones. Although further research is required, the presence of soft tissues in *Montsecosuchus* has bearings on our understanding of the evolution of epidermal tissues in crocodylomorphs. Particularly, scale patterns on the tail of *Montsecosuchus* resemble those in extant crocodylians, suggesting that the scaly skin pattern is highly conservative among crocodylomorphs. Skin patterns in some thalattosuchians, susisuchids, and the choristoderan *Champsosaurus* differ from those of *Montsecosuchus*, which represents the second but best record of soft tissues among the Atoposauridae.

Acknowledgements: This research is part of R+D+I project VEBPI (PID2020-119811GB-I00) funded by MCIN/AEI/10.13039/501100011033/, tproject PLEC2021-007903 funded by MCIN/AEI/10.13039/501100011033 and "NextGenerationEU"/PRTR, and CLT0009_22_000021 funded by the Departament de Cultura. Additional funding was provided by the CERCA

Programme/Generalitat de Catalunya. We thank Vicent Vicedo and Raquel Robles for access to material at MCNB.

REDESCRIPTION OF *PTERONISCULUS GUNNARI* NIELSEN, 1942, FROM A JUVENILE SPECIMEN FROM EAST GREENLAND

I. Cavicchini[1*], T. Argyriou[2,3], S. Giles[1,4]

[1]Earth Sciences, University of Birmingham, Edgbaston, B152TT, Birmingham, UK.

[2]Department of Earth and Environmental Sciences, Paleontology & Geobiology, Ludwig-Maximilians-Universität München, Richard-Wagner-Str. 10, 80333, München, Germany.

[3]GeoBio-Center, Ludwig-Maximilians-Universität München, Richard-Wagner-Str. 10, 80333, München, Germany.

[4]The Natural History Museum, Cromwell Road, SW7 5BD, London, UK.

*presenting author, IXC099@student.bham.ac.uk

Keywords: Pteronisculus, *Triassic, CT, Actinopterygii, skull.*

The Early–Middle Triassic actinopterygian genus *Pteronisculus* is part of the Triassic Early Fish Fauna (TEFF), a group of cosmopolitan genera that thrived in the aftermath of the end-Permian mass extinction. The phylogenetic relationships of many of these genera, including *Pteronisculus*, are debated, and the topology of the evolution of crown actinopterygian lineages during the Early Triassic remains unclear as a result. This contrasts with the traditional yet detailed morphological descriptions available for most of the TEFF genera, from a few fossiliferous localities. *Pteronisculus* is an essential outgroup for most works dealing with the interrelationships of early crown actinopterygians. The species *P. gunnari*, from East Greenland, was described in less detail than other species of the genus. Here, CT was employed for the first time on a 3D preserved specimen of *P. gunnari* to redescribe the species. The preservation of very fine morphological details (e.g., braincase, sensory canals, gill skeleton) permitted a thorough redescription of the species. The specimen revealed juvenile features (e.g., long bone extremities not fully ossified), details of the ossification pattern of the unfused braincase and palatoquadrate, as well as morphological features previously undescribed for the genus (e.g., additional pectoral girdle ossifications, pharyngeal parotic toothplates). Braincase preservation allowed for comparison among different *Pteronisculus* species, revealing a degree of variability in some structures (e.g., shape of the jugular canal). New information from the endoskeleton of *P. gunnari* enriches our understanding of both the morphological complexity as well as the interrelationships of morphologically generalised actinopterygians from the TEFF.

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

CT-SCANNING AS A NON-INVASIVE VISUALISATION TECHNIQUE FOR SEDIMENT-BASED DECAY EXPERIMENTS

I. Cavicchini[1*], P.F. Wilson[2], S. Giles[1,3], T. Clements[4]

[1]Earth Sciences, University of Birmingham, Edgbaston, B152TT, Birmingham, UK.

[2]Warwick Manufacturing Group, University of Warwick, Coventry, CV47AL, UK.

[3]The Natural History Museum, Cromwell Road, SW75BD, London, UK.

[4]GeoZentrum Nordbayern, Friedrich-Alexander Universität Erlangen-Nürnberg, Loewenichstrasse 28, 91054, Erlangen, Germany.

*presenting author, IXC099@student.bham.ac.uk

***Keywords**: taphonomy, computed tomography, decay, zebrafish, sediment*

Decay experiments provide insights that can aid with the interpretation of soft-bodied fossils and allow for investigation of variables that may impact patterns of decay. Many experiments seek to utilise sediment in their design; however, collecting data is usually difficult due to the exhumation process, and any disturbance of the carcasses may potentially lead to data loss. Here we present a novel application of CT-scanning during a decay experiment performed on zebrafish buried in sediment, as a proof of concept to test the effectiveness of non-invasive visualisation techniques as a sampling methodology for taphonomic investigations. To determine whether exposure to X-rays would impact decay rates, we CT-scanned decaying carcasses buried in sand at the initiation of the experiment and once again after 50 days. We compared the acquired 3D models with those of zebrafish that were only CT-scanned after 50 days and with control specimens (via traditional dissection). Our preliminary results show that exposure to X-rays from CT-scanning has little to no impact on decay rate or sequence of character loss. Our preliminary results confirm the effectiveness of this approach, and future work will focus on refining our methodology.

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

EVIDENCE OF CONVERGENT EVOLUTION OF AN EXTRAMANDIBULAR FENESTRA-LIKE STRUCTURES IN EARLY TETRAPODS

S. Chakravorti[1*], D.P. Sengupta[2]

[1]Staatliches Museum für Naturkunde Stuttgart, Rosenstein 1, Stuttgart 70191, Germany
[2]Geological Studies Unit, Indian Statistical Institute, Kolkata 700108, India.

*presenting author, chirpymoni2009@gmail.com

Keywords: *Temnospondyli, Middle Triassic, Anisian, India, extramandibular fenestra*

The Anisian Denwa Formation of India yielded a nearly complete skull and associated mandibles of a new temnospondyl. It has a striking similarity with *Vigilius wellesi* (previously known as *Hadrokkosaurus bradyi*) from the Early Anisian Holbrook member of the Moenkopi Formation in northeastern Arizona. The mandible of the Indian specimen shares some characteristics with *Hadrokkosaurus*, whereas its head resembles *Vigilius*. The mandible of *Plagiosuchus pustuliferus* from the Ladinian horizon of Gaildorf (Germany), on the other hand, has close similarity with the Indian specimen in the curvature of the mandible. It features a vaulted pterygoid. Other than *Vigilius wellesi* and *Vanastega pluridimens*, the Indian specimen is different from other brachyopids in having big orbits that are lower than those of most plagiosaurs, widely spaced nares, a wide parasphenoid cultriform process, and an emarginated cheek. The mandible is also distinctive, having an external mandibular fenestra (EMF) like the archosaurs. A sulcus runs from the anterior part of EMF up to the symphysis. The mandible has a very long retroarticular process, a transverse trough behind the glenoid, a slit-like opening between the prearticular and surangular, a shelf close to the symphysis formed only by the dentary, and a low posterior Meckelian opening at the sutural contact of the postsplenial, prearticular, and articular. The EMF is a rare anatomical feature generally absent from temnospondyls. The presence of distinct EMF in the Indian taxon makes a rare case of convergent evolution, as EMFs are more distinct in archosaurs.

Acknowledgement: We thank the Indian Statistical Institute, Institute of National Importance, Kolkata, India, and Ministry of Statistics and Programme Implementation (MoSPI) for the funding, and also the late Ram Narayan Mukherjee for the discovery and excavation of the specimen.

THE CAT ODYSSEY: ADAPTIVE LANDSCAPES AND DISPARITY OF CAT-LIKE CARNIVORANS THROUGH TIME AND SPACE

N. Chatar[1*], M. Michaud[1], D. Tamagnini[2], V. Fischer[1]

[1]Evolution and Diversity Dynamics Lab, Université de Liège, Allée du Six Août 14, 4000 Liège, Belgium.

[2]Department of Biology and Biotechnologies, Sapienza University of Rome, Piazzale Aldo Moro 5, 00185, Rome, Italy.

*presenting author, narimane.chatar@uliege.be

***Keywords**: Felidae, Nimravidae, convergence, 3D geometric morphometrics, adaptive landscape*

The cat-like morphology is a textbook example of evolutionary convergence. Besides felids, the Nimravidae are the most diverse cat-like family. They appeared 42 Ma and vanished 7–8 Ma, soon after the diversification of felids, which occurred during the Early to Middle Miocene. Nimravids are so convergent with felids that competitive replacement is regarded as one of the likely causes of their extinction. To quantify craniomandibular diversification and convergence in cat-like carnivorans we surface-scanned a total of 180 specimens, including 91 taxa for mandibles and 89 for crania, ranging from the early Oligocene to the present. We quantified the shape using 3D geometric morphometrics with a total of 38 landmarks and semilandmarks on mandibles and 72 on crania. Our analyses showed that both sympatric felids and nimravids display contrasting phenotypic features, meaning that felids probably occupied ecological niches that were not already occupied by nimravids. This leads to the conclusion that there was no direct competition between these two families. Nimravids also exhibit the highest morphological disparity, as they combine the most extreme sabretooth adaptations (barbourofelines) with feline-like taxa such as *Nimravus*, *Dinictis*, and *Eofelis*. The global adaptive landscape of cat-like carnivorans shows a continuum of iterative shapes from highly derived sabretooth forms to feline-like forms. These frequent intermediate forms indicate that selective pressures towards sabertooth or feline-like Baupläne are weaker than previously thought.

Acknowledgements: We thank the following curators/collection staff: Géralidne Véron, Guillaume Billet, Daniela Kalthoff, Thomas Mörs, Benjamin Kear, Roula Pappa, Pip Brewer, Patricia Holroyd, Samuel A. McLeod, Xiaoming Wang, Didier Berthet, François Vigouroux, Béatrice Roussel, Daniel Brinkman, Vanessa R. Rhue, Jin Meng, Ruth O'Leary, Nicholas Pyenson, Amanda Millhouse, and Matthew Miller.

ANALYSIS OF ODONTOMETRIC TRAITS IN *OREOPITHECUS BAMBOLII*

W.K. Cieszynska[1*]

[1]Dipartimento di Scienze della Terra, Università degli Studi di Firenze, Via G. La Pira 4, 50121, Firenze, Italy.

*presenting author, weronika.cieszynska@palaeoproteomics.org

Keywords: *endemic primate, dental variability, Tusco-Sardinian paleobioprovince, Miocene, Italy*

Oreopithecus bambolii is an extinct primate endemic to the Late Miocene Tusco-Sardinian insular paleobioprovince. As an endemic genus, *Oreopithecus* displayed numerous peculiar cranial and postcranial adaptations, including an unusual dental morphology. *Oreopithecus* shares many dental traits with extant catarrhines but also displays primitive features, such as long and narrow molars. In this study, 285 teeth of *Oreopithecus* from different localities in Tuscany (Baccinello V1 and V2, Ribolla, Casteani, Montemassi, Trasubbie, Serazzano, Montebamboli) and Sardinia (Fiume Santo) were measured. Only unworn or slightly worn permanent teeth were analyzed. Following previously established protocols, I took two measurements (buccolingual width and mesiodistal length) to study the odontometrics of *Oreopithecus* and to perform statistical comparisons of molar dimensions among specimens from different sites. I compared the measurements of *Oreopithecus* with available data for extinct and extant catarrhines. *Oreopithecus* shares dental traits, such as small incisors relative to cheek teeth and small M^1/M^2 length and width ratios, with other Miocene apes. It also possesses more primitive features, such as longer than broad lower molars than other Miocene hominoids. Similar to previous analyses based on smaller samples, the statistical analyses reported here show no significant differences in molar length or width among the specimens from different localities. The odontometrics of *O. bambolii* characterizes its unique dentition and lays the groundwork for further research on the odontology of this primate.

Acknowledgements: The author is supported by the Marie Skłodowska-Curie European Training Network (ETN) PUSHH, a project funded by the European Union's Framework Program for Research and Innovation Horizon 2020 (grant agreement no. 861389; www.pushh-etn.eu). Curators and researchers in charge of the collections are deeply acknowledged for access to specimens.

A RE-APPRAISAL ON THE *EQUUS SUESSENBORNENSIS* SAMPLE FROM AKHALKALAKI (GEORGIA, CAUCASUS) PROVIDES NEW INSIGHTS ON THE LARGE-SIZED EQUIDS DURING THE EARLY–MIDDLE PLEISTOCENE TRANSITION

O. Cirilli[1,2*], J. Saarinen[3], M. Bukhsianidze[4], D. Lordkipanidze[4], R.L. Bernor[1,5]

[1]College of Medicine, Department of Anatomy, Laboratory of Evolutionary Biology, 520 W St. N.W., 20059, Washington, DC, USA.

[2]Earth Sciences Department, Paleo[Fab]Lab, Università di Firenze, Via G. La Pira 4, I-50121 Firenze, Italy.

[3]Department of Geosciences and Geography, University of Helsinki, PO Box 64, Helsinki, 00014, Finland.

[4]Georgian National Museum, 3, Rustaveli Avenue, Tbilisi-0105, Georgia.

[5]Human Origins Program, Department of Anthropology, National Museum of Natural History, Smithsonian Institution, 20013 Washington DC, USA.

*presenting author, omar.cirilli@howard.edu

Keywords: Equus*, Quaternary, evolution*

Equus suessebornensis is one of the most intriguing species of the Early and Middle Pleistocene Eurasian *Equus*. Although it was described from the Middle Pleistocene site of Süssenborn (Germany), in the recent years its chronostratigraphic record has been extended until the Early Pleistocene, raising a debate in the scientific community about its paleobiogeography and biochronology. In this contribution, we provide the complete ontogenetic-based description of the Akhalkalaki *E. suessenbornensis* sample, and we compare it by means of bivariate and multivariate statistical analyses with the Early and Middle Pleistocene European fossil record of the genus *Equus*. Moreover, we provide new paleoecological insights including body mass, mesowear, and net primary productivity estimates. The outcomes give a new perspective on the *E. suessenbornensis* morphology and variability, allowing to identify the oldest occurrences of this species in the Early Pleistocene sites of Pirro Nord (Italy), Barranco Leon and Fuente Nueva-3 (Spain), as well as Apollonia (Greece). Moreover, the paleoecological analyses based on mesowear and body mass estimates lead us to characterize *E. suessenbornensis* as a large-sized "woodland horse" with mostly mixed-feeding diets but also considerable dietary plasticity, whereas the morphological and morphometric comparisons point out a possible evolutionary relationship between *E. major* and *E. suessenbornensis*, supporting the hypothesis of a separate evolutionary lineage from the widespread *E. stenonis*. Eventually, these results indicate that *E. suessenbornensis* may not be identified as a typical Epivillafranchian marker, but a taxon present in the European faunas at the onset of the Early–Middle Pleistocene Transition.

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

NEUROANATOMY OF A NEW STYRACOSTERNAN ORNITHOPOD SPECIMEN FROM THE ARCILLAS DE MORELLA FORMATION (CASTELLÓN, SPAIN)

M. Ciudad Real[1*], F. Escaso[1], J.M. Gasulla[1], F. Ortega[1]

[1]Grupo de Biología Evolutiva, Universidad Nacional de Educación a Distancia (UNED), Avda. Esparta s/n, 28232 Las Rozas de Madrid, Madrid, Spain.

*presenting author, paleobiologa@gmail.com

***Keywords**: Dinosauria, Styracosterna, computed tomography, neurocranium, Barremian*

While neuroanatomy has been studied in many dinosaurs in recent years, especially theropods and sauropods, the knowledge of the central nervous system in ornithopods is far more limited. Here, we describe the endocast of a new styracosternan ornithopod specimen from the Palau-3 site, a new fossiliferous locality from the upper Barremian Arcillas de Morella Formation in Morella (northeast Spain). The neurocranium was CT-scanned, which enabled accessing previously unknown cranial anatomical information. A 3D model was generated to virtually reconstruct the morphology of the braincase and its internal cavities. The olfactory bulbs and tracts (cranial nerve I), cerebrum, pituitary body, dural expansion, cerebellum, and the medulla oblongata were identified. Also, most of the cranial nerves and the internal carotid artery were also reconstructed. In addition, this model was compared with those of other styracosternans, like *Proa valdearinoensis* and *Iguanodon bernissartensis*, and even with those of hadrosaurids like *Hypacrosaurus altispinus.* Compared to these, the specimen from Morella is unique in having thicker nerves and longer olfactory bulbs and tracts. The angle between cranial nerve I and the foramen magnum is more pronounced (~20°) in *P. valdearinoensis* and *H. altispinus* than in *I. bernissartensis* and the Palau-3 styracosternan, where it is ~10°. Among styracosternans, the new neurocranium from Palau-3 is one of the most complete and presents a series of unique features providing valuable information on the paleobiology of European late Barremian ornithopods.

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

RECONSTRUCTING NECK ORIENTATION IN SAUROPOD DINOSAURS

S. Conti[1,2*], R. Martino[1], D. Estrazi-Lopez[1], E. Tschopp[3,4], M. Rios[1], P. Masarati[2], G. Sala[2], O. Mateus[1]

[1]GeoBioTec, Department of Earth Sciences, NOVA School of Science and Technology, Campus de Caparica, 2829 516, Caparica, Portugal.

[2]Department of Aerospace Science and Technology, Politecnico di Milano, via La Masa 34, 20156, Milan, Italy.

[3]Universität Hamburg, Martin-Luther-King-Platz 3, 20146, Hamburg, Germany.

[4]American Museum of Natural History, Central Park West @ 79th St, New York, NY, 10024, USA.

*presenting author, s.conti@campus.fct.unl.pt

Keywords: *biomechanics, diplodocid, mammals, cervical vertebrae*

Sauropod dinosaurs are well known to the general public due to their gigantic sizes, elongated necks, and tails. Yet, their most iconic feature (i.e., the elongated neck) is still not fully comprehended. The orientation of sauropod necks is a long-debated argument in palaeontology, with several studies published on the topic using different methods. However, the arrangement of the sauropod nuchal ligament remains unclear. This research is focused on tackling the orientation of sauropod necks with two different approaches: the use of multibody dynamic analyses (MDA) to test different hypotheses of nuchal ligament arrangement in *Apatosaurus*, and the use of geometric morphometrics (GM) to assess similarities in the transition between cervical and thoracic vertebrae, using modern mammal species for comparison. Among the arrangements of nuchal ligaments tested using MDA, the model with the nuchal ligament connected to the adjacent vertebrae resulted in being the most efficient. Moreover, variation of the height of the neural spines was tested using MDA, highlighting a strong correlation between the height of the neural spine and the force developed by the nuchal ligament, necessary to hold the neck in a horizontal position. The GM analyses highlighted a correlation between the shape of cervical and dorsal vertebrae neural spines and the “preferred” neck orientation, with a similar trend observed in the sauropod sample as well. Generally, both analyses highlight a correlation between the shape of the neural spines in the transition of the cervical–dorsal vertebrae and the neck orientation of extant and extinct animals.

Acknowledgements: This research benefited from the Geobiotec grant UIDB/04035/2020, BioGeoSauria Project PTDC/CTA-PAL/2217/2021, and the FCT PhD fellowships SFRH/BD/146336/2019, 2020.05395.BD and 2021.08458.BD.

TALES FROM THE TREASURE ISLAND: EVOLUTIONARY SIGNIFICANCE OF THE KOGAIONID MULTITUBERCULATES FROM THE LATEST CRETACEOUS HAȚEG ISLAND

Z. Csiki-Sava[1], J.Meng[2], M. Vremir[3†], Ș. Vasile[1*], S.L. Brusatte[4], M.A. Norell[2]

[1]Department of Geology, Mineralogy and Palaeontology, University of Bucharest, 1 N. Bălcescu Blvd., 010041, Bucharest, Romania.

[2]Division of Paleontology, American Museum of Natural History, 200 Central Park West, 10024, New York, USA.

[3]Department of Natural Sciences,Transylvanian Museum Society, 400009, Cluj-Napoca, Romania.

[4]School of Geosciences, University of Edinburgh, EH9 3FE, Edinburgh, UK.

*presenting author, yokozuna_uz@yahoo.com

†deceased.

***Keywords**: Kogaionidae, Romania, Late Cretaceous, island evolution*

Recent years have seen an important increase in our knowledge concerning the latest Cretaceous multituberculate mammals of Europe, represented exclusively by members of the endemic family Kogaionidae and restricted during this time interval to the Transylvanian Landmass (or Hațeg Island) of the Late Cretaceous European Archipelago. According to the most updated recent review of their fossil record, 30 different fossiliferous sites with kogaionid remains have been recorded in the Transylvanian area, mostly from the Hațeg Basin. These yielded remains of at least 5 different nominal taxa referred to the Transylvanian endemic genera *Barbatodon*, *Kogaionon*, and *Litovoi*, each represented by rather complete dentitions and even partial skulls; the presence of additional new taxa is certainly possible. The quality of the fossil record of Transylvanian Cretaceous kogaionids (several skulls, hundreds of isolated teeth and gnathic remains, postcrania) allows important new insights into their evolutionary history, clearly related to their restricted island habitat. Their local taxonomic diversity, coupled with body size and morphological disparity, as well as intra-clade phylogenetic relationships, are indicative of an insular adaptive radiation, including shifting towards larger body size through time. The basal phylogenetic position of Kogaionidae among cimolodontans identifies them as evolutionary holdovers near the end of the Cretaceous. Both their endemicity and their archaic nature are probably connected to their sheltering insular habitat. Kogaionids were among the few European vertebrate clades surviving into the Paleocene, when they are represented only by the widespread *Hainina*; their evolution through the Cretaceous–Paleogene events suggests body-size driven differential survival.

Acknowledgements: Work supported by (and contribution to) the Romanian Ministry of Research, Innovation and Digitalization, CNCS–UEFISCDI grant PN-III-P4-ID-PCE-2020-2570, within PNCDI III.

DECOUPLING OF DIVERSITY AND DISPARITY IN EUSUCHIANS (CROCODYLIFORMES, EUSUCHIA) ACROSS THE CRETACEOUS–PALEOGENE

A. de Celis[1*], I. Narváez[1], F. Ortega[1]

[1]Grupo de Biología Evolutiva, Departamento de Física Matemática y de Fluidos, Universidad Nacional de Educación a Distancia, Av. Esparta s/n, 28290, Las Rozas de Madrid, Spain.

*presenting author, ane.detecla@gmail.com

***Keywords**: Crocodylia, geometric morphometrics, K-Pg boundary, macroevolution, palate morphology*

Despite the widespread belief that eusuchian crocodiles possess a conserved cranial architecture, recent studies have shown that the morphological variability of the group is greater than previously thought. Our study of the taxonomic diversity of Eusuchia revealed that, during the Cretaceous, its fossil record was dominated by hylaeochampsids and allodaposuchids, endemic to Europe, whereas the first representatives of the crown group Crocodylia were scarce at this time. After the K-Pg boundary, these basal eusuchians had disappeared and a radiation of the crown group took place. However, this taxonomic turnover does not necessarily imply a significant increase in the morphological variability. Therefore, the evolution of morphological disparity has been studied using a geometric morphometric approach focused on the palate of eusuchians. This structure was chosen because of the importance of the secondary palate in the evolutionary history of Crocodyliformes. The disparity was calculated using three different metrics, each capturing different aspects such as total range, dispersion, and distance. The disparity was analysed in both extant and extinct eusuchians, and across time and space. The results indicate that morphological disparity is higher during the Cretaceous than during the Paleogene, in contrast to taxonomic diversity, which is lower during the Cretaceous than during the Paleogene. These findings suggest the presence of a decoupling event between taxonomic diversity and morphological disparity during the K-Pg transition in this crocodyliform group.

Acknowledgements: This research has been funded by the Spanish Ministerio de Ciencia e Innovación (PID2019-397 111488RB-100; F.O., A.d.C., and I.N.), and was supported by a FPU fellowship (FPU 2016/01058; A.d.C.).

PERMIAN DIPNOI OF THE CATALAN PYRENEES (NE IBERIAN PENINSULA): FIRST TAXONOMIC AND PALAEOECOLOGICAL APPROACHES

C. De Jaime-Soguero[1*], E. Mujal[2,1], A. Bolet[3,1,4], D.P. Groenenwald[1,5], J.-S. Steyer[6], J. Fortuny[1]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Staatliches Museum für Naturkunde Stuttgart, Rosenstein 1, D-70191, Stuttgart, Germany.

[3]Departamento de Estratigrafía y Paleontología, Universidad de Granada, Avda. Fuente Nueva s/n, E-18071, Granada, Spain.

[4]School of Earth Sciences, University of Bristol, Life Sciences Building, 24 Tyndall Avenue, BS8 1TQ, Bristol, UK.

[5]Evolutionary Studies Institute (ESI), University of the Witwatersrand, 2050, Johannesburg, South Africa.

[6]Centre de Recherches en Paléontologie – Paris, UMR 7207, CNRS-MNHN-SU, Muséum National d'Histoire Naturelle, 8 Rue Buffon, CP38, F-75005, Paris, France.

*presenting author, chabier.dejaime@icp.cat

Keywords: *lungfish, Sarcopterygii, µCT scan, tooth plates, Western Tethys*

Dipnoi (lungfish) are one of the three extant sarcopterygian clades and one of the closest to tetrapodomorphs. They became highly diverse during the Devonian, but this diversity subsequently reduced drastically, with only a few taxa known thus far from upper Palaeozoic rocks. Here we report the first discovery of lungfish in terrestrial red-beds ("Upper Red Unit") from the middle–?upper Permian of the Catalan Pyrenees (Catalonia, Spain), representing the first well-preserved lungfish from the Permian of the Western Tethys palaeoregion. The material includes abundant articulated and disarticulated tooth plates with cranial and postcranial bones, sometimes within cylindrical burrows. Some specimens have been µCT-scanned. They show anatomical details shared with Permian Gnathorizidae, for which an aestivation burrowing behaviour has been inferred. The new Pyrenean lungfish exhibit an elongated tooth plate composed of radiating laterally-compressed ridges with several cusps each. Sedimentological data place these fossils in a floodplain and meandering fluvial system, overlain by a playa-lake succession, with periodical desiccation. Together with the occurrence of fossils in burrows, this suggests a strong seasonality for the local palaeoclimate. This is consistent with palaeoclimatological data for the Permian of central Pangaea. These discoveries open a new window to a better understanding of the anatomy, palaeoecology, and palaeobiogeography of these vertebrates, during a time when their fossil record is poor.

Acknowledgements: Supported by CERCA Programme/Generalitat de Catalunya to ICP researchers; Departament de Cultura (CLT0009_22_000020); FI-AGAUR (ref. 2020 FI_B 00472) to C.J.S.; María Zambrano to A.B.; EU's Horizon Europe Marie Skłodowska-Curie actions (GA:

101060666) to D.P.G.; 2021 SGR 01184; PID2020-117118GB-I00 (MCIN/AEI/10.13039/501100011033) and “European Union NextGenerationEU/PRTR” (RYC2021-032857-I to J.F.).

RECONSTRUCTION OF DIETARY EVOLUTION IN NEW WORLD PRIMATES (PLATYRRHINI) BASED ON DENTAL TOPOGRAPHIC ANALYSIS OF EXTANT AND FOSSIL SPECIES

D. de Vries[1*], R. Batista[1], J. Boubli[1], I. Goodhead[1], R. Beck[1]

[1]Ecosystems and Environment Research Centre, School of Science, Engineering and Environment, University of Salford, M5 4WT, Salford, UK.

*presenting author, d.devries@salford.ac.uk

***Keywords**: primate evolution, dental topography, dietary reconstruction, Platyrrhini*

Modern New World primates (Platyrrhini) exhibit a diverse range of diets, including folivory, omnivory, seed predation, and exudate feeding. Numerous fossil platyrrhines are known, but predictions of their diet remain controversial, and the overall pattern of dietary evolution (particularly the number and direction of transitions between diets) within Platyrrhini as a whole remains unclear. We developed a revised 5-category dietary classification for platyrrhines based on data extracted from 92 published studies and we used dental topographic metrics calculated via a novel freeware pipeline to quantify second lower molar shape of a large comparative sample of platyrrhines covering 32 genera (20 extant, 12 fossil) and 44 species (31 extant, 13 fossil), totalling 161 specimens. Using our extant platyrrhine sample as a training set, we used phylogenetic flexible discriminant analysis (pFDA) to classify the fossil taxa with unknown diets into one of five dietary categories. For example, stem platyrrhine *Homunculus* was classified as a folivore; *Proteropithecia* and *Cebupithecia* were classified as seed predators; and the stem alouattine *Stirtonia* was classified as a frugivore. The inferred diets of 12 fossil platyrrhine genera provide key new evidence for understanding dietary evolution within Platyrrhini. Our results allow us to robustly identify transitions in the diets of New World primates, which can be compared against genomic evidence of dietary evolution.

Acknowledgements: We thank Profs. Erik Seiffert and John Fleagle for the sharing and scanning of casts of *Branisella* and *Carlocebus*.

NEW CROCODYLIAN REMAINS FROM THE LATE CRETACEOUS OF CATALONIA (SPAIN): INSIGHT INTO OSTEODERM ARRANGEMENT IN ALLODAPOSUCHIDS

F. Della Giustina[1*], B. Vila[2,3]

[1]Department of Biological, Geological and Environmental Sciences (BiGeA), University of Bologna, Via Zamboni 67, 40126, Bologna, Italy.

[2]Institut Català de Paleontologia Miquel Crusafont, c/ Escola Industrial 23, 08201 Sabadell, Barcelona, Spain.

[3]Museu de la Conca Dellà, c/ Museu 4, 25650 Isona, Lleida, Spain.

*presenting author, france.dellagiustina@studio.unibo.it

***Keywords**: Allodaposuchidae, Crocodylia, Late Cretaceous, osteoderms, Tremp Fm.*

Osteoderms are bony structures commonly found in the dermal layer of the skin of various animals, including crocodylians, whose osteoderms are abundant in the fossil record. In crocodyliforms, osteoderms are often arranged in regular patterns, which can provide valuable insights into their evolutionary history, behavior, and ecology. However, determining the arrangement of osteoderms in extinct crocodyliform groups has been challenging due to the limited number of cases where the osteoderms of a single specimen are found in anatomical connection. Here, we analyze more than 70 dorsal osteoderms from the allodaposuchid specimen found at the Fontllonga-6 fossil site (Àger Basin, NE Spain), in the lower red unit of the Tremp Formation (early–late Maastrichtian). All recovered osteoderms exhibit a single keel, the ridge and pit pattern commonly associated with crocodyliforms, and diverse size and shape, which provides information about the position of these elements in the dermal skeleton. Allodaposuchids possess a tetraserial paravertebral shield with large, flat, and low-keeled osteoderms that have thick lateral and medial sutures to connect each osteoderm along the transverse row. While the exact number of accessory parasagittal rows cannot be determined, several accessory osteoderms and nuchal shield osteoderms have been recovered, including both low-keeled and very high-keeled osteoderms. Generally, the relative size and shape of the osteoderms resemble those of alligators, suggesting a similar osteoderm pattern. The study sheds light on the poorly documented dermal skeleton of allodaposuchids, providing new insight into the evolutionary history and ecology of crocodyliforms in the Late Cretaceous of Europe.

Acknowledgements: Thanks to Adriana Vilaró i Filella and Antoni Lacasa (Institut d'Estudis Ilerdencs), and Xavier Delclòs (Universitat de Barcelona). This research is part of the project I+D+i/PID2020-119811GB-I00 funded by MCIN/AEI/10.13039/501100011033/, the project CLT0009_22_000021 funded by Departament de Cultura, and the CERCA Programme/Generalitat de Catalunya.

FLYING CAPABILITIES OF STEM BIRDS—INSIGHTS FROM X-RAY RECONSTRUCTION OF MOVING MORPHOLOGY DATA OF NEORNITHINES

O.E. Demuth[1,2*], J.R. Hutchinson[2], G. Kinney-Broderick[1], S.E. Warner[2], D.J. Field[1,3]

[1]Department of Earth Sciences, University of Cambridge, Downing Street, CB2 3EQ, Cambridge, UK.

[2]Structure and Motion Laboratory, Royal Veterinary College, Hawkshead Lane, AL9 7TA, Hatfield, UK.

[3]Museum of Zoology, University of Cambridge, Downing Street, CB2 3EJ, Cambridge, UK.

*presenting author, oed24@cam.ac.uk

***Keywords**: Aves, biomechanics,* Ichthyornis*, joint mobility, flight*

Birds can morph their wings with exceptional precision for a variety of tasks. They can change their wing shape and area to generate lift, adjust air flow for manoeuvrability, and fold and store the wings when on the ground. A link exists between wing joint mobility and the flight behaviour in extant birds, with different flight styles exhibiting different constraints on joint range of motion (ROM). Ex vivo joint movement and ROM in extant taxa can be investigated with high fidelity using X-ray reconstruction of moving morphology (XROMM). We collected a phylogenetically broad ex vivo XROMM dataset of 11 extant bird species, representing the major clades of Neornithes, spanning a wide range of ecological niches and flight styles. 94 XROMM trials were conducted resulting in over 500,000 individual poses per wing bone during movement. For each bird species the 3D boundary of the ex vivo ROM for each rotational degree of freedom in the wrist, elbow, and shoulder joints were landmarked for geometric morphometric analysis, thus creating the first ecologically and phylogenetically informed framework for quantitative comparison of avian joint mobility data. We then estimated the ROM of the wing joints of the crownward stem bird *Ichthyornis dispar*, calculated ligamentous constraints on its joint mobility and projected the soft-tissue-constrained ROM estimates into the ecophylomobility space of the extant birds. This allowed us to infer the flight behaviour of *Ichthyornis* and draw inferences regarding both the evolutionary refinement of avian flight performance, and the ancestral flight capabilities of crown group birds.

Acknowledgements: This research was supported by an EAVP Research Grant awarded to O.E.D. and D.J.F. acknowledges support from UKRI Future Leaders Fellowship MR/S032177/1.

FIRST BIOSTRATINOMIC STUDY OF A FOSSIL SIRENIAN BONEBED: THE CASTEJÓN DE SOBRARBE-41 SITE (MIDDLE EOCENE, SOUTHERN PYRENEES, HUESCA PROVINCE)

E. Díaz-Berenguer[1*], A. Badiola[2], J.I. Canudo[1]

[1]Aragosaurus: Recursos Geológicos y Paleoambientes-IUCA, Universidad de Zaragoza, C/ Pedro Cerbuna 12, 50009 Zaragoza, Spain.

[2]Departamento de Geología, Universidad del País Vasco/Euskal Herriko Unibertsitatea, 48940 Leioa, Vizcaya, Spain.

*presenting author, ester.berenguer@gmail.com

***Keywords**: marine mammals, taphonomy, Spain, Lutetian*

Studies on marine mammalian fossils in transitional depositional paleoenvironments are scarce in the literature. Here we present a biostratinomical study of the macrofossil assemblage of Castejón de Sobrarbe-41 (CS-41), which is a middle Eocene fossil site in the deltaic facies of the Sobrarbe Fm. (Huesca, Spain) and the type locality of the quadrupedal sirenian *Sobrarbesiren cardieli.* CS-41 is a 79 cm-thick layer of marly silts with an extension of 22 m^2, which has provided 703 macrovertebrate remains. For each specimen over 1 cm, 19 biostratinomic parameters were analyzed. The spatial density of 32 specimens/m^2 represents a grouped bone distribution. 528 specimens were identified belonging to 5 different taxa (2 testudines, 2 crocodiles, and *Sobrarbesiren*) showing a low taxonomic diversity. The minimum number of individuals is 15, of which 8 pertain to juveniles and young adult individuals of *Sobrarbesiren*. The CS-41 macrofossil assemblage is a multi-individual monodominant sirenian bonebed with a “L” age population distribution pattern. These agree with a mass mortality event. Biostratinomic breakage, abrasion, bioerosion and weathering are scarce (less than 5% of the sample), which suggest a short period of subaerial or subaquatic exposure and the absence of a long-distance transportation before burial. Nevertheless, the bones are disarticulated, but not sorted, suggesting that skeletization happened before their final accumulation. The vertebrate fossil assemblage of CS-41 represents a deposit resulting on the fluvial accumulation of a parautochtonous thanatocoenosis, in an abandoned deltaic channel, dominated by sirenians and testudines, and caused by a catastrophic event that killed a sirenian herd.

Acknowledgements: Financial support was provided by the Spanish Ministry of Science, Innovation and Universities and The European Regional Development Fund (projects CGL2017-85038-P and PID2021-122355NB-C31 MCIN/AEI/10.13039/501100011033/FEDER, UE), the Basque Country Goverment (projects IT418-19 and IT1485-22), and the Government of Aragón (‘DGA’ and ‘Grupos de Referencia’ E18_17R).

UPDATE ON THE TITANOSAURIAN SAUROPOD DIVERSITY OF THE LATEST CRETACEOUS HAŢEG ISLAND, ROMANIA

V. Díez Díaz[1*], P. Mannion[2], Z. Csiki-Sava[3], P. Upchurch[2]

[1]Museum für Naturkunde, Leibniz-Institut für Evolutions-und Biodiversitätsforschung, Invalidenstraße 43, 10115 Berlin, Germany.

[2]Department of Earth Sciences, University College London, Gower Street, London, WC1E 6BT, UK.

[3]Laboratory of Paleontology, Faculty of Geology and Geophysics, University of Bucharest, 010041 Bucharest, Romania.

*presenting author, diezdiaz.veronica@gmail.com

Keywords: *Titanosauria, diversity, Late Cretaceous, Haţeg Basin, Romania*

The Haţeg Basin and surrounding areas in Transylvania, western Romania (corresponding to the latest Cretaceous Haţeg Island), have long been a hotspot for research on the faunas of the Late Cretaceous European archipelago, including their rich diversity, as well as evolutionary and biogeographical patterns. Indeed, one of the historically earliest titanosaurian sauropods to be discovered, the 'dwarfed' species *Magyarosaurus dacus*, comes from Maastrichtian deposits in this basin; however, this species has been neglected, with no modern treatment of its anatomy, taxonomy, or phylogenetic affinities. We have rectified this, conducting a detailed anatomical study of historical and undescribed remains, combined with archival data, to identify shared autapomorphies that link multiple partial skeletons. Our thorough analysis of hundreds of specimens (including more than 20 partial skeletons or monospecific assemblages), alongside a new phylogenetic analysis (comprising 150 species scored for 570 characters), enables the taxonomic stabilization of the type species *Magyarosaurus dacus*, and also supports the presence of at least three additional approximately contemporaneous and sympatric taxa, namely: (1) *Paludititan nalatzensis*; (2) the former '*Magyarosaurus*' *hungaricus*, which we identify as a new genus; and (3) a large-bodied species that is amongst the largest known sauropods of the Late Cretaceous European archipelago. These four taxa demonstrate that the latest Cretaceous (Maastrichtian) titanosaurian diversity of Haţeg Island was high when compared to other contemporaneous faunas. Moreover, the Transylvanian region continues to yield new material, currently under study, that will expand our knowledge of Late Cretaceous European sauropod diversity and evolution over the next few years.

Acknowledgments: The Jurassic Foundation, a Royal Society International Exchange award (IES\R1\180088), and a Royal Society University Research Fellowship (UF160216) funded this project. We thank S. Maidment, P. Barrett, L Kordos, L. Makádi, V. Codrea, B. Vila, and A. Sellès for facilitating access to specimens.

3D SIMULATIONS OF SAUROPOD TAIL LOCOMOTOR CAPABILITIES: BEHAVIOURAL AND PROPULSION-INDUCED INFLUENCES

V. Díez Díaz[1*], P.A. van Bijlert[2], D. Schwarz[1], W.I. Sellers[3], M. Wedel[4]

[1]Museum für Naturkunde, Leibniz-Institut für Evolutions-und Biodiversitätsforschung, Invalidenstraße 43, 10115 Berlin, Germany.

[2]Department of Earth Sciences, Faculty of Geosciences, Utrecht University, Heidelberglaan 8, 3584 CS Utrecht, The Netherlands.

[3]School of Natural Sciences, University of Manchester, Oxford Rd Manchester M13 9PL, UK.

[4]College of Osteopathic Medicine of the Pacific and College of Podiatric Medicine, Western University of Health Sciences, 309 E. Second Street, Pomona, CA 91766-1854, USA.

*presenting author, diezdiaz.veronica@gmail.com

Keywords: *Sauropoda, tail,* Giraffatitan*, biomechanics, simulation*

At the beginning of the 21st century, there has been a surge in research into dinosaur evolution, behaviour, and locomotion using 3D reconstructions and biomechanical analyses. These include 3D geometric morphometrics and finite element analyses, as well as musculoskeletal modelling and multibody dynamic analyses and simulations, among other approaches. However, the axial skeleton has been neglected in most of these studies, although it is a major component of dinosaur locomotion. In recent years, we have been refining and improving the methodology to help us achieve a more reliable understanding of the locomotor capabilities of sauropod tails, using the Late Jurassic titanosauriform *Giraffatitan brancai* from Tendaguru (Tanzania) as a case study. Our analyses corroborate the importance of the choice of the centre of rotation in the vertebral joints, which will be of key value in subsequent range of motion analyses and motion simulations. We also discuss the role of intervertebral cartilage based on the type of joint between vertebrae and its impact on axial skeleton stability. The major contribution of this work is that it is the first model that represents all of the major functions of the tail with individually controllable muscles. This level of anatomical realism has never been attempted in a dinosaur before, and it allows for the exploration of possible coordination strategies that could influence the animal's locomotion. The final results will be of great importance for a better understanding of pre-existing behavioural and functional hypotheses of the tail in large dinosaurs.

Acknowledgements: Funding from the Alexander von Humboldt Stiftung and DFG Projekt 470751746: “Wandelnde Monolithen: eine Analyse der Körperhaltung und Bewegung sauropoden Dinosaurier”.

THE EUROPEAN SYNCHROTRON AND RADIATION FACILITY EXTREMELY BRILLIANT LIGHTSOURCE INSTALLATION: ADVANCEMENTS IN IMAGING IN PALAEONTOLOGY

K. Dollman[1*], V. Fernandez[1], B. Weiss[2], C. Montgomery[2], L. Mukwevho[2], J. Choiniere[2], P. Tafforeau[1]

[1]European Synchrotron and Radiation Facility, 71 Avenue des Martyrs, 38000, Grenoble, France.
[2]Evolutionary Studies Institute, University of Witwatersrand, 1 Jan Smuts Avenue, Braamfontein, 2000, Johannesburg, South Africa.

*presenting author, dollman@esrf.fr

***Keywords**: computed tomography, synchrotron radiation, virtual histology, X-ray, phase-contrast*

The importance of X-ray imaging in palaeontological studies has a long and successful history. The new installation of BM18 and upgrade of BM05 (Extremely Brilliant Lightsource, EBS) at the European Synchrotron Radiation Facility presents a novel opportunity for advances in palaeontology imaging. Together, both beamlines currently present a voxel size range of 70–0.65 µm on BM18 and 25–0.35 µm on BM05, and an energy range of 55–240 keV on BM18 and 25–140 keV on BM05. Multiresolution imaging allows for imaging complete or larger portions of a fossil and then focusing on a specific region of interest for higher resolution analyses. Here, we present successful applications of propagation phase contrast synchrotron radiation µCT to examine fossils, including examples of gross anatomy (42 µm to 6.5 µm) and virtual histological (1.2 µm to 0.7 µm) studies. Furthermore, we present the results of increased distance for propagation phase contrast imaging made available by the extensively long experimental hutch on BM18 (<31m) by testing the imaging results taken at 1 m, 10 m, and 26.5 m with three different energy setups (120 keV, 160 keV, 193 keV). This extended propagation distance together with a high energy range and improved coherence after the EBS upgrade allows for effective imaging of very problematic fossils (e.g., dense fossil material or fossil material that is only visible with phase retrieval). As imaging technologies advance, X-ray imaging will continue to be a pivotal tool for research in palaeontology, palaeoanthropology, and evolutionary biology.

Acknowledgements: GENUS grant (86073).

25TH ANNIVERSARY OF EXCAVATIONS AT SOMOSAGUAS FOSSIL SITES (MADRID, SPAIN)

M.S. Domingo[1*], A.R. Gómez Cano[2,3], A. Oliver[2,4], P. López-Guerrero[2], B.A. García Yelo[5], D. Sanz-Pérez[1,2,6], P.M. Carro-Rodríguez[1,2,6], I. Menéndez[7], S. Gamboa[1,8], M. Hernández Fernández[1,6], L. Domingo[1]

[1]Departamento de Geodinámica, Estratigrafía y Paleontología, Facultad de Ciencias Geológicas, Universidad Complutense de Madrid, C/ José Antonio Novais 12, 28040 Madrid, Spain.

[2]Asociación Mujeres con los pies en la Tierra, C/ José Antonio Novais 12, 28040 Madrid, Spain.

[3]Transmitting Science, C/ Gardenia 2 - Urb. Can Claramunt, 08784 Piera, Barcelona, Spain.

[4]Departamento de Paleobiología, Museo Nacional de Ciencias Naturales-CSIC, C/ José Gutiérrez Abascal 2, 28006 Madrid, Spain.

[5]Departamento de Didáctica de las Ciencias Experimentales, Sociales y Matemáticas, Facultad de Educación - Centro de Formación del Profesorado, Universidad Complutense de Madrid, C/ Rector Royo Villanova 1, 28040 Madrid, Spain.

[6]Departamento de Geología Sedimentaria y Cambio Ambiental, Instituto de Geociencias (IGEO-UCM), C/ del Doctor Severo Ochoa 7, 28040 Madrid, Spain.

[7]Museum für Naturkunde, Leibniz Institute for Evolution and Biodiversity Science, Invalidenstrasse 43, 10115 Berlin, Germany.

[8]Centro de Investigación Mariña (CIM), Universidade de Vigo, Grupo de Ecoloxía Animal (GEA), MAPAS Lab, Campus Lagoas-Marcosende, 36310 Vigo, Spain.

*presenting author, soledaddomingo@ucm.es

***Keywords**: mammals, Miocene, education, outreach*

Somosaguas fossil sites (Pozuelo de Alarcón, Madrid) were excavated for the first time in 1998 by a group of students from the Universidad Complutense de Madrid (UCM) led by Professor Nieves López Martínez. In 2023, we commemorate twenty-five years of excavations at these Miocene sites, which stand out for being located inside a university campus (Somosaguas Campus of the UCM). This circumstance has allowed that, over the years, the working objectives of the Somosaguas Project of Palaeontology have gone beyond the purely scientific realm to spheres centred on the social role of Palaeontology. There are three main pillars behind the Somosaguas Project of Palaeontology: Science, Education, and Outreach. From the scientific viewpoint, we have conducted multidisciplinary research that includes studies about the taxonomy, taphonomy, palaeoecology, mineralogy or palaeoclimatology of the sites and that have increased our knowledge about the faunas inhabiting central Iberia in the Middle Miocene. From the educational viewpoint, students from any degree at the UCM can learn how to work in a palaeontological excavation and obtain credit for it. Besides, we have also conducted didactic visits and activities for primary and secondary students and teachers. From the outreach viewpoint, we celebrate Open Door Days every year during the excavation, open to the general public. We also participate in other initiatives such as the Week of

Science or the International Day of Women and Girls in Science. To promote the accessibility to the sites, in 2016, we installed walkways and fixed informative signs to allow self-guided visits.

Acknowledgements: We thank all the people involved in the Somosaguas Paleontological Project throughout these 25 years. Excavations are funded by the Dirección General de Patrimonio Cultural, Comunidad de Madrid. We especially thank Emilia Nogueras (Comunidad de Madrid) for her constant support. This is a contribution of the research group UCM 910607.

MODERN BONE ASSEMBLAGES FROM DOÑANA NATIONAL PARK (SPAIN): INSIGHTS INTO TAPHONOMY AND ECOLOGY

M.S. Domingo[1*]

[1]Departamento de Geodinámica, Estratigrafía y Paleontología, Facultad de Ciencias Geológicas, Universidad Complutense de Madrid, C/ José Antonio Novais 12, 28040, Madrid, Spain.

*presenting author, soledaddomingo@ucm.es

***Keywords**: taphonomy, fossilization, ecology, bones, Doñana National Park*

The taphonomic study of modern bone assemblages provides useful information about the early stages of fossilization and also about the ecology of the vertebrates from the analysed natural area. We conducted a comprehensive taphonomic analysis of the modern vertebrate assemblage from Doñana National Park, a Mediterranean protected natural area in the southwest coast of Andalusia (Spain), evaluating and comparing ten different habitats. Half of these habitats occur in active depositional environments (marshland, lake margin, river margin, beach, and dunes). Main results obtained are: (1) the modern bones from Doñana National Park are generally well preserved and display little damage, mainly due to the low predator pressure; (2) the lake margin and river margin habitats, which are also common depositional contexts in the fossil record, display taphonomic features indicative of a higher fossilization potential (abundant remains, high element completeness, buried elements) compared to other habitats in Doñana National Park; (3) the distribution of shed antlers provides ecological information about a preferred geographic area for cervids located to the south of the park. The myriad of insights that can be gained from the taphonomic study of modern death assemblages are helpful not only to palaeontologists and archaeologists but also to ecologists and conservation biologists.

Acknowledgements: Thanks to all the collaborators of this project: C. Badgley, J.J. Negro, D.M. Martín-Perea, E. Cantero, P. López-Guerrero, and A. Oliver. This project was funded by the European Union's Horizon 2020 programme under grant agreement MSCA-700196 (Marie Skłodowska-Curie Individual Fellowships). This is a contribution of the research group UCM 910607.

PALAEOECOLOGICAL CONTEXT FOR THE LATE PLEISTOCENE OF CENTRAL IBERIA: SMALL MAMMALS FROM LOS CASARES CAVE (GUADALAJARA PROVINCE, SPAIN)

Á.C. Domínguez-García[1,2*], G. Cuenca-Bescós[1], M.P. Alfaro-Ibañez[1], L. Luque[3], J.J. Alcolea-González[3], M. Alcaraz-Castaño[3]

[1]Aragosaurus-IUCA, Departamento de Ciencias de la Tierra, Facultad de Ciencias, Universidad de Zaragoza, c/ Pedro Cerbuna 12, 50009 Zaragoza, Spain.

[2]Departamento de Geodinámica, Estratigrafía y Paleontología, Facultad de Ciencias Geológicas, Universidad Complutense de Madrid, c/ José Antonio Novais 12, 28040 Madrid, Spain.

[3]Área de Prehistoria, Departamento de Historia y Filosofía, Universidad de Alcalá, c/ Colegios 2, 28801 Alcalá de Henares, Spain.

*presenting author, acdomgar@unizar.es

***Keywords**: Quaternary, palaeoenvironment, taphonomy, palaeoclimate, Neanderthals*

Los Casares cave is a classic archaeopalaeontological site known since the late 19th century that contains a deposit showing evidence of Neanderthal and carnivore occupations during MIS 3 in layers C and B–C of the Seno A (44.9–42.2 cal kyr BP). In order to provide an updated palaeoenvironmental and palaeoclimatic framework for the last Neanderthals of central Iberia, a rich small mammal assemblage comprising a minimum of 244 individuals and 25 taxa was analysed in depth for the first time. The origin of the accumulation can be related to the predatory activity of some mammalian carnivores since the high percentage of signs of digestion observed (>70%) reaches a high to extreme degree of alterations. From a biochronological point of view, the presence of *Allocricetus bursae*, *Pliomys lenki*, and *Alexandromys oeconomus* is consistent with the radiocarbon age and archaeological record of the deposit. Palaeoecological reconstructions performed show stable warm and humid Mediterranean climate with slight variation between different layers of the stratigraphic sequence. The temperatures inferred are similar than at present, whereas rainfall was slightly more abundant than today. Reconstructed landscapes are mainly constituted by open areas with humid meadows and forest patches with moderate ground cover. Aquatic areas, such as rivers, streams, marshlands or ponds, were also represented around the site. Therefore, the small mammal assemblage suggests environmental and climatic conditions favorable for Neanderthals inhabiting this area at that time.

Acknowledgements: A.C.D.G. is supported by a postdoctoral Margarita Salas contract (CT18/22) funded by the European Union “NextGenerationEU/PRTR”. M.P.A.I. is funded by a FPU grant (FPU20/02030-MIU, Gobierno de España). This research has been also funded by the ERC under the European Union’s Horizon 2020 research and innovation programme (No 805478; MULTIPALEOIBERIA project).

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

WESTERN BEARS: THE LATE PLEISTOCENE FOSSIL URSIDAE FROM PORTUGAL (IBERIAN PENINSULA)

D. Estraviz-López[1,2*], A. Duraud[1], O. Mateus[1,2], A. Grandal-d'Anglade[3]

[1]GeoBioTec, Department of Earth Sciences, NOVA School of Science and Technology, FCT-NOVA, Universidade NOVA de Lisboa, 2829-516, Caparica, Portugal.

[2]Museu da Lourinhã, R. João Luís de Moura 95, 2530-158, Lourinhã, Portugal.

[3]Instituto Universitario de Xeoloxía Isidro Parga Pondal, 15071, A Coruña, Spain.

*presenting author, estravizlopez.dario@gmail.com

***Keywords**:* Ursus arctos*,* Ursus spelaeus*, Furninha cave, Escoural cave, Caldeirão cave*

The historical perspective is crucial for our understanding of living species and it has implications for the conservation of endangered animals, like guiding reintroductions. The brown bear (*Ursus arctos*) has been locally extinct in Portugal for more than a century and a half, but its fossils are known from 16 Pleistocene localities, all but one, Late Pleistocene in age. No definitive proof of the presence of the cave bear (*Ursus spelaeus*) has been described in Portugal. Here we morphometrically re-examine 550 remains (minimum number of individuals = 35) from 7 Portuguese localities, including (to our knowledge) the largest collection of brown bear fossils in Iberia, with more than 450 measurable remains coming from Furninha cave, Peniche. Preliminary analysis of morphometric data from this remarkable sample indicate that previous conclusions stand correct and that no unquestionable *Ursus spelaeus* fossil has been found in Portugal. We also identified pathologies on at least two individuals, one from Furninha cave and one from Fontainhas cave. The nature of these pathologies will help to understand the paleobiology of fossil brown bears. This trove of data will serve as a framework for future studies on other Ursidae fossils in Portugal. It will help complete the picture of the evolution of this iconic animal in the Iberian Peninsula. This will be achieved especially with the inclusion of further fossils from these localities currently under preparation and the use of techniques such as molecular analysis.

Acknowledgements: We thank the staff of the Geological Museum of Lisbon, José Moita and Rubén Dias, that of the National Museum of Archaeology, and Dr. Mariana Nabais and Prof. João Zilhão for their permission and help to access collections. This work has benefited from grant UIDB/04035/2020 and 2020.05395.BD.

FOSSIL ANURANS REVEAL A NEW TAPHONOMIC MODEL FOR THE EOCENE GEISELTAL KONSERVAT-LAGERSTÄTTE (GERMANY)

D. Falk[1,2*], O. Wings[3], M.E. McNamara[1,2]

[1]School of Biological, Earth and Environmental Sciences, University College Cork, Distillery Fields, North Mall, T23 TK30, Cork, Ireland.

[2]Environmental Research Institute, University College Cork, Lee Rd, T23 XE10, Cork, Ireland.

[3]Natural History Museum Bamberg, Fleischstraße 2, 96047, Bamberg, Germany.

*presenting author, daniel.falk@ucc.ie

***Keywords**: amphibian skin, soft tissue, phosphatization, mineralization, melanosomes*

The Geiseltal Konservat-Lagerstätte (Eocene, Germany) is represented by ca. 50,000 fossil specimens that were recovered from open lignite mines located SW of Halle (Saale), central Germany, about a hundred years ago. Early studies of the vertebrates reported remarkable (sub)cellular details of muscle, cartilage, blood vessels, feathers, hair, reptile scales, and bacteria. The mode of preservation was reported as three-dimensional silica replacements, which is unknown from other vertebrate Konservat-Lagerstätten. These claims of cellular fidelity, however, have not been verified using modern techniques. Here, we tested these claims by examining soft tissues preserved in the Geiseltal anurans using electron microscopy, energy dispersive spectroscopy, electron probe microanalysis, Fourier-transform infrared spectroscopy, Raman spectroscopy, and synchrotron rapid scanning-x-ray fluorescence analysis. Our results indicate that soft tissues are not preserved as silica replacements. Instead, the preserved soft tissues include layers of melanosomes that exhibit tissue-specific geometries. In addition, the Eberth-Katschenko layer of the mid-dermis is preserved in calcium phosphate. These features—carbonaceous melanosome films and phosphatized soft tissues—recur in vertebrates from other Konservat-Lagerstätten through space and time. This recognition helps to understand the taphonomic pathways available for preservation of vertebrate soft tissues in the fossil record.

Acknowledgements: Thanks to Michael Stache and all associates who documented, prepared, and curated the Geiseltal specimens and who gave access to the Geiseltal collections and databases in the Natural Sciences Collections (ZNS). Thanks to Richard Unitt (UCC) for Raman analysis and to the UCC Palaeo Group for assistance.

A SPECTACULAR MIDDLE TO LATE PERMIAN TETRAPOD AND INSECT TRACKSITE: THE WOLFERODE QUARRY (CENTRAL GERMANY)

D. Falk[1,2*], M. Buchwitz[3], J.W. Schneider[4], A. Pieri[5], B.-C. Ehling[6]

[1]School of Biological, Earth and Environmental Sciences, University College Cork, Distillery Fields, North Mall, T23 TK30, Cork, Ireland.

[2]Environmental Research Institute, University College Cork, Lee Rd, T23 XE10, Cork, Ireland.

[3]Museum für Naturkunde Magdeburg, Otto-von-Guericke-Straße 68-73, 39104 Magdeburg, Germany.

[4]Technische Universität Bergakademie Freiberg, Institut für Geologie, Bernhard-von-Cotta-Str. 2, 09599 Freiberg, Germany.

[5]Dipartimento die Scienze della Terra, Università di Pisa, via S. Maria 53, 56126 Pisa, Italy.

[6]Landesamt für Geologie und Bergwesen Sachsen-Anhalt, Köthener Str. 38, 06118 Halle (Saale), Germany.

*presenting author, daniel.falk@ucc.ie

Keywords: *trace fossils, red beds, ichnology, excavation, Rotliegend*

The middle to upper Permian Hornburg Fm. (Saxony-Anhalt, Germany) unveils a complete fan- and playa-system and its biota, which is rarely preserved in present-day central Europe. The successions represent an exceptional window into the continental environments and biotas of the Euramerican Permian Pangean palaeoequatorial northern trade wind zone. In September 2022, an excavation (ca. 60 m^2) in the NE corner of the abandoned “Quarry Held”, Wolferode (Upper Hornburg Fm.), unearthed a variety of well-preserved trace fossils (40 excavation boxes) including tetrapod trackways (from probably araeoscelids and / or bolosaurids), tetrapod scratch traces (probably swimming traces), insect traces, insect body imprints, jellyfish imprints and microbially induced sedimentary structures. The fossil-bearing strata are approximately 6 m thick and include laminated siltstones and claystones; intercalated sandstone channel deposits show internal cross bedding structures, and on the bottom desiccation crack fillings, ice crystal casts, flute casts, and/or load casts. The trace fossil content of these dry evaporitic red beds is exceptional on a worldwide scale and is much needed for the Permian tetrapod biostratigraphy. It will also add to the interpretation of ancient food chains and environments. The excavation will be continued in 2023 and is open for volunteers.

Acknowledgements: Thanks to all excavation volunteers who performed excavation, documentation, preparation, and transport of the Wolferode specimens. Many thanks to Juergen Waschkuhn for excavation permission, quarry access, and assistance. We are grateful for the financial support by the EAVP, the Subcommission on Permian Stratigraphy, and the Natural History Museum Magdeburg.

A NEW TRUE GOOSE (ANSERINI, ANATIDAE, ANSERIFORMES) FROM THE QUATERNARY OF EIVISSA (BALEARIC ISLANDS, SPAIN)

J. Femenias-Gual[1,2,3*], J.A. Alcover[4]

[1]PhD - Margarita Salas Postdoctoral Researcher, Universitat Autònoma de Barcelona, Campus de la UAB, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Grup de Recerca de Ciències de la Terra, Departament de Biologia, Universitat de les Illes Balears, 07122 Palma, Mallorca, Spain.

[3]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[4]Institut Mediterrani d'Estudis Avançats IMEDEA (CSIC-UIB), María de Maeztu Center of Excellence, Miquel Marquès 21, 07190 Esporles, Mallorca, Spain.

*presenting author, joan.femenias@uab.cat

***Keywords**: insular evolution, geese, Anserini, Pleistocene, Holocene*

Fieldwork carried out at the end of last century, excavating the Upper Pleistocene–Holocene layers of Es Pouàs (Eivissa), yielded a huge quantity of fossil bones (estimated >120,000; 30,000 of them individually catalogued). Currently, over 100 different terrestrial vertebrates have been identified, including birds, bats, a lizard, and a snake. Nevertheless, only a limited number of them have been studied in detail. The recent review of the large non-passerine birds from this site resulted in the identification of more than 1,000 bones of adults and goslings (from newborn to fully-developed specimens) of a small goose of the tribe Anserini. The goose of Eivissa is unlike any living Palearctic goose, although it shares characters with some of them. Some traits of these fossils (e.g., non-pneumatized furculae, sternums with bilateral compression of the spina externa, or skulls displaying a well-developed processus supraorbitalis of the lacrimal bone) point to its attribution to *Branta.* Along the stratigraphic record, the width of the interorbital narrowing of the skull decreases, and the grooves to hold salt glands become well marked. Probably, they represent an evolutionary adaptation to a more saline diet. The presence of a breeding goose in Eivissa during the Holocene climatic optimum precludes the use of these fossil as cold climatic bioindicators. To conclude, the peculiar combination of morphological characters, together with the evidence of breeding in Eivissa, suggests that this goose represents a new species.

Acknowledgements: This work is supported by projects PID2020-112720GB-I00 and PID2020-116908GB-I00 funded by MCIN/AEI/10.13039/501100011033, and by "Maria de Maeztu Centre of Excellence" accreditation to IMEDEA (CSIC-UIB) (CEX2021-001198). J.F.G. is financed by Margarita Salas fellow from the Ministerio de Universidades, funded by the European Union - Next Generation EU.

MULTIPLE SOLUTIONS TO THE SAME PROBLEM: SHELL BIOMECHANICS IN EARLY TURTLES (LATE TRIASSIC)

G.S. Ferreira[1,2*], C. Kyriakouli[1,2], D. Dróżdż[3], T. Szczygielski[3,4]

[1]Senckenberg Centre for Human Evolution and Palaeoenvironment at the Eberhard Karls Universität Tübingen, Hölderlinstrasse 12, 72074 Tübingen, Germany.

[2] Fachbereich Geowissenschaften, Eberhard Karls Universität Tübingen, Hölderlinstrasse 12, 72074 Tübingen, Germany.

[3] Department of Evolutionary Paleobiology, Institute of Paleobiology, Polish Academy of Sciences, Twarda 51/55, 00-818, Warsaw, Poland.

*presenting author, gabriel.ferreira@senckenberg.de

Keywords: *early turtles, functional morphology, finite element analysis,* Proganochelys, Proterochersis

In the earliest turtles, the girdles form pillars between the dorsal carapace and the ventral plastron. In *Proterochersis* the pelvic girdle is sutured to the shell, while in *Proganochelys* and australochelyids the pillar is anterior, formed by a bone homologous to the clavicles. Those columns are lost in the clade including all other turtles, only to be regained by one of the crown lineages, i.e., Pleurodira. Suturing girdles has obvious downsides—it restrains neck or hindlimb movement—so trade-offs are likely. In pleurodires, femoral protraction is limited, but the sutured girdle confers levels of stress resistance to predation similar to those of turtles without this trait even in flatter morphotypes. Here, we explore the functional significance of sutured girdles in early turtles. Using photogrammetry, we digitized specimens of *Proganochelys* and *Proterochersis*, and created in vivo-like shell models with and without sutured elements. Those were submitted to five finite element analyses that simulate different predation scenarios, which were compared by von Mises stress plots and mean stress per element. Similar to pleurodires, suturing the shell reduces stress locally, i.e., anteriorly and posteriorly in *Proganochelys* and *Proterochersis*, respectively, but in the latter a larger effect was also found for longitudinal bites. Given their very disparate morphology, we propose that the turtle shell possess structural weaknesses that were solved differently and independently in *Proganochelys, Proterochersis*, and pleurodires. The solution without the sutured girdles released the neck and limbs for wider mobility, yielding better fit, and was thus stabilized in the turtle lineage.

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

A METHODOLOGICAL FRAMEWORK TO TEST COMPETING HYPOTHESES ON THE NATURE OF ORGANISMAL EVOLUTION

H.G. Ferron[1,2,*], P.C.J. Donoghue[2], B. Figueirido[3]

[1]Institut Cavanilles de Biodiversitat i Biologia Evolutiva, Universitat de València, c/ Catedrático José Beltrán Martínez 2, 46980 Paterna, Valencia, Spain.

[2]School of Earth Sciences, University of Bristol, Tyndall Avenue, Bristol, BS8 1TQ, UK.

[3]Departamento de Ecología y Geología, Universidad de Málaga, Blvr. Louis Pasteur 31, 29010, Málaga, Spain.

*presenting author, humberto.ferron@uv.es

***Keywords**: evolution, contingency, determinism, marine tetrapods*

The long-term patterns and processes of evolution are a key topic in evolutionary research and the debate over contingency vs. determinism in evolution has occupied biologists and palaeontologists alike for decades. The design of experiments to test among hypotheses is challenging in historical sciences but evolutionary history is replete with parallel natural evolutionary experiments from which general nomothetic principles can be gleaned. Among the most powerful of these natural experimental systems is the evolutionary transition to life in water by tetrapods, a phenomenon that has happened more than 30 times independently over different lineages. The recent emergence of new computational techniques in palaeobiology provides for the first time the opportunity to perform rigorous computational and physical examination to explore evolutionary, functional and ecological hypotheses. Based on those, here, we present a methodological pipeline to test competing hypotheses (contingency vs. determinism) on the nature of organismal evolution in marine tetrapods. We propose that a virtual morphospace can be derived with elliptic Fourier analysis and interrogated using computational fluid dynamics to generate performance heatmaps (≈ adaptive landscapes). This, supported by Pareto theory, can allow to test functional optimality of both realized and unrealised morphologies. Convergence quantification can be used then to assess whether secondarily aquatic tetrapod lineages are more similar to one another than any are to their immediate terrestrial relatives, whether they are attracted to the same predictable regions of design space, whether these converge on optimal designs (functional 'attractors') or discrete but distinct regions of design space (phylogenetic burden).

Acknowledgements: This project is funded by the Fundación BBVA - Leonardo Grants for Researchers and Cultural Creators (LEO22-2-2137).

GEOMETRIC MORPHOMETRIC ANALYSIS OF THE DISTAL HUMERUS OF *PLIOBATES CATALONIAE*: LOCOMOTOR INFERENCES AND ANTHROPOID ELBOW EVOLUTION

A. Figueroa-Torrejón[1*], Sergio Almécija[2,3,4], S. Moyà-Solà[4,5,6], D.M. Alba[4], J. Arias-Martorell[4]

[1]Departamento de Antropología, Facultad de Ciencias Sociales, Universidad de Chile, 7800020, Santiago, Chile.

[2]Division of Anthropology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024, USA.

[3]New York Consortium in Evolutionary Primatology, New York, NY 10024, USA.

[4]Institut Català de Paleontologia Miquel Crusafont, Universitat Auntònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[4]Institució Catalana de Recerca i Estudis Avançats, 08010 Barcelona, Spain.

[5]Unitat d'Antropologia Biològica (Dept. BABVE), Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, ambra.figueroa@ug.uchile.cl

***Keywords**: locomotion, shape analysis, elbow, positional repertoire, catarrhines*

Pliobates cataloniae is a Miocene (11.6 Ma) small-bodied catarrhine from NE Iberian Peninsula of debated systematic position (stem catarrhine pliopithecoid vs. stem hominoid) due to the possession of a mosaic of primitive and derived features relative to extant apes. At the elbow, *Pliobates* exhibits a primitive (stem catarrhine-like) humeroulnar joint coupled with a derived (crown hominoid-like) humeroradial joint and a crown catarrhine-like distal humerus (lack of capitular tail and entepicondylar foramen). We assess the morphological affinities of the distal humerus of *Pliobates* (IPS58443.15, holotype) from a functional viewpoint by means of landmark-based 3D geometric morphometrics (trochlea, capitulum, and the whole distal end separately). The comparative sample consists of 144 extant individuals (including hominoids, cercopithecoids, and platyrrhines) and 8 fossil anthropoids. Computations of Blomberg's K and Pagel's λ indicate that distal humeral shape embeds high phylogenetic signal ($K > 1$; $\lambda \approx 1$). Morphometric analyses of the whole epiphysis and trochlea enable good discrimination between extant hominoids and other (extant and fossil) anthropoids, unlike those based on capitulum shape alone, despite hominoids and *Pliobates* exhibiting a distinctive well-rounded and large capitulum. The trochlea's shallow medial keel and poorly developed spool shape distinguish *Pliobates* from crown hominoids, more closely resembling the condition of large arboreal quadrupedal platyrrhines (e.g., *Alouatta*) and small-bodied Miocene catarrhines (*Epipliopithecus*, *Dendropithecus*). The morphometric affinities of the distal humerus support *Pliobates* engaging in a high proportion of (possibly slow) arboreal quadrupedalism—similar to *Alouatta*—and climbing, combined with a lower proportion of suspensory behaviors similar to those of *Ateles*.

Acknowledgements: Funded by R+D+I projects PID2020-116908GB-I00 and PID2020-117289GB-I00 (MCIN/AEI/10.13039/501100011033/), Generalitat de Catalunya/CERCA Programme, AGAUR (2001 SGR 01188, 2001 SGR 00620, and BP-H2020 MSCA-Cofund No. 801370 to J.A.M.), and Departament de Cultura of the Generalitat de Catalunya (CLT0009_22_000018).

3D SURFACE SCANNING THROUGH GLASS

V. Fischer[1*], N. Vaczi[1,2], A. Caps[1], R.F. Bennion[1,3], J.A. MacLaren[1,4]

[1]Evolution & Diversity Dynamics Lab, Université de Liège, 4000 Liège, Belgium.
[2]Département Sciences et Technologies, Haute Ecole en Hainaut, 7000 Mons, Belgium.
[3]OD Earth and History of Life, Royal Belgian Institute of Natural Sciences, Brussels, Belgium.
[4]Department of Biology, Universiteit Antwerpen, Antwerpen 2610, Belgium.

*presenting author, v.fischer@uliege.be

***Keywords**: 3D surface scanning, digitization, geometric morphometrics*

Three-dimensional modelling and, more generally, morphometric analyses of specimens have become a crucial source of data for natural sciences. However, the quest for a thorough sampling has been impaired by 19th–20th centuries exhibition practices of locking specimens behind glass. A well-known example is the Jurassic marine reptiles at the Natural History Museum in London, UK. In this contribution, we tested how well structured white-light scanning (Artec Eva, resolution ≈ 0.5 mm), Artec Spider (resolution ≈ 0.2 mm) captures the morphology of a variety of fossil specimens behind modern (i.e., flat) and old (i.e., undulating) glass. Objects ranged from ~10 cm to ~1 m in length, and from pristine to diagenetically flattened condition. Encouragingly, we were able to generate precise and accurate meshes through modern glass (validated by scanning objects without the glass): 92–99% of comparable points deviated <1 mm from the reference model and 90–98% deviated <0.5 mm; objects with complex geometry such as an extant goat skull provided the least accurate models. Older glass would roughly double the deviations, which thus remains manageable in most cases. Postprocessing was often increased in duration, as additional scan cleaning was necessary (e.g., duplicated surfaces). Scanners that required close proximity to the specimen (i.e., <50 cm) are difficult to use in many cases. We conclude that, with the right scanning methods, specimens can be confidently digitized and incorporated into 2D or 3D morphometric (or other digital modelling) analyses.

Acknowledgements: This research was made possible thanks to funding from F.R.S.–FNRS and Université de Liège. We also thank Sandra Chapman, Zoe Hughes, and Robin Hansen (NHMUK) for facilitating our visit.

ADDUCTOR MUSCLE RECONSTRUCTION IN GIANT FOSSIL LIZARDS

J. Fortuny[1*], L. Garcia-Escolà[1], A. Bolet[2,1,3], A. Villa[1], A. Serrano-Martínez[1], J. Marcé-Nogué[4,1], C. Castillo-Ruiz[5], C. De Jaime-Soguero[1], E. Mujal[6,1], P. Cruzado-Caballero[5,7]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Departamento de Estratigrafía y Paleontología, Universidad de Granada, Avda. Fuente Nueva s/n, 18071 Granada, Spain.

[3]School of Earth Sciences, University of Bristol, Life Sciences Building, 24 Tyndall Avenue, BS8 1TQ, Bristol, UK.

[4]Department of Mechanical Engineering, Universitat Rovira i Virgili, Campus Sescelades, building E4, Avinguda Països Catalans 26, 43007 Tarragona, Spain.

[5]Departamento de Biología Animal, Edafología y Geología, Universidad de La Laguna, Av. Astrofísico Francisco Sánchez s/n, San Cristóbal de La Laguna, 38200 Tenerife, Spain.

[6]Staatliches Museum für Naturkunde Stuttgart, Rosenstein 1, D-70191, Stuttgart, Germany.

[7]Grupo Aragosaurus-IUCA, Facultad de Ciencias, Universidad de Zaragoza, C/ Pedro Cerbuna 12, 50009 Zaragoza, Spain.

*presenting author, josep.fortuny@icp.cat

Keywords: Gallotia*, myology, paleobiology, insularity, 3D modelling*

Jaw adductor muscles play a key role in feeding function as muscles power bones and related structures involved. However, the lack of preserved soft tissue in the fossil record represents a major challenge for performing accurate biomechanical analyses in extinct taxa. In recent years, different approaches have provided new tools to obtain accurate muscle reconstructions in extinct taxa based on three-dimensional muscle modelling. Herein, we present jaw adductor muscle reconstructions in the endemic insular lizard genus *Gallotia*. This genus contains giant and non-giant taxa from the Canary Archipelago and includes both extant and extinct representatives. Jaw adductor muscles were reconstructed for all extant species in adult and juvenile/subadult specimens, as well as in almost complete skulls of two extinct giant species, *Gallotia goliath* and *Gallotia auaritae*. The use of the free, open-source software Blender add-on Myogenerator to reconstruct adductor muscles based on muscle origin and insertion attachment areas offers the opportunity to test how gigantic species solve different challenges of becoming giant under insular conditions. Muscle reconstructions in extinct taxa further provided the opportunity to obtain physiological cross-sectional areas for each muscle, which will be required for future biomechanical analyses such as multibody dynamics and finite element analysis.

Acknowledgements: Funded by projects PROID1017010136, PID2020-117118GB-I00 (MCIN/AEI/10.13039/501100011033), AGAUR (2021 SGR 01184), CERCA Programme/Generalitat de Catalunya, RNM190 group (Universidad de Granada), Agencia Estatal de Investigación

(RYC2021-032857-I MCIN/AEI/10.13039/501100011033 “European Union NextGenerationEU/ PRTR” to J.F. and FCI2019-039443-I/AEI/10.13039/501100011033 to A.V.), Ministerio de Universidades (Spain) and the NextGenerationEU programme (María Zambrano Junior Fellowship to A.B.).

THE RECORD OF AN ICHTHYOSAUR FROM THE MIDDLE JURASSIC OF THE CARACOLES FORMATION, NORTHERN CHILE

N. Fouquet Jo[1,2*], J. Pardo-Pérez[3,4], H. Urqueta[1], E. Maxwell[5]

[1]ELBO Consultores, Cauti 554, Calama, Chile.

[2]ANQA Servicios Paleontológicos y Geológicos, Mario Bahamondes Silva 2855, Antofagasta, Chile.

[3]Macropaleontology area, Instituto de la Patagonia, Universidad de Magallanes, Avenida Bulnes 01890, 6200000, Punta Arenas, Chile.

[4]Centro de Investigación GAIA-Antártica, Universidad de Magallanes, Avenida Bulnes 01855, 6200000, Punta Arenas, Chile.

[5]Staatliches Museum für Naturkunde Stuttgart, Rosenstein 1 70191, Stuttgart, Germany.

*presenting author, nfouquet@anqa.cl

***Keywords**: ichthyosaurs, Middle Jurassic, pathologies, taphonomy, palaeoecology*

Ichthyosaurs from the southern margin of Gondwana have been recorded from the Jurassic and Cretaceous of Argentina and Chile. Here we report the first ichthyosaur record from the Middle Jurassic of the Caracoles Formation in the north of Chile. The material is incomplete but preserved in three dimensions. The best element preserved is the skull, which is fragmentary; the large jaws from the rostrum (i.e., premaxilla and dentary) were the most completely exposed portions in situ, but they were sadly stolen before the excavation of 2023. From the rest of the skeleton, we have preliminarily observed an abundant and diverse dentition, with tooth morphology ranging from cutting to piercing styles, which indicates a generalist diet. The teeth have rounded crowns in cross section and thin longitudinal striations very close to each other, which do not reach the apex. Additionally, we observed healed trauma in the jaws of the stolen individual, which we preliminary interpret as evidence of aggressive behavior, caused by territorial battles or mating, as has been previously interpreted for ichthyosaurs. Several traces of scavengers utilizing the carcass postmortem have been observed in the preserved fragments. This, in addition to the abundant associated fauna (i.e., various fishes, bivalves, ammonites, and other marine reptiles), indicates a highly nutritive shallow water environment, in which the carcass decomposed on the seafloor, providing food and nutrients for consumers and decomposers.

Acknowledgements: N.F.J. acknowledges Minera Centinela for funding this research and the Consejo de Monumentos Nacionales for the permit and for having allowed the excavation. J.P.P. acknowledges the Agencia Nacional de Investigación y Desarrollo de Chile (Project PAI77200036 to J.P.P.).

FIRST RECORD OF LATE VALLESIAN INSECTIVORES (EULIPOTYPHLA, MAMMALIA) FROM SOUTHEASTERN SPAIN

M. Furió[1,2*], R. Minwer-Barakat[3,2], A. García-Alix[3], M. Freudenthal[3], J. Agustí[4,5,6], E. Martín-Suárez[3]

[1]Serra Húnter Fellow in Departament de Geologia, Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[3]Departamento de Estratigrafía y Paleontología, Universidad de Granada, Avda. Fuente Nueva s/n, 18071 Granada, Spain.

[4]IPHES-CERCA, Institut Català de Paleoecologia Humana i Evolució Social, Zona Educacional 4, Campus Sescelades URV, Edifici W3, 43007 Tarragona, Spain.

[5]Universitat Rovira i Virgili, Departament d'Història i Història de l'Art, Av. Catalunya 35, 43002 Tarragona, Spain.

[6]ICREA, Institució Catalana de Recerca i Estudis Avançats, Pg. Lluís Companys 23, 08010 Barcelona, Spain.

*presenting author, marc.furio@icp.cat

***Keywords**: insectivorans, Miocene, Vallesian, Iberian Peninsula, Guadix-Baza Basin*

The Guadix-Baza Basin (southeastern Spain) was established as a separate intramontane basin in the late Tortonian. Its sedimentary infill records a first phase of marine sedimentation, a second phase reflecting the sea retreat at the end of the Tortonian, and a third phase of exclusively continental sedimentation from the Messinian to the Late Pleistocene. Nevertheless, the finding of the localities named Cortijo de la Piedra-1 (CP-1) and 2 (CP-2) demonstrated the occurrence of continental environments in this area prior to the establishment of the Guadix-Baza Basin sensu stricto. These sites have yielded micromammal remains, among which only rodents have been studied in detail. In CP-1, only *Huerzelerimys minor* was identified, whereas the assemblage from CP-2 includes *H. minor*, *Occitanomys hispanicus*, *Hispanomys* aff. *peralensis*, *Rotundomys bressanus*, Cricetinae indet., *Eliomys* cf. *truci*, Pteromyinae indet., and *Heteroxerus* sp. This fauna was assigned to the early Tortonian (late Vallesian, MN10) and thus represents the oldest non-insular mammal assemblage from southern Spain. Besides rodents, scarce insectivoran remains were recovered from these levels, which have not been described until now. The material includes two genera of soricids (*Miosorex* and *Paenelimnoecus*) and one genus of erinaceid (*Parasorex*), which represent the southwesternmost occurrences of Vallesian insectivorans in Europe. Such low diversity of the insectivoran fauna is unlikely to be a sampling bias, but an expected result according to the nested model of latitudinal gradient described in previous works. The absence of Talpidae and the occurrence of generalistic taxa among the Soricidae and the Erinaceidae fully support this view.

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

Acknowledgements: This work is part of project P20_00066 funded by the Junta de Andalucía (Spain). Support of the projects PID2020-117289GB-I00 and PID2020-116908GB-I00 (Ministerio de Ciencia e Innovación, Spanish Government), the groups 2021 SGR 00127 (Generalitat de Catalunya) and RNM190 (Junta de Andalucía), and CERCA Programme/Generalitat de Catalunya is also acknowledged.

GEOMETRIC MORPHOMETRICS ON TRIBOSPHENIC MOLARS: A NEW APPROACH TO THE EVOLUTIONARY HISTORY OF LARGE-SIZED *MYOTIS*

J. Galán[1*], J. Aramendi[2]

[1]Department of Geology, Faculty of Science and Technology, University of the Basque Country UPV/EHU, Barrio Sarriena s/n, 48940 Leioa, Spain.

[2]McDonald Institute for Archaeological Research, Department of Archaeology, Cambridge, UK.

*presenting author, julia.galan@ehu.eus

***Keywords**: mouse-eared bats, Quaternary,* Myotis myotis, Myotis blythii, Myotis punicus

A major challenge when studying Quaternary fossil bats is the assignment of fragmentary remains to cryptic species, as in the complex of large-sized mouse-eared bats (LSMEB) that includes the extant *Myotis myotis* (Europe), *Myotis blythii* (southern Europe, Near East), and *Myotis punicus* (northwestern Africa, some Mediterranean islands). The first two form a monophyletic clade that split ca 0.6 Ma according to molecular data, with the appearance of *M. myotis* tentatively located in the Iberian Peninsula. The third one likely diverged from the *M. myotis–M. blythii* clade ca. 6 Ma. However, the published fossil evidence does not totally fit in, chronologically, with this molecular-based scenario. Solving the puzzle of LSMEB evolutionary history requires identifying the anatomical changes concurrent to the appearance and diversification of these bats, detectable on fragmentary fossils. Here we performed a 2D geometric morphometric study on the first to third upper and lower molars of the three extant LSMEB species (the out-of-the-clade species *Myotis nattereri* was included as external group), to obtain a suitable methodology for the study of fossil LSMEB. For the first and second molars, shape analyses showed very similar morphospaces, while form analyses showed a higher degree of variance related to size. Reversely, the third molars occupied distinct morphospaces but presented overlapping sizes. Finally, we performed a preliminary analysis on two fossil samples (Early and Middle Pleistocene, Gran Dolina site, Spain), which showed clearly distinct shape and form features in comparison to the extant LSMEB. Confirming these trends will need further analysis of larger samples.

Acknowledgements: J.G. is the recipient of a University of the Basque Country UPV/EHU postdoctoral grant (ESPDOC20/83). J.A. is the recipient of a Newton International Fellowship (NIF22\220310). The Eusko Jaurlaritza (IT1485-22) and the Spanish Ministry of Science, Innovation and Universities (PID2021-122533NB-I00, PD2021-122355NB-C31) supported this work.

BRINGING BACK LIFE BEFORE THE PYRENEES: VIGEOCULT VIRTUAL REALITY PROJECT IN THE GEOPARC ORÍGENS (NORTHEASTERN CATALONIA)

A. Galobart[1,2*], X. Costa-Badia[3], X.M. Pellicer[3], G. Rivas[4], J.A. Muñiz[5], O. Ferrer[4], O. Gratacós[4], P. Santolaria[4], G. Puras[3], N. Verdeny[3], E. Carola[4], J.A. Muñoz[5], A. Sellés[1,4]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, c/ Escola Industrial 23, 08201 Sabadell, Barcelona, Spain.

[2]Museu de la Conca Dellà, c/ Museu 4, 25650, Isona i Conca Dellà, Lleida, Spain.

[3]Geoparc Mundial de la UNESCO Orígens, c/ Soldevila 3 baixos, 25620 Tremp, Spain.

[4]Institut de Recerca GEOMODELS, Departament de Dinàmica de la Terra i de l'Oceà, Facultat de Ciències de la Terra, Universitat de Barcelona, c/ Martí i Franquès s/n, 08024 Barcelona, Spain.

[5]Digivisión, Avinguda Onze de Setembre 1, Edificio Zenit, 4ª Planta A, 43202 Reus, Tarragona, Spain.

*presenting author, angel.galobart@icp.cat

***Keywords**: virtual reality, Pyrenees, fossil heritage*

The UNESCO Global Geopark Orígens, located in the south-eastern Pyrenees, holds a rich geological and paleontological heritage that includes a great number of continental outcrops, ranging from Permian to Paleogene, which explain the last 300 Myr of Earth's history. With the aim to disseminate this singular natural heritage and, at the same time, energize different regional socioeconomic sectors, the VIGEOCULT Project focus on creating outstanding virtual immersive experiences that help to explain parts of the evolution of life on our planet. From the geological point of view, sedimentological and paleontological evidence allow recreating a selection of landscapes (Permian, Triassic, Early and Late Cretaceous, and Eocene) which permit to bring back the timeline of the geological formation of the Pyrenees from modern days to the Permian. Within this frame, paleontological sites cover the Permian/Triassic boundary, the freshwater ecosystems of the Early Cretaceous, the fluviolitoral environments of the last dinosaurs, and the swampy ecotopes of the Eocene mammals. The project is currently focussing on the 3D modeling of four groups of dinosaurs based on the anatomical and paleobiological information of local paleofauna. These are the titanosaurian *Abditosaurus*, the lambeosaurine *Adynomosaurs*, the nodosaur *Struriosaurus*, and a generic dromaeosaur. These reconstructions fit each species in their natural habitat and will be made available to the Geopark visitors throughout virtual reality experiences offered in paleontological sites equipped with non-invasive and sustainable infrastructures distributed around the territory. These will be part of a sustainable "open-air museum" representing a novel way to disseminate the geopark heritage in natural spaces.

Acknowledgements: The VIGEOCULT Project (PLEC2021-00793), funded by MCIN/AEI/10.13039/501100011033 and the European Union NextGenerationEU/PRTR, is led by the

Geomodels research Group of Universitat de Barcelona and partnered by Origens UGGp, Institut Català de Paleontologia Miquel Crusafont, and the Digivisión enterprise. Research also supported by CERCA Programme/Generalitat de Catalunya.

FIRST REPORT OF *EUCLADOCEROS* (CERVIDAE, MAMMALIA) FROM THE LATE PLIOCENE SITE OF PODARI (MN 16a, SW ROMANIA)

J. Gamarra[1*], M.J. Salesa[1], G. Siliceo[1,2], A. Popescu[3], V.A. Codrea[4,5,6,7]

[1]Departamento de Paleobiología, Museo Nacional de Ciencias Naturales-CSIC, C/ José Gutiérrez Abascal 2, 28006 Madrid, Spain.

[2]Faculty of Natural Science, Department of Geology and Paleontology, Comenius University, Mlynská dolina, Ilkovičova ulica č. 6, 842 15 Bratislava 4, Slovak Republic.

[3]Muzeul Olteniei Craiova, Str. Popa Sapcã nr. 8, Craiova, Romania.

[4]Laboratory of Paleotheriology and Quaternary Geology, STAR Institute, Babeș-Bolyai University, Kogalniceanu 1 Str., 400084 Cluj-Napoca, Romania.

[5]Țării Crișurilor Museum, Natural History Department, 1/A Armatei Române Str., RO-410087 Oradea, Romania.

[6]Natural Sciences Department, Mureș County Museum, 24 Horea Street, RO-540036, Târgu Mureș, Romania.

[7]Institute of Speleology 'Emil Racoviță', 13, Calea 13 Septembrie, RO-050711, Sector 5, Bucharest, Romania.

*presenting author, jesus.gamarra@mncn.csic.es

***Keywords**: Cervidae, Pliocene, Romania, Dacic Basin, anatomy*

The Early Villafranchian (MN16a, Late Pliocene, Romanian) fossil site of Podari (Dolj County, Oltenia District, Southwestern Romania) is well known for its microvertebrates, mostly fishes and micromammals, although unpublished material confirms the presence of megafauna in this site. One of these fossils is a complete femur of a large-sized cervid, which in this work is assigned to *Eucladoceros* sp. Thus, Podari constitutes the oldest fossil site in Romania with presence of this genus, and one of the oldest localities in the whole European record. The studied femur has been taxonomically identified based on several anatomical characters that distinguish *Eucladoceros* from the other Villafranchian large-sized deer, *Praemegaceros*: a deeper trochanteric fossa; a caudally prominent, robust, and broad lesser trochanter; and the absence of a small fossa on the medial condyle of the distal epiphysis. The different development of some of these structures would also implies the presence, in *Eucladoceros* and the extant genera *Axis* and *Cervus,* of larger attachment areas for some muscles of the thigh (mm. gemelli, m. obturatorius externus, and m. iliopsoas) than those of *Praemegaceros*, as well as differences in their line of action. In consequence, it is very probable that *Eucladoceros* had relatively more powerful and larger abductor and rotator muscles of the thigh than *Praemegaceros*, which poses interesting questions on the diversity of locomotor adaptations in Pliocene cervids, something very relevant to understand the evolution of landscapes and faunas during the Plio-Pleistocene transition.

Acknowledgements: This study is part of the research projects EVOFEL (reference PID2020-112642 GB-I00 funded by MCIN/AEI/10.13019/501100011033). M.J.S. is member of the Research

Groups CSIC 641538 (MNCN-CSIC) and FOCONTUR (FCPT-Dinópolis). A.P. and V.A.C. are thankful to their colleague Dr Valentin Paraschiv and Dr Cristina Fărcaș for their help.

STUDY OF METHODS OF APPLICATION OF GLASS MICROSPHERES FILLER ON PALEONTOLOGICAL MATERIAL

M. García[1*], C. Marqués[1], J. Ripoll[1], R. Liébana[1], F. Marcos-Fernández[2,3], F. Escaso[3], F. Ortega[3], J.M. Gasulla[3]

[1]Archaeology Department, Institut Valencià de Conservació, Restauració i Investigació, c/ Genaro Lahuerta Pintor 25, 46010 Valencia, Spain.

[2]Universidad Complutense de Madrid, C/ Greco s/n, 28049 Madrid, Spain.

[3]Grupo de Biología Evolutiva UNED, Avda. Esparta s/n, 28232 Las Rozas, Madrid, Spain.

*presenting author, marina96gc@gmail.com

***Keywords**: paleontology, filler, glass microspheres, restoration, cultural heritage*

Here, we present a comparison of the effectiveness of different methods for filling cracks in vertebrate fossil remains from the Mas de la Parreta Quarry (Lower Cretaceous; Morella, Castellón) by application of glass microspheres in 5% Paraloid® B72. The purpose of this comparison is to determine whether this filler is covering the entire crack or it only remains on the surface, thus not sufficiently reinforcing the joint. The filler was chosen for its characteristics, since it is a lightweight, reversible, malleable material, compatible with the fossils to be intervened, which offers resistance and reinforcement of the contact areas of the fragments adhered. To carry out this study, a total of seven clay samples from the same site were used to test the different methods of applying the filler. Clay was used to avoid the destruction of fossils because no fragments with cracks were preserved. The different methodologies used to apply the filler were: a syringe inside the incisions, two applications with a spatula on the surface of the sample (one with a more liquid stuffing and the other one denser), a dentist's probe inside the incision, and the direct use of dry microspheres inside the incision with a subsequent pouring of Paraloid® B72. The final results could be observed by the naked eye, although we also measured the depth, surface and hardness achieved by each method. Our findings revealed that the most effective method is that of dry microspheres plus Paraloid® B72 due to its filling capacity, penetration, and hardness.

Acknowledgments: We would like to thank IVCR+i, Grupo de Biología Evolutiva UNED, Concesión Minera Vega del Moll, and the Morella City Council for their collaboration.

POSTCRANIAL REMAINS OF A STYRACOSTERNAN ORNITHOPOD FROM THE LOWER CRETACEOUS OF CABRA DE MORA (PROVINCE OF TERUEL, SPAIN)

J. García-Cobeña[1*], F.J. Verdú[1], A. Cobos[1]

[1]Fundación Conjunto Paleontológico de Teruel-Dinópolis/Museo Aragonés de Paleontología, Avenida Sagunto, 44002 Teruel, Spain.

*presenting author, gcobena@fundaciondinopolis.org

***Keywords**: dinosaurs, systematics, Hauterivian, Barremian, Maestrazgo Basin*

Fossils of non-hadrosaurid styracosternans are common in the Lower Cretaceous sediments of the Maestrazgo Basin (eastern Iberia, Spain). In particular, the upper Hauterivian–lower Barremian El Castellar Formation in the Peñagolosa subbasin (southwestern sector) has yielded a considerable number of osteological remains of these dinosaurs. Among other findings, the fossils referable to *Iguanodon galvensis* found in the CM-8 site (Cabra de Mora, Province of Teruel, Spain) stand out. Here, we present new postcranial elements found ex situ in this locality. The material consists of fragments of cervical and dorsal vertebrae, and some partial appendicular bones such as both proximal and distal epiphyses of a radius, and the distal end of a femur. The highly opisthocoelous cervical centra indicate that these fossils belong to a styracosternan. The taller than long dorsal centrum resembles those of Early Cretaceous European styracosternans such as *Magnamanus, Hypselospinus, Barilium, Iguanodon,* and *Brighstoneus*, unlike *Morelladon* and *Mantellisaurus.* Although the proximal end of the radius is apparently rounded, it appears to be more subtriangular due to the strong notch for the articulation with the ulna. The distal end is dorsoventrally expanded and has a convex and rugose articular surface, similar to the above-mentioned taxa (except for the unknown radius of *Morelladon* and *Brighstoneus*). However, the degree of preservation of the appendicular fossils (e.g., that of the distal end of the femur) does not allow us to refer them to a lower rank than Styracosterna indet., pending confirmation on whether or not these remains belong to *Iguanodon* cf. *galvensis*.

Acknowledgements: This work was funded by Research Group E04_20R FOCONTUR financed by Departamento de Ciencia, Universidad y Sociedad del Conocimiento (Gobierno de Aragón), the Instituto Aragonés de Fomento, and Unidad de Paleontología de Teruel (Ministerio de Ciencia e Innovación, Gobierno de España).

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

ANALYSIS OF CRANIAL BIOMECHANICS USING COMPUTATIONAL METHODS ON A CROCODILE AS A CASE STUDY

L. Garcia-Escolà[1*], J. Fortuny[1], J. Marcé-Nogué[1,2]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2] Department of Mechanical Engineering, Universitat Rovira i Virgili, Campus Sescelades, building E4, Avinguda Països Catalans 26, 43007 Tarragona, Spain.

*presenting author, laia.garcia@icp.cat

***Keywords**: cranial sutures, finite element analysis, biomechanics,* Crocodylus niloticus*, functional morphology*

The involvement of cranial sutures in mitigating and dissipating stresses through them is essential to understand their role in skull biomechanics and to develop highly accurate prediction models. Of particular interest, it is unclear how the ontogeny of the specimens can modify suture morphology and function trough time and how different types of sutures influence frequent cranial movements such as chewing or direct biting. However, studies of extinct taxa that want to include sutures must face the lack of information about the fibrous joints present within cranial sutures, as it is not preserved in the fossil record. Sutures are studied in detail in this work using contact elements under finite element analysis models. This methodology can improve cranial sutures modelization, resulting in proper and highly accurate results. Herein, a dry skull of *Crocodylus niloticus* (MZB 2003-1423), with each bone digitally segmented, has been tested under different load configurations and contacts simulating different ontogenetic stages. Our results suggest that the lack of sutures or any cranial kinesis cause a reduction on the stress distribution over the skull (with a concentration of the stress in some areas), whereas sutures and cranial kinesis help the skull to relieve stress and prevent particular bones to endure high stress values. We explore how, under the same analyzed feeding behaviors and identical variables, the results obtained in our models vary when cranial sutures are considered under different scenarios and its implications when fossil taxa are analyzed.

Acknowledgements: This research has received support through the project PID2020-117118GB-I00 funded by MCIN/AEI/10.13039/501100011033, the consolidated research group 2021 SGR 01184, and the CERCA Programme/Generalitat de Catalunya. J.F. acknowledges RYC2021-032857-I grant funded by MCIN/AEI/10.13039/501100011033 and by "European Union NextGenerationEU/PRTR".

ON THE USE OF PEPTIDE MASS FINGERPRINTING FOR TAXONOMIC IDENTIFICATION OF FOSSIL BONE FRAGMENTS: PROGRESS AND CHALLENGES

A. García-Vázquez[1], A. Grandal-d'Anglade[2*]

[1]ArchaeoScience Division, Research Institute of the University of Bucharest (ICUB), University of Bucharest, 90-92 Sos. Panduri, 5th District, 50663, Bucharest, Romania.

[2]Instituto Universitario de Xeoloxía, Universidade da Coruña, ESCI, Campus de Elviña, 15008 A Coruña, Spain.

*presenting author, aurora.grandal@udc.es

***Keywords**: bone collagen, molecular palaeontology, taxonomy, ZooMS, Carnivora*

The taxonomic identification of bone remains by means of their collagen peptide fingerprint, or ZooMS (Zooarchaeology by Peptide Mass fingerprinting), is proving to be a powerful tool in palaeontology. In many Pleistocene sites, the taxonomic identification of faunal remains is not always easy due to the high fragmentation that bones usually present. Peptide mass fingerprinting is a technique for protein identification that does not require protein sequencing and is based on the differences in mass/charge of the peptides obtained from an enzymatic digestion (usually trypsin) of the protein, collagen in this case. The application of ZooMS to identify ancient remains began in the 21st century and is still under development. Given the highly conserved amino acid sequence of collagen, most of the peptides obtained by tryptic digestion are identical across taxa and only a few of them are useful in taxonomy. Advances in the development of this technique allow to identify bone fragments in many cases down to genus rank. However, in certain taxa it is not possible so far to differentiate genera of the same family. The main current challenges are: (1) recover well-preserved collagen; (2) the correct definition of peptide markers for each taxon; (3) the availability of a large database of peptide markers including a large number of extant and extinct species. In this contribution we will present as an example the case of some mammals of the order Carnivora (cases of Quaternary ursids, felids, and pinnipeds), highlighting the current problems for their identification by ZooMS.

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

RECONSTRUCTION OF THE CAUDAL AND PELVIC MUSCULATURE OFTHE MACRONARIAN SAUROPOD *CAMARASAURUS GRANDIS*

E. Garcia-Zamora[1*], A. González[1], D. Vidal[2,3]

[1]Departamento de Geodinámica, Estratigrafía y Paleontología, Facultad de Ciencias Geológicas, Universidad Complutense de Madrid, C/ José Antonio Novais 12, 28040 Madrid,Spain.

[2]Department of Organismal Biology, University of Chicago, 1027 E 57th St, Chicago, Illinois 60637, USA.

[3]Grupo de Biología Evolutiva, Facultad de Ciencias, Universidad Nacional de Educación a Distancia (UNED), Avda. Esparta s/n, 28232 Las Rozas de Madrid, Madrid, Spain.

*presenting author, Edugar11@ucm.es

***Keywords**: muscles, 3D reconstructions, tail,* Camarasaurus grandis, *CT scan*

Reconstructions of the musculoskeletal system of dinosaurs have been inferred from the anatomical comparison of homologous structures in closely related or osteologically similar amniotes. Due to musculature leaving marks on the surface of the bones (osteological correlates), caudal muscles can be reconstructed at a level II inference (the inference of a character that leaves a signature on the skeleton of only one of the extant sister groups). The advance of techniques and software has enabled more accurate 3D digital reconstructions of dinosaur bones and their soft tissues, improving the knowledge of the musculoskeletal system of extinct animals. Despite being one of the most abundant and well-studied sauropod dinosaurs, the pelvic and caudal musculature of *Camarasaurus* has never been reconstructed and compared with that of other sauropods. Here we present the first digital reconstruction of the holotype tail and hindlimbs of *Camarasaurus grandis.* The musculature was reconstructed after gathering anatomical information from the digital dissection of CT scans of various extant species of crocodylians (e.g., *Crocodylus niloticus*) and squamates (e.g., *Varanus komodoensis*). This allowed for narrower boundaries in estimating muscle volume, which were sculpted by generating 3D surfaces after interpreting the osteological correlates. These reconstructions were later used for estimating the relative position, mass, and volume of the caudal muscles in *C. grandis*. We finally compared them with those of other macronarian sauropods, such as *Tastavinsaurus sanzi* or *Giraffatitan brancai*, showing that *Camarasaurus* had relatively larger caudal epaxial and hypaxial muscles, but smaller than those of sauropods outside Macronaria.

Acknowledgements: To Yale Peabody Museum, especially Marylin Fox, for access to digitizing the specimens.

A NEW STYRACOSTERNAN-BEARING ASSEMBLAGE FROM THE ARCILLAS DE MORELLA FORMATION IN MORELLA (SPAIN)

J.M. Gasulla[1], F. Escaso[1], E. Malafaia[2,1], P. Mocho[2,1], I. Narváez[1], F. Ortega[1*]

[1]Grupo de Biología Evolutiva, Universidad Nacional de Educación a Distancia (UNED), Avda. Esparta s/n, 28232 Las Rozas de Madrid, Madrid, Spain.

[2]Instituto Dom Luiz, Faculdade de Ciências da Universidade de Lisboa, Campo Grande Edifício C1 Piso 1, 1749-016 Lisboa, Portugal.

*presenting author, fortega@ccia.uned.es

***Keywords**: Dinosauria, Styracosterna, Allosauroidea, Early Cretaceous, Iberian Peninsula*

For nearly two decades, the Mas de la Parreta (CMP) quarry in Morella (northeastern Spain) has yielded one of the most abundant collections of continental vertebrate fossils from the upper Barremian of Europe. Eighteen fossil assemblages were reported from this quarry, all characterized by variably complete styracosternan ornithopod remains. CMP-MS-07, located in the Mas de Sabaté area within the CMP has yielded remains of crocodyliforms and dinosaurs (ornithopods and theropods). The crocodyliform record consists of a partial tooth, a caudal vertebra, and osteoderms all of them sharing features with the members of Neosuchia. Theropods are represented by teeth tentatively referred to allosauroids. This is relevant in that most theropod remains in the Mas de Sabaté area belong to spinosaurids, while allosauroids are rare. Ornithopods are represented by cranial, axial, and appendicular elements that can be confidently referred to styracosternan iguanodontians. These materials include maxillary and dentary teeth, a partial jugal, remains of dorsal neural arches, fragmentary cervical and dorsal ribs, a caudal vertebra, haemal arches, a partial scapula, manual and pedal bones, and ossified tendons. The fauna represented at CMP-MS-07 corresponds to that known from other upper Barremian sites in the rest of the Arcillas de Morella Formation, confirming the frequent occurrence of styracosternans, but in this case, remarkably associated with allosauroid theropods.

Acknowledgements: Paleontological control at Mas de la Parreta Quarry (CMP) and fieldwork on CMP-MS-07 site were funded by the Arcillas Vega del Moll S.A. company.

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

THE FOSSIL RECORD OF THE BARREMIAN LITHOGRAPHIC LIMESTONES OF THE MONTSEC RANGE (LLEIDA): DIVERSITY AND ABUNDANCE

A. Gil-Delgado[1,2*], X. Delclòs[3,4], A. Sellés[5,2], À. Galobart[5,2], J. Párraga[6], O. Oms[1]

[1]Unitat d'Estratigrafia (Department de Geologia), Universitat Autònoma de Barcelona, Facultat de Ciències edifice Cs, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Museu de La Conca Dellà, c/ Museu 4, 25650 Isona i Conca Dellà, Lleida, Spain.

[3]Departament de Dinàmica de la Terra i de l'Oceà, Facultat de Ciències de la Terra, Universitat de Barcelona, c/ Martí i Franquès s/n, 08028 Barcelona, Spain.

[4]Institut de Recerca de la Biodiversitat (IRBio), Universitat de Barcelona, 08028 Barcelona, Spain.

[5]Institut Català de Paleontologia Miquel Crusafont, c/ Escola Industrial 23, 08201 Sabadell, Barcelona, Spain.

[6]Muséum d'Histoire Naturelle du Havre, Place du Vieux Marché, 76600, Le Havre, France.

*presenting author, alejandro.gil@uab.cat

***Keywords**: Konservat-Lagerstätte, Early Cretaceous, limestones, biodiversity, scattered record*

The southern side of the Montsec Range (southern Pyrenees) exposes some of the most significant Barremian Konservat-Lagerstätte localities in Europe. Since the discovery of the lacustrine lithographic limestones of La Pedrera de Meià site at the end of the 19th century, together with seven nearby synchronic outcrops, these localities have been the subject of significant paleontological interest, leading to a total of 225 scientific publications. Such research intensity has resulted in 113 species described that outline a complex trophic web. These include the flowering plant *Montsechia vidalii*, the oldest eusocial insect (*Meiatermes bertrani*), fishes such as *Ocloedus subdiscus* or the fresh-water shark *Lissodus palustris,* frogs (*Eodiscoglossus santonjae*), reptiles (*Montsecosuchus depereti*), and birds (*Noguerornis gonzalezi*). After analyzing 4388 specimens scattered in several European institutions, we observed that the mere counting of types did not provide a reliable representation of the ecosystem: 66% of the described types are insects, fishes represent 12%, and plants only 8%, other taxa being only minor components of the ecosystem. A different picture emerges when relative abundance is established considering the whole record. Aquatic plants represent 45%, fishes 32%, and insects only 13% of the taxa that lived in the lacustrine ecosystem. However, these results seem to be affected either by sampling or taphonomic biases, which lead to the over- or underrepresentation of certain groups. This prevents an accurate reconstruction of the ecological relationships within this lacustrine foodweb. Further research is needed to achieve complete understanding of these unique Barremian ecosystems.

Acknowledgements: This study has been supported by MCIN/AEI project PGC2018-101575-B-I00, CERCA Programme/Generalitat de Catalunya, AGAUR grant 2020-FI-SDUR-00360, research group 2021-SGR-00127, VIGEOCULT (PLEC2021-00793) funded by MCIN/AEI/10.13039/501100011033

and by the European Union NextGenerationEU/ PRTR. Special thanks to the municipalities of Vilanova the Meià and Camarassa, and Orígens UNESCO Global Geopark.

NECK MYOLOGY AND FEEDING STYLE OF *AFROVENATOR ABAKENSIS* (THEROPODA: MEGALOSAURIDAE)

A. González[1*], D. Vidal[2,3], P. Sereno[2]

[1]Departamento de Geodinámica, Estratigrafía y Paleontología, Facultad de Ciencias Geológicas, Universidad Complutense de Madrid, C/ José Antonio Novais 12, 28040 Madrid, España.

[2]Department of Organismal Biology, University of Chicago, 1027 E 57th St, Chicago, Illinois 60637, USA.

[3]Grupo de Biología Evolutiva, Facultad de Ciencias, Universidad Nacional de Educación a Distancia (UNED), Avda. Esparta s/n, 28232 Las Rozas de Madrid, Madrid, España.

*presenting author, ariadnaglezperez@gmail.com

***Keywords**: cervical, Jurassic, Niger, biomechanics, photogrammetry*

Feeding strategies in megalosaurid theropods are less known than in other clades due to their fragmentary fossil record. *Afrovenator abakensis* from the Tiouraren Formation of Niger is a prime taxon to evaluate this, being one of the most complete megalosaurids known. The holotype of *Afrovenator* was digitized via photogrammetry, obtaining virtual models of the seven preserved cervical vertebrae. We reconstructed the cervical series along with the missing vertebrae. With this model, we performed a range of motion (ROM) analysis and reconstructed its myology to interpret its feeding style. Like most theropods, *Afrovenator* had a S-shaped neck in neutral pose, providing room for attachment of the head dorsiflexor m. transversospinalis capitis at the tips of anterior and middle neural spines, shorter than those of *Allosaurus fragilis*. Anteroposteriorly elongated pre- and postzygapophyseal articular facets imply a greater dorsoventral ROM than that of *A. fragilis,* more similar to that of Spinosauridae. Epipophyses were more developed than those of *A. fragilis,* suggesting larger muscles for head laterodosiflexion (m. complexus) and neck laterodorsiflexion (m. longus colli dorsalis). Ventral midline keels are present in posterior cervical and anterior dorsal vertebrae, therefore having larger attachment areas for the neck ventriflexor m. longus colli ventralis, although not as large as in Spinosauridae. Overall*, A. abakensis* would have been capable of stronger and more ample dorsolateroflexive neck movements than *A. fragilis* but weaker than Spinosauridae, and greater muscle mass and ventriflexive movements than *A. fragilis* yet weaker than Spinosauridae.

Acknowledgements: We thank MNBH for specimen curation and access for digitalization, especially Moustapha Amadou.

3D TOPOGRAPHY ON THE CONODONT *PALMATOLEPIS* GENUS FROM THE UPPER DEVONIAN

C. Goudemez[1*], A. Assemat[1], G.Thiery[2], C. Girard[1]

[1]Institut des Sciences de l'Évolution de Montpellier, Université de Montpellier, Place Eugène Bataillon, 34095 Montpellier Cedex 5, France.

[2]Center for Evolutionary Origins of Human Behavior EHUB, Kyoto University Museum, 606-8501 Yoshida-honmachi, Sakyo-ku, Kyoto, Japan.

*presenting author, cicigoude@gmail.com

***Keywords**: 3D topography, conodonts, occlusion, functional morphology, diet*

Conodont elements are the components of the feeding apparatus of extinct marine organisms named conodonts. The shape of these elements has be proposed to be related to the type of ingested food. To test if morphological changes in tooth-like conodont elements could be associated to changes in resources exploitation, morphometric analyses have previously been performed on the 2D outline of P1 elements belonging to the conodont genus *Palmatolepis* from the Upper Devonian (381–360 Ma) of the Montagne Noire (France). These analyses evidenced a general decrease in breadth of P1 elements, which was interpreted as a long-term response to a change in available food resources and/or a possible change in the trophic position of this conodont. In contrast analyses of calcium stable isotopes ratio have shown that no change in $\delta^{44/42}$Ca occurred through time, suggesting that *Palmatolepis* did not change its trophic position despite the mentioned change in element morphology. In this work, we complement earlier studies with a preliminary analysis of the 3D topography of P1 elements of this genus for the same period and section in order to further investigate its diet. The 3D topological results are congruent with the 2D analyses-with an evolution towards narrower specimens over time. In addition to this long-term trend, analyses of some parts of P1 elements, thought to be involved in the direction of masticatory motion, show an evolution of topographic indices over time, suggesting a dietary change within the same trophic position and even within the same species.

Acknowledgements: With the support of the LabEx CeMEB, an ANR "Investissements d'avenir" program (ANR-10-LABX-04-01).

TAPHONOMIC INSIGHTS ON A VANISHED TROPICAL ECOSYSTEM: THE LATEST PLIOCENE *TAPIRUS* SKELETONS FROM CAMP DELS NINOTS MAAR (NE IBERIA)

F. Grandi[1,2*], J. Madurell-Malapeira[3,4], L. Pandolfi[4], L. Sorbelli[5], I. Càceres[1,2], G. Campeny[1,2], B. Gomez de Soler[1,2]

[1]Institut Català de Paleoecologia Humana i Evolució Social (IPHES-CERCA), Zona Educacional 4 - Campus Sescelades URV (Edifici W3), 43007 Tarragona, Spain.

[2]Universitat Rovira i Virgili (URV), Dpt. Història i Història de l'Art. Av. de Catalunya 35, 43002 Tarragona, Spain.

[3]Dipartimento di Scienze della Terra, Università di Firenze, Via Gino Capponi 3R, 50121, Firenze, Italy.

[4]Dipartimento di Scienze, Università della Basilicata, Viale dell'Ateneo Lucano 10, 85100, Potenza, Italy.

[5]Institut Català de Paleontologia Miquel Crusafont, Universitat Autónoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, fgrandi@iphes.cat

***Keywords**: Pliocene, ungulates, taphonomy, maar*

Throughout 20 years of fieldwork at the Pliocene deposit of Camp dels Ninots (CN; NE Iberia) an outstanding collection of vegetal, micro- and macrovertebrate remains has been unearthed in an extraordinary state of preservation. The recorded taphocenosis is roughly synchronous with the progressive intensification of glacial dynamics in the Northern Hemisphere, the gradual increase of open landscapes, and the last environments with subtropical affinities. The CN stratigraphical section is related to an ancient paleolake located within a low relief volcanic crater (maar) and correlates with the Late Pliocene (ca. 3.3–3.1 Ma). The uncovered remains include up to 25 individuals of macrovertebrates in anatomical collection, six of which are attributed to the European tapir *Tapirus arvernensis*. The unique preservation of these six individuals enabled the first study of the total number of bones of this species. Within the studied assemblage, there are individuals of different ages represented, including the presence of an infantile. Furthermore, the completeness of these specimens permitted the correlation between teeth replacement and epiphyseal bone fusion in different skeletal elements. The putative circumstances that permitted or favored the CN large mammal accumulations are still up to debate and an extensive taphonomic analysis is ongoing with the purpose of clarifying similarities and differences in the preservation patterns of these individuals. The results will include the percentage of skeletal completeness of the individuals, the correlation with teeth eruption and epiphyseal bone fusion. and the description of postdepositional processes, related to the volcanic context, that affected the carcasses.

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

Acknowledgements: Funding by Generalitat de Catalunya (Culture Department project CLT009/22/00043, AGAUR SGR 01238) and CERCA Programme (F.G., L.S., I.C., G.C. and B.G.S.); MICINN project PID2021-123092NB-C21); Spanish Ministry of Science and Innovation ('María de Maeztu' program for Units of Excellence, CEX2019-000945-M, to IPHES-CERCA); AGAUR (2022FI_00383 to F.G.) and Mineco project PID2020-116908GB-I00 (L.S.)

FAR FROM HOME: THE RECORD OF THE FLYING SQUIRREL *MIOPETAURISTA* (SCIURIDAE, RODENTIA) IN NORTH AMERICA

M. Grau-Camats[1*], I. Casanovas-Vilar[1], J.X. Samuels[2]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]East Tennessee State University, Department of Geosciences, Don Sundquist Center of Excellence in Paleontology, PO Box 70357, Johnson City, TN 37614, USA.

*presenting author, montsegraucamats@gmail.com

***Keywords**: Pteromyini, Sciurinae, paleobiogeography, Pliocene, Tennessee*

Miopetaurista (Rodentia, Sciuridae, Sciurinae, Pteromyini) is one of the most successful genera of extinct flying squirrels. In Eurasia, up to ten different species are known ranging from the early Miocene to the Pliocene, and from Portugal to China. *Miopetaurista* is also the best known extinct flying squirrel. Exceptionally complete material has shown that its postcranial skeleton was virtually identical to that of the extant giant flying squirrel (*Petaurista*), placing it phylogenetically as sister to this taxon. The genus is also known from North America, being exclusively restricted to Florida (USA). Only two specimens are known there: one from the early Pleistocene Haile 15A locality and one from the early Pliocene Palmetto Fauna. Both specimens have been assigned to an endemic American species, *Miopetaurista webbi*. Here we report another specimen (ETMNH 14850), an isolated lower third molar from the early Pliocene (latest Hemphillian or early Blancan) Gray Fossil Site in Tennessee (USA), which expands the known range of this genus. Its size matches that of *M. webbi* but shows a somewhat simpler trigonid basin, with lower and less developed transverse ridges. It is also similar in size to *Miopetaurista tobieni*, the only known Pliocene European species, but differs in its better-developed anterosinusid and simpler trigonid basin. The dispersal of *Miopetaurista* from Eurasia into North America is framed within a major late Neogene faunal dispersal that included other rodents (*Castor, Eutamias*), talpids (*Neurotrichus*, *Parascalops*), soricids (*Paenelimnoecus*, *Crusafontina*), the meline *Arctomeles*, and an ailurine (*Pristinailurus*), which also occur at the Gray Fossil Site.

Acknowledgements: Funded by R+D+I project PID2020-117289GB-I00 (MCIN/AEI/10.13039/501100011033/), CERCA Programme/Generalitat de Catalunya, and AGAUR (2001 SGR 00620). Collection of specimens at the Gray Fossil Site in Tennessee was partially funded through NSF Grant #0958985.

RECONSTRUCTING FEEDING BEHAVIOUR AND DIET IN DEVONIAN CTENACANTH CHONDRICHTHYANS USING TOOTH WEAR ANALYSIS AND FINITE ELEMENT ANALYSIS

M. Greif[1*], I. Calandra[2], S. Lautenschlager[3], T. Kaiser[4], C. Klug[1]

[1]Palaeontological Institute and Museum, Universität Zürich, Karl-Schmid-Strasse 4, 8006, Zürich, Switzerland.

[2]Imaging Platform at LEIZA (IMPALA), MONREPOS Archaeological Research Centre, Leibniz-Zentrum für Archäologie, 56567 Neuwied, Germany.

[3]School of Geography, Earth and Environmental Sciences, University of Birmingham, Edgbaston, Birmingham, UK.

[4]Centre for Taxonomy and Morphology, Leibniz Institute for the Analysis of Biodiversity Change (LIB), Martin-Luther-King-Platz 3, 20146 Hamburg, Germany.

*presenting author, merle.greif@pim.uzh.ch

***Keywords**: food web, tooth wear, finite element analysis, palaeoecology, Morocco*

Many modern sharks are known as dietary opportunists. In fossil chondrichthyans, however, there is little direct evidence for their diet such as digestive tract contents (cololites and gastrolites), as opposed to indirect evidence from coprolites, tooth marks, stable isotopes or tooth wear. Dental microwear texture analysis (DMTA) is frequently used for the reconstruction of diet and feeding behaviour in terrestrial mammals and recently also in marine mammals, reptiles, and dinosaurs. In chondrichthyans, dental wear analysis has only been applied to modern species and Cenozoic fossils. Due to the high rate of tooth replacement in many modern chondrichthyans, their teeth are usually hardly worn and do not record a distinct dietary signal. In some Devonian chondrichthyans, the tooth replacement rate was very slow and significantly more food-to-tooth contact occurred. This project focuses on teeth of the large chondrichthyan genus *Ctenacanthus* from Late Devonian (Famennian) layers of the Anti-Atlas, Morocco. *Ctenacanthus* is the largest chondrichthyan genus of the Devonian worldwide and therefore hypothetically an apex predator. Using DMTA combined with finite element analysis, as well as synecological and anatomical data, we aim to reconstruct feeding behaviour and diet of this Devonian predator. First examinations of the tooth wear indicate two main directions of scratches. In the apical part of the wear facet, the scratches are mainly oriented vertically, while horizontal scratches dominate in the more basal areas. This pattern might correspond to a feeding behaviour combining biting and a head shaking movement to reduce the size of the prey.

Acknowledgements: Mohamed Mezane (La Khraouia) found most of the material. We thank the Swiss National Science Foundation (project nr. 200020_184894) for the support.

A REFINED STRATIGRAPHIC FRAMEWORK FOR MID- TO LATE PERMIAN DEPOSITS IN THE NORTH OF THE MAIN KAROO BASIN OF SOUTH AFRICA BASED ON DETRITAL ZIRCON GEOCHRONOLOGY AND BIOSTRATIGRAPHY

D.P. Groenewald[1,2*]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193, Cerdanyola del Vallès, Barcelona, Spain.

[2]Evolutionary Studies Institute, University of the Witwatersrand, 2050, Johannesburg, South Africa.

*presenting author, david.groenewald@icp.cat

***Keywords**: Karoo Supergroup, Ecca Group, Beaufort Group, U-Pb dating, Balfour Formation*

The main Karoo Basin in South Africa arguably preserves the best record of life on Earth from the middle Permian to the Early Jurassic. Because few basin-wide lithological markers exist within the fluvio-lacustrine Permian–Triassic Beaufort Group of the Karoo Supergroup, but tetrapod fossils are abundant, correlation of rock units between the geographically distant northern (distal) and southern (proximal) areas of the main Karoo Basin has largely relied on biostratigraphy. However, the northern area of the basin has received less research effort than the south, and existing correlations can be improved considering recent stratigraphic, taxonomic, and biostratigraphic advances. Here I present a refined stratigraphic framework for the uppermost Ecca and lowermost Beaufort groups in the north of the main Karoo Basin based on geological, geochronological (detrital zircon), and palaeontological investigations that were undertaken along the mapped Ecca-Beaufort contact in the Free State and KwaZulu-Natal provinces. Lithological work demonstrates the presence of the Waterford Formation of the uppermost Ecca Group in this part of the basin. Petrography and detrital zircon geochronology show that similar source regions around the periphery of the basin were active during the deposition of the Waterford and overlying Balfour formations and that the two can be distinguished using the distribution of ages derived from detrital zircons. Combining biostratigraphy with the ages obtained from detrital zircon geochronology enabled refined correlation of mid- to upper Permian strata from the north of the basin with the rest of the main Karoo Basin.

Acknowledgements: Support from the National Research Foundation (NRF), GENUS: DSI-NRF Centre of Excellence in Palaeosciences, Palaeontological Scientific Trust (PAST), Geological Society of South Africa's REI Fund, CERCA Programme/Generalitat de Catalunya, Consolidated Research Group 2021 SGR 01184, and the European Union's Horizon Europe Marie Skłodowska-Curie actions (GA: 101060666) are acknowledged.

TESTING HYPOTHESES ON HETEROSTRACAN FEEDING

M. Grohganz[1*], A. Ballell[1], H. Ferron[1,2], Z. Johanson[3], E. Rayfield[1], P. Donoghue[1]

[1]Palaeobiology Research Group, School of Earth Sciences, University of Bristol, Life Sciences Building, Tyndall Avenue, Bristol BS8 1TQ, UK.

[2]Cavanilles Institute for Biodiversity and Evolutionary Biology, University of Valencia, Calle Catedrático José Beltrán Martínez 2, Paterna 46980, Spain.

[3]Department of Earth Sciences, Natural History Museum, Cromwell Road, London SW7 5BD, UK.

*presenting author, madleen.grohganz@bristol.ac.uk

***Keywords**: Heterostracans, feeding hypotheses, computational fluid dynamics, finite element analysis, growth dynamics*

Teeth constitute a key innovation underpinning the evolutionary and ecological development of jawed vertebrates. As the earliest jawed vertebrates already possess teeth, we must study tooth-like structures in stem gnathostomes to learn more about the evolutionary origin of teeth. Heterostracans are a group of extinct, jawless vertebrates that possess tooth-like structures covered with denticles. These oral plates have been hypothesised to perform a diversity of functions, from filter-feeding to predation. We integrate evidence from different computational biomechanics methods and morphology to test feeding hypotheses. To test if the anteriorly-facing denticles on the oral plates are an adaption to suspension feeding, we performed computational fluid dynamics analyses. Independent of denticle orientation, similar velocity and turbulence patterns develop in the spaces between the denticles and on their upper surface, which allows us to reject this hypothesis. Our internal growth dynamics analysis indicates a similar histology to the dermal skeleton and does not show patterns of replacement in the denticles, which we expect if they were homologous to teeth. We also performed finite element analysis (FEA) and bone density calculations to further test the mechanical function hypothesis. FEA stresses in the shaft of the oral plate are negatively correlated with bone density: the smaller the compressive stress, the higher the bone density. The anterior part of the oral plate shows the highest bone density, indicating a specific adaption of the microstructure to a mechanical function. We conclude that the heterostracan oral pates most likely performed a mechanical function, possibly deposit feeding.

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

A PRELIMINARY APPROACH TOWARD THE FEEDING STRATEGY OF THE SPANISH CENOMANIAN BOTHREMYDID TURTLE *ALGORACHELUS PEREGRINA*

A. Guerrero[1*], A. Pérez-García[1]

[1]Grupo de Biología Evolutiva, Facultad de Ciencias, UNED, Avda. de Esparta s/n, 28232 Las Rozas, Madrid, Spain.

*presenting author, guerbach@gmail.com

***Keywords**: Pleurodira, Late Cretaceous, Algora, 3D reconstruction, musculature*

The bothremydid turtle *Algorachelus peregrina* corresponds to the oldest representative of the crown group Pleurodira known in Europe. The type locality of this species (i.e., the Cenomanian site of Algora, in central Spain), has provided numerous complete and well-preserved shells that allowed us to recognize it as the best-represented bothremydid in the European record. Studies relating to its intraspecific shell variability and the disarticulation patterns of this element have been performed. However, relevant biological aspects of this turtle species, including those related to its dietary preferences and feeding mechanisms, are still unknown. In this context, the study of a partial skull corresponding to one of its paratypes, as well as some other unpublished cranial remains, allowed us to obtain a first insight into the feeding strategy of *A. peregrina*. More specifically, we made a 3D reconstruction of the muscles of the aforementioned paratype, of a relatively complete skull and of an isolated but almost complete lower jaw using digital photogrammetry, and we estimated the muscle mass and bite force of the species. This allowed us to obtain virtual meshes suitable for generating 3D reconstructions. We obtained a high muscle mass index with high values in masticatory force. These results agree with the data reported in extant turtles with a durophagous diet.

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

THE PELVIC GIRDLE OF THE IBERIAN CENOMANIAN TURTLE *ALGORACHELUS PEREGRINA* (PLEURODIRA, BOTHREMYDIDAE)

M. Gutiérrez-Gálvez[1*], A. Pérez-García[1]

[1]Grupo de Biología Evolutiva, Facultad de Ciencias, UNED, Avda. Esparta s/n, 28232 Las Rozas, Madrid, España.

*presenting author, maria.gutierrezgalvez@gmail.com

***Keywords**: Testudines, Podocnemidoidea, Spanish record, Late Cretaceous, pelvis anatomy*

The Cenomanian (earliest Late Cretaceous) *Algorachelus peregrina* is not only the oldest bothremydid turtle (Pleurodira, Podocnemidoidea) known for the European record, but it also corresponds to that represented by the largest number of specimens in the continent. Most of them come from its type locality: the uppermost middle to lowermost upper Cenomanian fossil site of Algora (Castilian Branch of the Iberian Ranges, Guadalajara Province, Castilla-La Mancha, central Spain). Partial and complete pelvic girdles of several dozen specimens have been found there, thanks to excavation campaigns carried out in recent years. In addition to isolated disarticulated or partially articulated elements of this anatomical region, numerous well-preserved pelvic bones have been found in its original position in complete and relatively complete shells. This is favoured by the firm suture of the pelvic girdle of pleurodires with both the carapace and the plastron. The abundance of carapace and plastral remains, corresponding to the sutured areas with the pelvis, allows studying the scar of the ilium in the visceral view of the dorsal shell and the scars of the ischium and pubis in the visceral view of the ventral shell. Considering this relatively extensive source of information, the detailed description of the pelvic girdle of *A. peregrina* is provided here. This will provide new data on the knowledge of the paleobiology of this animal, currently under study.

Acknowledgements: This research has been funded by the Ministerio de Ciencia e Innovación (PID2019-111488RB-I00) and the Viceconsejería de Cultura of the Consejería de Educación, Cultura y Deportes of Castilla-La Mancha (SBPLY/21/180801/000039 and SBPLY/22/180801/000020).

NEW INSIGHTS INTO THE AGE OF THE FOSSIL VERTEBRATE SITE FROM STĂUCENI (MOLDAVIAN PLATFORM, NORTHEASTERN ROMANIA)

B.-S. Haiduc[1*], B.-A. Torcărescu[2,3], Ş. Vasile[1,4], V.D. Crespo[5,6], D. Ţabără[7], S. Loghin[7]

[1]Lythos Research Center, University of Bucharest, 1 Nicolae Bălcescu Avenue, 010041, Bucharest, Romania.

[2]Doctoral School of Geology, University of Bucharest, 6 Traian Vuia Street, 020956, Bucharest, Romania.

[3]Geological Institute of Romania, 1 Caransebeş Street, 012271, Bucharest, Romania.

[4]'Emil Racoviță' Institute of Speleology, Romanian Academy, 13 Calea 13 Septembrie, 050711, Bucharest, Romania.

[5]Departamento de Ciências da Terra, GeoBioTec, Universidade Nova de Lisboa, Quinta da Torre, 2829-516, Caparica, Portugal.

[6]Museu da Lourinhã, 9 Rua João Luis de Moura, 2530-158, Lourinhã, Portugal.

[7]Department of Geology, 'Alexandru Ioan Cuza' University of Iași, 20B Carol I Avenue, 700505, Iași, Romania.

*presenting author, haiduc.bogdan91@gmail.com

***Keywords**: Plio-Pleistocene, small mammals, reworked fossils*

Extensive Sarmatian (Middle Miocene) marine deposits occur on the Moldavian Platform, in Eastern Romania. Several vertebrate fossil sites have been described from this area in the past century. Recently, a new fossil site was reported at the Stăuceni open pit, in Botoşani County. It has yielded numerous marine vertebrate fossils since 2017, which support a Volhynian (late Middle Miocene) age. However, further excavations led to the discovery of terrestrial vertebrate remains belonging to terrestrial ungulates, including indeterminate equids and bovids, in the same gravel bed from the top of the analyzed succession where the marine vertebrates were found. Additional investigations have been carried out to get a better understanding of the depositional setting and the age of the fossiliferous deposits. Screen-washing of silty sandstones, which overlie the macrofaunal fossil beds, has allowed the recovery of a few small mammal remains, tentatively assigned to the arvicolid *Borsodia* sp. and to the sciurid *Spermophilus nogaici*, which indicate a Late Pliocene–Early Pleistocene age. The different taphonomy of the two sets of fossil remains suggests that the better mineralized Miocene fossils were reworked and redeposited in younger Plio-Pleistocene deposits, possibly in a fluvial or alluvial depositional setting. Preliminary palynological studies have identified a scarce number of freshwater algae which include *Sigmopollis laevigatoides*, characteristic of the Pliocene and which would support the small-mammal based correlation. Although only preliminarily studied, the succession from Stăuceni is an intriguing occurrence for the Moldavian Platform, where Upper Pliocene–Lower Pleistocene deposits are rare.

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

Acknowledgements: This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS - UEFISCDI, project number PN-III-P1-1.1-TE-2021-0664, within PNCDI III (B.-S.H., Ș.V.).

DESCRIPTION OF A WELL-PRESERVED AND DIVERSE ICHTHYOSAUR FAUNA FROM THE TOARCIAN OF NORTHERN GERMANY WITH REMARKS ON TAPHONOMY AND PALEOBIOGEOGRAPHY

J. Heijne[1*], F. Miedema[2,3], R. Kosma[4], A.G. Reisdorf[5], M. Wuttke[6]

[1]Division of Paleontology, Institute for Geosciences, University of Bonn, Nußallee 8, 53115 Bonn, Germany.

[2]Staatliches Museum Für Naturkunde Stuttgart, Rosenstein 1, 70191 Stuttgart, Germany.

[3]Paläontologisches Institut, Universität Zürich, Karl-Schmid-Strasse 4, 8006, Zürich, Switzerland.

[4]Staatliches Naturhistorisches Museum, Pockelsstraße. 10, 38106 Braunschweig, Germany.

[5]Stiftung Ruhr Museum, Fritz-Schupp-Allee 15, 45141 Essen, Germany.

[6]Senckenberg Forschungsinstitut und Naturmuseum Frankfurt, Senckenberganlage 25, 60325 Frankfurt am Main, Germany.

*presenting author, heijne@uni-bonn.de

***Keywords**: Early Jurassic, Ichthyosauria, taxonomy, Posidonia Shale, Fossillagerstätte*

Among the best-preserved fossils worldwide are finds from the Toarcian organic-rich black shales of Western Europe. Especially the fauna from the Southern German Posidonienschiefer Fm. has greatly contributed to the understanding of Jurassic ichthyosaurs. In contrast, ichthyosaur remains from the Northern German Posidonienschiefer Fm. have so far received only minor attention. The systematic excavations carried out by the Staatliches Naturhistorisches Museum (SNHM) Braunschweig since 2011 in Hondelage and since 2014 in Schandelah (Lower Saxony) show great paleontological potential. Here we present a description of 17 ichthyosaur specimens, most of which originate from these excavations, that were assigned to a genus with high certainty (namely *Stenopterygius*, *Temnodontosaurus*, *Hauffiopteryx*, and *Eurhinosaurus*). A tentative assignment to a species is possible for some of these specimens. The assignment of the material to *Temnodontosaurus* sp., *Hauffiopteryx typicus*, *Eurhinosaurus* cf. *huenei*, and all three Toarcian species of *Stenopterygius* allows for an increase in biogeographic range for all but *S. quadriscissus*. Biostratigraphically, most specimens described herein come from the Exaratum Subzone, corresponding to some of the most fossiliferous strata of the Southern German Posidonienschiefer Fm. Furthermore, the systematic excavation and excellent preparation at the SNHM Braunschweig allow a precise analysis of the taphonomic patterns for these specimens. These data were used to determine the absolute ratios of isolated bones compared to associated and articulated finds. These results can be used to assess the extent to which ichthyosaur material in public and private collections has been modified by preparatory procedures and estimate the number of sampling biases.

Acknowledgements: J.H. would like to thank the DFG (Projektnummer 461387258) for funding this project. R.K. would like to thank the Dr. Scheller Stiftung and FUN Hondelage for enabling the yearly

excavations in Schandelah and Hondelage. Furthermore, we thank Sebastian Radecker for the excellent preparation of the SNHM material.

FUNCTIONAL MORPHOLOGICAL DIVERGENCE WITHIN INSULAR GIANTS

J.J. Hennekam[1,2*], V.L. Herridge[3], P.G. Cox[4]

[1]Maastricht Science Programme, Maastricht University, Paul-Henri Spaaklaan 1, 6200 MD, Maastricht, The Netherlands.

[2]Naturalis Biodiversity Center, Darwinweg 2, 2333 CR, Leiden, The Netherlands.

[3]Natural History Museum, Cromwell Road, South Kensington, London SW7 5BD, London, UK.

[4]Department of Cell and Developmental Biology, University College London, WC1E 6BT, London, UK.

*presenting author, j.hennekam@maastrichtuniversity.nl

***Keywords**: island evolution, finite element analysis, geometric morphometrics,* Hypnomys*,* Leithia

A key driver of insular gigantism, the evolutionary phenomenon whereby small insular animals evolve large body sizes relative to their mainland ancestors, is thought to be selection for dietary niche expansion in a resource-limited environment. However, generalist taxa make better colonisers, and may not be resource limited in insular settings owing to release from competition, making it difficult to tease out cause and correlation in insular feeding niche trends. Here we address this issue directly, using both geometric morphometrics and finite element analysis to evaluate functional morphological divergence related to feeding niche shifts in some extreme examples of insular gigantism: Mediterranean giant dormice. We used 3D geometric morphometrics to analyse shape changes in skull and mandible morphology of insular dormice compared to closely related mainland populations. In addition, we implemented finite element analyses (FEA) to calculate stress, strain, and mechanical advantage during incisor and molar biting for three extinct giant species (*Leithia melitensis*, *Hypnomys morpheus*, *Hypnomys onicensis*), the extant giant Formentera dormouse (*Eliomys quercinus ophiusae*), and their extant mainland relative (*Eliomys quercinus*), assessing whether morphological changes were indicative of adaptation to new dietary niches. We show that both size and shape of insular dormice vary significantly from that of mainland dormice, but also between insular habitats. Our FEA results indicate that specialized dietary adaptations occurred in the insular taxa, and could evolve relatively rapidly. Furthermore, dietary adaptations varied between taxa. The "giant niche" therefore varies among islands and across time periods, arguing against a universal ecological driver for insular gigantism.

Acknowledgements: We thank all the researchers and curators who aided in accessing and scanning the dormouse specimens used in this study.

NEW TAPHONOMIC INSIGHTS ON THE 'PTEROSAUR GRAVEYARD' FROM THE CRETACEOUS OF CRUZEIRO DO OESTE (PARANÁ, BRAZIL)

B. Holgado[1,2*], L.C. Weisnchütz[3], E.V. Araújo[4], M.B. Soares[4], L. Canejo[4], E. Wilner[3], J.H. Z. Ricetti[3], J.M. Sayão[5], A.W.A. Kellner[4]

[1]Museu de Paleontologia Plácido Cidade Nuvens (MPPCN), R. Plácido Cidade Nuvens 326, 63190-000, Santana do Cariri, CE, Brazil

[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[3]Centro de Pesquisa Paleontológica – CENPALEO, Universidade do Contestado, Av. Nereu Ramos 1071, 89306-076, Mafra, SC, Brazil.

[4]Laboratory of Systematics and Taphonomy of Fossil Vertebrates, Departmento de Geologia e Paleontologia, Museu Nacional / Universidade Federal do Rio de Janeiro, Quinta da Boa Vista s/n, 20940-040, Rio de Janeiro, RJ, Brazil.

[5]Seção de Museologia, Museu Nacional / Universidade Federal do Rio de Janeiro, Quinta da Boa Vista s/n, 20940-040, Rio de Janeiro, RJ, Brazil.

*presenting author, borja.holgado@icp.cat

***Keywords**: Pterosaur Graveyard, taphonomy,* Caiuajara*, Cretaceous, Brazil*

The 'Pterosaur Graveyard' is a unique pterosaur bonebed located in the municipality of Cruzeiro do Oeste (Southern Brazil), and comprises a sequence of aeolian sandstones representing a former desert environment with interdunal wetland. It is constituted by four successive fossil assemblages where thousands of disassociated skeletal elements and a few more complete articulated specimens were found, most of them belonging to the pterosaur *Caiuajara dobruskii*. However, little has been discussed about the taphonomic interpretations of this depositional environment. Recent osteohistological analyses suggest individuals of *C. dobruskii* were mostly juveniles and subadults (whilst adults are rare and seniles absent). This apparently indicates at least several catastrophic (non-selective) death toll events, originating the different death communities (thanathocoenoses) now represented in the four fossil assemblages. Here we performed a taphonomic analysis on several blocks of each assemblage, also highlighting some diagenetic features at microstructural level. A hypothesis that would potentially explain such mortality events could be that the individuals were dragged by water flows after death, in sporadic flows of water in aeolian sands around possible oases. Several issues point to the possibility of the site resulting from death events close to a breeding area or creching behavior in this species, whilst different assemblages could be explained by distinct phenomena. This can be supported by: the substantially larger quantity of carcasses belonging to *Caiuajara* compared to other species in each assemblage; the much higher occurrence of disarticulated specimens; the apparent absence of weathering marks and scratches; and the overrepresentation of juveniles and subadults.

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

Acknowledgements: We thank Vilson Greinert for preparing the specimens. CERCA Programme/Generalitat de Catalunya and the following Brazilian research foundations are acknowledged: CAPES (#88887.824909/2023-00 to L.C.); CNPq (#141138/2022-0 to E.V.A.; #314222/2020-0 to J.M.S.; #313461/2018-0, #406779/2021-0, and #406902/2022-4 to A.W.A.K.); FAPERJ (#E-26/210.666/2023 to J.M.S.; #E-26/201.095/2022 to A.W.A.K.); and FUNCAP (#PV1-0187-00054.01.00/21 to B.H.).

A HIGH-DIVERSITY ASSEMBLAGE OF HERBIVOROUS DINOSAURS FROM A BARREMIAN–APTIAN PALEOUPLAND LOCALITY OF NORTHWESTERN GERMANY

J.J. Hornung[1], D. Madzia[2*], S. Sachs[3], A.H. Schwermann[4]

[1]Niedersächsisches Landesmuseum Hannover, Willy-Brandt-Allee 5, 30169 Hannover, Germany.
[2]Institute of Paleobiology, Polish Academy of Sciences, Twarda 51/55, 00-818, Warszawa, Poland.
[3]Abteilung Geowissenschaften, Naturkunde-Museum Bielefeld, Adenauerplatz 2, 33602, Bielefeld, Germany.
[4]LWL-Museum of Natural History Münster, Sentruper Straße 285, 48161, Münster, Germany.

*presenting author, daniel.madzia@gmail.com

***Keywords**: Herbivorous dinosaurs, diversity, upland, Lower Cretaceous, Balve*

Upland environments are severely underrepresented in the fossil record, which causes substantial gaps in our knowledge of their paleodiversity. Barremian–Aptian upland paleokarst fissure and cave deposits exposed at Balve-Beckum in northwestern Germany yield a large amount of vertebrate remains. Disarticulated and fragmentary bones and teeth represent a diverse vertebrate fauna that includes selachians, osteichthyans, lissamphibians, mammals, squamates, turtles, crocodyliforms, and pterosaurs, as well as ornithischian, theropod, and sauropodomorph dinosaurs. Sedimentological and taphonomical information indicate a complex, probably multiphasic history of enrichment, sorting, and deposition of the material within a cave system that was formed in Paleozoic carbonates. Abundant ornithopods and rare sauropods are represented by larger disarticulated bones and bone fragments, as well as by several isolated teeth. The current sample includes at least two morphotypes of iguanodontian teeth corresponding to different positions within the tooth row or, potentially, several taxa. Aside from rare fragments of larger individuals, sauropod remains include small tooth crowns, probably from hatchling-sized individuals, representing two morphotypes that indicate two different taxa. There are also small, isolated tooth crowns displaying ornithischian features. A minimum of five morphotypes are recognized, probably representing at least three different taxa. The morphotypes differ from other Early Cretaceous ornithischians known from well-sampled localities such as the Wessex and Weald basins. This indicates that a high diversity of herbivorous dinosaurs was present at Balve, which adds to the previously known faunal community at the site. Current research aims to elucidate the relationships, paleoecology, and taphonomy of this fauna.

Acknowledgements: We thank the Lhoist company for permission to perform excavations at Balve and for technical support over the past twenty years. This work is supported by the National Science Centre, Poland (2020/37/B/NZ8/01321).

NEW MATERIAL OF *TETRACLAENODON* (PHENACODONTIDAE, MAMMALIA), FROM THE SAN JUAN BASIN OF NEW MEXICO, SHEDS LIGHT ON ITS EVOLUTIONARY HISTORY AND PHYLOGENETIC POSITION

S. Holpin[1*], T.E. Williamson[2], J.R. Wible[3], S.L. Shelley[1], S.L. Brusatte[1]

[1]School of Geosciences, University of Edinburgh, Grant Institute, The King's Buildings, James Hutton Road, EH9 3FE, Edinburgh, UK.
[2]New Mexico Museum of Natural History & Science, 1801 Mountain Road NW, 87104, Albuquerque, USA.
[3]Carnegie Museum of Natural History, 5800 Baum Blvd, 15206, Pittsburgh, PA, USA.

*presenting author, sofia.holpin@ed.ac.uk

***Keywords**: Paleocene, evolution, mammals, 'Condylarthra',* Tetraclaenodon

Following the K-Pg mass extinction, 66 Ma, among the first placental pioneers were the 'condylarth' phenacodontids, postulated to be related to modern perissodactyls. *Tetraclaenodon*, a basal phenacodontid from the Torrejonian (~64.77 Ma to ~62.36 Ma) NALMA of North America, was a medium-sized (~5–10 kg), herbivorous, incipiently hoofed, terrestrial mammal. Understanding more about the anatomy, phylogeny, and taxonomy of *Tetraclaenodon* is fundamental for elucidating the evolutionary trends of phenacodontids, and their role in perissodactyl evolution. Here, we describe new material of *Tetraclaenodon* from the San Juan Basin, New Mexico. Anatomical comparisons were made with phenacodontids and early Eocene taxa, alongside an ingroup phylogeny conducted in TNT v. 1.6, with >660 characters and 188 taxa from the Paleocene, Eocene, and modern mammals. Lower m2 size variation shows a ~50% increase in body size throughout the Torrejonian, the smaller *T. pliciferus* present in the lower levels, the larger *T. puercensis* present in the upper levels. Morphologically, *Tetraclaenodon* is the most generalized phenacodontid. It did not display the size of *Phenacodus*, the more specialized herbivorous, lophodont dentition of *Ectocion* and *Copecion* or the cursorial adaptations of *Meniscotherium*. Preliminary phylogenetic analyses reveal that *Tetraclaenodon* forms a group with *Phenacodus*, *Ectocion* and *Copecion*, with Arctocyonidae as siter taxa. Our results confirm the basal position of *Tetraclaenodon* within the Phenacodontidae. The increase in body size is in line with what we see in other contemporary 'condylarths' such as *Periptychus*. The completion of the phylogeny will elucidate the wider phylogenetic relationships between phenacodontids, early Cenozoic placentals, and extant mammals.

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

3D GEOMETRIC MORPHOMETRIC ANALYSIS OF FEMUR SHAPE AND SIZE VARIATION IN *MYOTRAGUS*

L. Holt[1*], N. Balan[1], J.J. Hennekam[1,2]

[1]Maastricht Science Programme, Maastricht University, Paul-Henri Spaaklaan 1, 6200 MD, Maastricht, The Netherlands.

[2]Naturalis Biodiversity Center, Darwinweg 2, 2333 CR, Leiden, The Netherlands.

*presenting author, l.holt@student.maastrichtuniversity.nl

***Keywords**: island evolution, insular dwarfism, Balearic Islands, limb morphology, landmark data*

Island dwarfism is a manifestation of insular evolution where larger mammals become reduced in size. A variety of factors contribute to dwarfism: insular environments often have fewer available resources, species that inhabit them typically face a lack of predation and interspecific competition, etc. *Myotragus*, a genus endemic to the Balearic Islands of Spain (Western Mediterranean), exhibits island dwarfism. Its short and robust limb bones formed limbs that were spread apart, and its tarsals fused over time, resulting in rigid feet. *Myotragus* likely had a limited range of low-gear locomotion and little sagittal movement. We used 3D geometric morphometrics to analyze the shape and size variation in femurs of *M. pepgonellae*, *M. batei*, and *M. balearicus*, from nine different caves of varying elevation on Mallorca and Menorca, and femurs of unknown *Myotragus* species found in an old deposit cave on Mallorca. The ages of these species range from the Middle Pliocene (*M. pepgonellae*) to the Early Holocene (*M. balearicus*). Preliminary results of this project suggest significant intraspecific variation in femur shape of *M. balearicus* and that femurs differ in shape and size between caves. In particular, the shape of the condyles, trochanters, neck, and head of the femur varies greatly. Additionally, femurs of *M. balearicus*, the most recent species in the lineage, are relatively similar to those of the unknown *Myotragus* species femurs from the old deposit cave. This study shows that insular mammals can adapt to insularity by adjusting size and developing functional morphological changes, such as varying shapes of condyles.

Acknowledgements: We are very grateful to Josep Antoni Alcover (IMEDEA) and Carol Constantino de la Peña (Museu Balear de Ciències Naturals, Sóller) for allowing us to access the skeletal material necessary for this study.

A NEW PACHYPLEUROSAUR (REPTILIA: SAUROPTERYGIA) FROM THE MIDDLE TRIASSIC OF SOUTHWESTERN CHINA

Y.-W. Hu[1*], Q. Li[1,2], J. Liu[1]

[1]School of Resources and Environmental Engineering, Hefei University of Technology, Hefei 230009, China.

[2]Institute of Geosciences, University of Bonn, Bonn 53115, Germany.

*presenting author, huyiweixyy@gmail.com

Keywords: *Pachypleurosauria,* Dianmeisaurus*, phylogeny, paleobiogeographic origin, marine reptile*

After the devastating Permo-Triassic mass extinction, several new groups of large predators invaded the sea in the early part of the Triassic, including sauropterygians, ichthyosauromorphs, and thalattosaurs. Among these predators, sauropterygians are the most abundant group in terms of the genus/species diversity. Here we report a new species of Pachypleurosauria (Sauropterygia: Eosauropterygia) from a recently discovered Lagerstätten in the Upper Member of the Anisian Guanling Formation. The only known specimen of the new species was collected from Muta village, Luxi County, Yunnan Province, South China. Our new phylogenetic analysis based on a novel data matrix recovered the new taxon as a sister group to *Dianmeisaurus*. The new phylogenetic analysis also collapsed the monophyly of the traditionally recognized Eusauropterygia. Pistosauridea, *Majiashanosaurus*, and *Hanosaurus* comprise the consecutive sister groups with a new clade including Pachypleurosauria and Nothosauroidea. A monophyletic Pachypleurosauria, of which the clade consisting of *Dianmeisaurus* and *Panzhousaurus* occupies the basal-most position, is recovered by this study. The clade consisting of *Dawazisaurus* and *Dianopachysaurus* forms the sister group to the remaining pachypleurosaurs included in this study. Since *Dianmeisaurus*, *Panzhousaurus*, *Dawazisaurus*, and *Dianopachysaurus* are all exclusively known from South China, we suggest that pachypleurosaurs had a paleobiogeographic origin in the eastern Tethys.

Acknowledgements: We thank A.S. Wolniewicz for discussion, and S.P. Jiang and other members of the paleontological lab of HFUT for field assistance. We also acknowledge L.Y. Li for preparing this specimen. This work was supported by the National Natural Science Foundation of China (Grant numbers 42172026 and 41772003).

PALAEOECOLOGY OF THE RHINOCEROTIDS FROM ULM-WESTTANGENTE (EARLY MIOCENE, GERMANY) AND ITS CONTRIBUTION TO UNDERSTANDING THE PALAEOCENE–NEOGENE TURNING POINT

M. Hullot[1*], C. Martin[2], C. Blondel[3], G. Rößner[1,4]

[1]Bayerische Staatsammlung für Paläontologie und Geologie, Richard-Wagner Straße 10, 8033 München, Germany.

[2]Géosciences Montpellier, Université de Montpellier Bât 22 – Place Eugène Bataillon, 34090, Montpellier, France.

[3]PALEVOPRIM, Université de Poitiers Bât B35 – TSA 51106, 6 rue Michel Brunet, 86073, Poitiers, France.

[4]Department für Geo- und Umweltwissenschaften, Paläontologie & Geobiologie, Ludwig-Maximilians-Universität München, Richard-Wagner Straße 10, 80333, München, Germany.

*presenting author, hullot@snsb.de

***Keywords**: diet, palaeoenvironment, niche partioning, Freshwater Molasse Germany, Aquitanian*

The locality of Ulm-Westtangente presents the richest vertebrate fauna from the early Miocene of Germany. Its dating to the Aquitanian, a turning point in Cenozoic climate, makes it interesting to understand the faunal, palaeoecological, and palaeoenvironmental context in Europe at that time. However, very little has been done concerning the large herbivores despite they are a good proxy for palaeoenvironments. Here we used a multiproxy approach to investigate the palaeoecology of the two rhinocerotids from Ulm-Westtangente: *Mesaceratherium paulhiacense* and *Protaceratherium minutum*. The dental remains of the smaller species, *P. minutum* (estimated body mass based on teeth: 442–667 kg), are twice as abundant (337 vs. 155) as that of the larger *M. paulhiacense* (1687–2576 kg), but they display a similar age structure with around 10% of juveniles, 20% of subadults, and 70% of adults. Dental wear (mesowear, microwear) and carbon isotopes indicate different feeding preferences for the two species: both were C3 feeders but *M. paulhiacense* had a more abrasive diet and was probably a mixed feeder inhabiting a wider range of habitats. Both species have similar mortality curves revealing four mortality peaks correlated with life stages and events: around birth, juvenile diseases, weaning, and sexual maturity. They are also similarly affected by enamel hypoplasias, with about 17% of teeth bearing at least one defect, but the most affected loci are species-dependent. The oxygen isotopes of the studied rhinocerotid sample also allow to infer the mean annual temperature (19.2 °C), confirming warm-temperate to subtropical conditions.

Acknowledgements: We are grateful to Dr. Eli Amson the curator for fossil mammals at the SMNS for granting access to and providing inventory numbers for the specimens of Ulm-Westtangente. This study was funded by a post doctoral fellowship of the Alexander von Humboldt Foundation (Germany).

A NEW LOWER CRETACEOUS SPINOSAURID SPECIMEN FROM LA RIOJA (NORTHERN SPAIN): PRELIMINARY RESULTS

E. Isasmendi[1*], E. Cuesta[2,3], I. Díaz-Martínez[4], P. Sáez-Benito[5], A. Torices[6], X. Pereda-Suberbiola[1]

[1]Departamento de Geología/Geologia Saila, Universidad del País Vasco/Euskal Herriko Unibertsitatea, Sarriena, 48940 Leioa, Bizkaia, Spain.

[2]Museo Paleontológico Egidio Feruglio, Fonana, 9100, Trelew, Argentina.

[3]Geo- und Umweltwissenschaften department. Ludwig Maximilian Universität, Richard Wagner Strasse, 80333, Munich, Germany.

[4]Department of Earth Sciences and Condensed Matter Physics, Faculty of Sciences, University of Cantabria, Los Castros, 39005 Santander, Spain.

[5]Centro de Interpretación Paleontológica de La Rioja, C/ Mayor 10, 26525 Igea, La Rioja, Spain.

[6]Departamento de Geodinámica, Estratigrafía y Paleontología, Universidad Complutense de Madrid, C/ José Antonio Novais 12, 28040 Madrid, Spain.

*presenting author, erik.isasmendi@ehu.eus

Keywords: *Theropoda, Spinosauridae, Iberian Peninsula, Cameros Basin, Early Cretaceous*

Spinosaurid theropods are becoming especially abundant in the Barremian deposits of the Iberian basins with four identified genera: *Baryonyx*, *Camarillasaurus*, *Iberospinus*, and *Vallibonavenatrix*. In the Cameros Basin (La Rioja, northern Spain), only the presence of the genus *Baryonyx* has been reported to date. However, the revision of specimens formerly assigned to this genus shows that they belong to baryonychine spinosaurids different from *Baryonyx*. During the field season of 2022, remains of a new theropod were recovered from the lacustrine deposits of the Enciso Group (DS 7; uppermost Barremian–lower Aptian). They include a partial skeleton that preserves an almost complete forelimb (scapula, humerus, ulna, radius, and several phalanges including unguals), besides cranial, axial, pelvic girdle, and hindlimb elements. Based on previous phylogenies of early-branching tetanurans, the presence of an exceptionally prominent and anterolaterally oriented deltopectoral crest, the blade-like olecranon process, and the broad distal epiphysis of the ulna allow to preliminarily assign this specimen to the Spinosauridae. Furthermore, the hypertrophied ungual phalanx of the first manual digit suggests baryonychine affinities. This skeleton shows a set of characters that enable its distinction from other Spinosauridae that preserve forelimb bones. Further preparation of other elements will help to resolve its affinities and relationship with other spinosaurid taxa. This newly recovered theropod will significantly contribute to a better understanding of the Early Cretaceous spinosaurid (and dinosaur) faunas of the Iberian Peninsula.

Acknowledgements: Work supported by the Spanish Ministry of Science and Innovation-ERDF (PID2021-122612OB-I00, MINECO/FEDER, UE), and the Basque Government/EJ (IT1485-22). E.I. is supported by a Ph.D. fellowship of the Basque Government/EJ (PRE_2019_1_0215). I.D.M. is

supported by a Ramón y Cajal fellowship (RYC-2022) and by the Ministry of Science and Innovation of Spain.

THE PTEROSAUR BONANZA: DIVERSIFICATION OF PTEROSAURS RECOVERED FROM THE BRITISH MIDDLE JURASSIC

N. Jagielska[1*], M. O'Sullivan[2], G.F. Funston[1], I.B. Butler[1], T.J. Challands[1], N.D.L. Clark[3], N.C Fraser[1], A. Penny[1], D.A. Ross[4], M. Wilkinson[3], S. Brusatte[1]

[1]School of Geosciences, University of Edinburgh, Grant Institute, EH9 3FE, Edinburgh, Scotland.
[2]Limerick, Ireland.
[3]The Hunterian, University of Glasgow, University Avenue, G12 8QQ, Glasgow, Scotland
[4]Staffin Museum, 6 Ellishadder, IV51 9JE, Staffin, Scotland.

*presenting author, N.Jagielska@sms.ed.ac.uk

***Keywords**: Scotland, margin-marine, preservation bias, diversification*

A mass diversification occurred sometime between the Early to Middle Jurassic in terrestrial and marine tetrapod groups. The drivers and timespan of that transition are poorly understood, given vertebrate remains of that interval are relatively sparse. That transition also occurred in pterosaurs. The description of new pterosaur material from Bathonian deposits in Scotland and reassessment of legacy collections from Middle Jurassic England reveals high diversity of volant reptiles, previously obscured by preservation and human bias. *Dearc sgiathanach*, a sizeable non-pterodactyloid pterosaur, was described recently as the first well-preserved European pterosaur in the Middle Jurassic (Bathonian) interval. Additionally, other partial but coeval pterosaur remains from across the British Tethyan seaway (hailing from the Great Oolite Group and Great Estuarine Group) have been described. The throughout assessment of British Bathonian pterosaur fossils, via literature and specimen review, wingspan estimates and phylogenetic placement, demonstrates that these reptiles were diverse in terms of species and body size. Taken together, these remains point to the shallow seaway with fossils of scaphognathid pterosaurs, sizeable *Dearc*-like non-pterodactyloid pterosaurs with wingspans possibly reaching four meters, transitional monofenestratans, and small pterosaurs with wingspans below a meter. This fauna is not dissimilar to biotas represented by younger Jurassic Lagerstätte (such as Tiaojishan Formation). This suggests that main non-pterodactyloid pterosaur morphotypes developed by the Bathonian and plateaued until the Late Jurassic, until these basal pterosaurs disappeared at or near the Jurassic–Cretaceous boundary. The evolution of pterosaurs helps us to understand species turnovers of other major animal groups.

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

STABLE ISOTOPES AND ENVIRONMENT OF THE CAVE BEAR (*URSUS SPELAEUS*) FROM THE SOUTHERN SLOPES OF THE PYRENEES (IBERIAN PENINSULA)

V. Jerjotoma-Ortín[1], R. Rabal[2], G. Cuenca-Bescós[2], T. Torres[3], J. Maroto[4], A. Grandal-d'Anglade[5*]

[1]Departamento de Ciencias de la Antigüedad, Universidad de Zaragoza, C/ Pedro Cerbuna 12, 50009 Zaragoza, Spain.

[2]Aragosaurus-IUCA, Earth Sciences Department, Universidad de Zaragoza, 50009 Zaragoza, Spain.

[3]Biomolecular Stratigraphy Laboratory, E.T.S.I. Minas, Universidad Politécnica de Madrid, C/ Ríos Rosas 21, 28003 Madrid, Spain.

[4]Institut de Recerca Històrica, Universitat de Girona, Àrea de Prehistòria, Pl. Ferrater Mora 1, 17004 Girona, Spain.

[5]Instituto Universitario de Xeoloxía, Universidade da Coruña, ESCI, Campus de Elviña, 15008 A Coruña, Spain.

*presenting author, aurora.grandal@udc.es

***Keywords**: bone collagen, $\delta^{15}N$, $\delta^{13}C$, Pleistocene, palaeoenvironment*

In this study, we address a comparative analysis of the isotopic signatures of bone collagen from several end-Pleistocene cave bear (*Ursus spelaeus*) populations in the southern slopes of the Pyrenees: Troskaeta (n = 2) in Biscay, Amutxate (n = 8) and Abauntz (n = 30) in Navarre, Tella (n = 16) in Aragon, and Ermitons (n = 7) in Catalonia. The analysis of carbon and nitrogen isotope ratios in fossil bone collagen is a widely used tool to reconstruct the diet and palaeoenvironment in past vertebrates. Fossil bone collagen usually preserves well in karst caves due to their stable environmental conditions. Thus, isotopic studies on the cave bear, whose remains accumulate in many European caves after millennia of occupation, are not uncommon. Most of these studies focus on the diet or physiology of these animals. However, isotopic signatures also vary depending on environmental factors such as temperature, rainfall, or insolation. Here, we analyse cave bear's isotopic signatures to reconstruct their environment. Average $\delta^{13}C$ values of each population are: Troskaeta –20.7‰ ± 0.1, Amutxate –20.8‰ ± 0.4, Abauntz –20.8‰ ± 0.6, Tella –19.9‰ ± 0.5. and Ermitons –20.8‰ ± 0.2. Average $\delta^{15}N$ values are: Troskaeta 1.5‰ ± 0.1, Amutxate 1.3‰ ± 0.4, Abauntz 1.7‰ ± 0.5, Tella 1.0‰ ± 0.6, and Ermitons 3.9‰ ± 0.4. $\delta^{13}C$ values positively correlate with the altitude of the caves, while $\delta^{15}N$ values correlate negatively. The correlation disappears when introducing correction factors for the altitudinal effect, showing the influence of environment and climate on the isotopic signatures. Furthermore, the small range of variation within each population indicates a strong spatial relationship between the bears and their cave and surroundings.

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

HISTOLOGY OF THE DERMAL PECTORAL GIRDLE OF METOPOSAURID TEMNOSPONDYLS

S. Kalita[1*], E.M. Teschner[1,2], J. Heijne[1], D. Konietzko-Meier[1]

[1]Institute of Geosciences, University of Bonn, Nussallee 8, 53115, Bonn, Germany.
[2]Institute of Biology, University of Opole, Oleska 22, 45-052, Opole, Poland.

*presenting author, sudiptakalita164@gmail.com

Keywords: Metoposaurus krasiejowensis*, interclavicle, clavicle, dermal bones, pectoral girdle*

The pectoral girdle of Temnospondyli consists of two ventrally placed dermal elements, namely the interclavicle and the two clavicles. During the Late Triassic, large Stereospondyli evolved massive interclavicle and clavicles relative to the humerus, which is significantly pronounced in metoposaurid Sterospondyli. In this study, we explore the histology of the dermal pectoral girdle of the Polish metoposaurid *Metoposaurus krasiejowensis*. We analysed several histological thin sections from two clavicles (belonging to early and late juveniles) and three interclavicles (early and late juveniles, plus an adult) using polarised light microscopy. Additionally, we identified distinct histological ontogenetic stages (HOS) among the sampled dermal elements by inferring relative amount of primary (simple vascularization, primary osteons, disorganised bone matrix) and secondary (secondary osteons, erosion cavities) histological signals along with relative growth marks. Results show transitioning HOS in the samples. Furthermore, clavicles and interclavicles exhibit disparity in HOS number, indicating variation in the growth dynamics of different skeletal elements. Fast growth of dermal elements occured in younger metoposaurid individuals, which is a result of drastic shift in the ornamentation pattern rather than the volumetric growth of these bones. Additionally, a large number of Sharpey's fibers developed in the articulating region of the clavicle but none in the interclavicle, indicating a clavicle initiated interlocking joint. This interlocking of the dermal girdle, along with their increased bone mass known from recent studies, indicates a highly rigid girdle. Such an adaptation could have rendered the metoposaurid pectoral girdle to function as a plastron, potentially reducing forelimb driven terrestrial locomotion.

Acknowledgements: We are thankful to Mateusz Antczak (Institute of Biology, University of Opole) for providing access to the metoposaurid material from Krasiejow, Poland. We also extend our gratitude to Olaf Dülfer (Institute of Geosciences, University of Bonn) for providing crucial assistance during thin section extraction from the sampled bones.

KRETZOIARCTOS BEATRIX (CARNIVORA, URSIDAE) FROM THE LATE MIOCENE OF HAMMERSCHMIEDE (GERMANY): DIETARY IMPLICATIONS

N. Kargopoulos[1,2,3*], J. Abella[4,5,6], A. Daasch[7], T. Kaiser[7], P. Kampouridis[1], T. Lechner[1,8], M. Böhme[1,8]

[1]Department of Geosciences, Eberhard Karls University of Tübingen, Sigwartstr. 10, 72074, Tübingen, Germany.

[2]Department of Biological Sciences, University of Cape Town, Private Bag X3, Rhodes Gift, 7701, Cape Town, South Africa.

[3]Giraffe Conservation Foundation, P.O. Box 86099, Eros, Windhoek, Namibia.

[4]Grup d'Investigació en Paleontologia de Vertebrats del Cenozoic (PVC-GIUV), Departament de Botànica i Geologia, Universitat de València, 46100, Burjassot, València, Spain.

[5]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[6]Instituto Nacional de Biodiversidad (INABIO), Pje. Rumipamba N. 341 y Av. de los Shyris (Parque La Carolina), Quito, Ecuador.

[7]Biocenter Grindel and Zoological Museum, University of Hamburg, 20146, Hamburg, Germany.

[8]Senckenberg Centre for Human Evolution and Paleoenvironment (HEP), Sigwartstraße 10, 72074, Tübingen, Germany.

*presenting author, nikoskargopoulos@gmail.com

Keywords: *bear, microwear, ecomorphology, Miocene*

Recent excavations at the HAM 4 (11.44 Ma) and HAM 5 (11.62 Ma) layers of the hominid-bearing clay pit of Hammerschmiede (Bavaria, Germany; 11.44 and 11.62 Ma, respectively) have revealed dental material of the primitive ailuropodine *Kretzoiarctos beatrix* (Carnivora, Ursidae). The particular metrical and morphological characteristics of the discovered upper and lower teeth clearly distinguish them from all the other Miocene ursid genera. The newly discovered material includes some anatomical elements that were previously unknown. This is the first occurrence of *Kretzoiarctos* outside the Iberian Peninsula, where it has been reported from two localities. The age of all three known localities is very similar (ca. 11.9–11.4 Ma), enabling us to correlate the Western Mediterranean and Central European niches of the species through its temporospatial distribution. Ecomorphological comparisons and dental microwear texture analysis agree in suggesting that *Kretzoiarctos* was an omnivorous opportunistic feeder that included both plant and animal materials in its diet, without any traits related to bone consumption. There are also no indications of strict herbivory based on hard plant material, which would point towards its affinities with the bamboo-eating giant panda. Interestingly, the closest modern analogue of *Kretzoiarctos* in terms of diet seems to be the New World spectacled bear, *Tremarctos ornatus*.

Acknowledgements: The first author (N.K.) would like to thank DAAD for the financial support of the ongoing study on the Hammerschmiede carnivorans. This study was supported by the CERCA

Programme/Generalitat de Catalunya and Beatriu de Pinós contract 2017 BP 00223 from AGAUR to J.A.. We are also thankful to the curators and volunteers that helped with the excavations and our studies.

SMELLING IN STEREO: A NEW BROAD-SNOUTED CLADOSELACHIAN FROM THE DEVONIAN OF MOROCCO AND THE ORIGIN OF THE CHONDRICHTHYAN CROWN

C. Klug[1]*, M.I. Coates[2], L. Frey[1], M. Greif[1], M. Jobbins[1], A. Pohle[3], A. Lagnaoui[4,5], W. Bel Haouz[5,6], M. Ginter[7]

[1]Paläontologisches Institut und Museum, University of Zurich, Karl-Schmid-Strasse 4, 8006 Zürich, Switzerland.

[2]Department of Organismal Biology and Anatomy, University of Chicago, 1027 E. 57Th St., Chicago 60637, USA.

[3]Institute for Geology, Mineralogy, and Geophysics, Ruhr University Bochum, Universitätsstraße 150, 44801 Bochum, Germany.

[4]Interdisciplinary Research Laboratory in Sciences, Education and Training, Higher School of Education and Training Berrechid (ESEFB), Hassan First University, Avenue de l'Université, B.P:218, 26100 Berrechid, Morocco.

[5]Laboratory of Stratigraphy of Oil-and-Gas Bearing Reservoirs, Department of Paleontology and Stratigraphy, Institute of Geology and Petroleum Technologies, Federal University, Kremlyovskaya Str. 18, 420008 Kazan, Volga Region, Russia.

[6]Geosciences Laboratory, Department of Geology, Faculty of Sciences Ain Chock, Hassan II University, Km 8 Route d'El Jadida, 20100 Casablanca, Morocco.

[7]Faculty of Geology, University of Warsaw, Al. Żwirki I Wigury 93, 02-089 Warsaw, Poland.

*presenting author, chklug@pim.uzh.ch

***Keywords**: Holocephali, exceptional preservation, neuroanatomy, phylogeny*

Although chondrichthyans already originated early in the Silurian, the crown group roots in the Devonian. Exceptionally preserved skeletons from the Famennian (Upper Devonian) of Morocco provide new insights into the anatomy of some of the earliest representatives of the main clades nested in the crown group. Here, we describe the new cladoselachian *Maghriboselache mohamezanei*, which is slightly older than the type genus *Cladoselache* from Ohio. Like its sister genus, *M. mohamezanei* is known from a series of skeletons preserving musculature, skin, bromalites and, importantly, three-dimensionally preserved crania. This allowed us to reconstruct its neuroanatomy including sensory organs such as the nasal capsules, orbits with sclerotic rings, and semicircular canals. While orbit size does not differ in proportions from contemporary taxa, the snout is much broader, suggesting enhanced olfactory abilities. Additionally, the endocast reflects the early stage of the formation of a higher and more compact shape, with higher and broader semicircular canals, as seen in derived holocephalans. In our Bayesian analyses, *Maghriboselache* forms a monophylum with *Cladoselache*, which is sister group to the lineage comprising modern holocephalans and symmoriids. Together with *Ferromirum*, *M. mohamezanei* is the oldest stem group representative of the holocephalan lineage. The early presence of representatives of the main

clades of the chondrichthyan crown possibly reflects the increasing competition among large predators occupying the water column.

Acknowledgements: Saïd Oukherbouch (Tafraoute) and Mohamed Mezane (La Khraouia) discovered many of the specimens. Christina Egli (Winterthur), Ben Pabst (Zürich), and Claudine Misérez (Neuchâtel) prepared material. Thodoris Argyriou (Munich) and Dylan Bastiaans (Zürich) helped with segmentation. Tom Davis (Bristol), Jorge Carillo Briceño, and Alexandra Wegmann (both Zürich) produced CT scans.

ANCIENT PROTEINS FROM IBERIAN EQUIDS IN THE LIGHT OF ANCIENT DNA

J. Krueger[1*], R. Fong[1], X. Aymerich[2], R. Paterson[3], E. Cappellini[3], L. Orlando[4], D.M. Alba[2], T. Marques-Bonet[1,2], E. Lizano[1,2]

[1]Institut de Biologia Evolutiva (UPF-CSIC), Parc de Recerca Biomèdica de Barcelona, C/ del Dr. Aiguader, 88, 08003 Barcelona, Spain.

[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, C/ de les Columnes s/n, 08193, Cerdanyola del Vallès, Barcelona, Spain.

[3]Section for Geogenetics, Globe Institute, University of Copenhagen, Øster Voldgade 7, 1350, Copenhagen, Denmark.

[4]Centre d'Anthropobiologie et de Génomique de Toulouse, Université Paul Sabatier, 118 Rte de Narbonne, 31062, Toulouse, France.

*presenting author, johanna.krueger@upf.edu

***Keywords**: equids, palaeoproteomics, tooth enamel, aDNA*

The evolution of equids over the past millennia has been studied extensively using ancient DNA (aDNA). However, there is a fair amount of debate about equid phylogenetics, in particular about evolutionary processes outside the temporal scope of aDNA. The application of palaeoproteomics could provide some answers since it extends the maximal age of samples that deliver genetic information to millions of years. Also, because of the numerous aDNA studies on equids, we have the opportunity to analyze our palaeoproteomic data in the context of aDNA data. We predicted protein sequences of the enamel proteome from ancient and modern whole genome sequences from approximately 800 horse individuals across Eurasia. In both modern and ancient individuals, we identified novel sequence variants in their enamel proteome. These predicted protein sequences were compared to experimental palaeoproteomic data. For this, we extracted ancient peptides from tooth enamel of equids including *Equus* spp., cf. *Cremohipparion* sp., and *Hippotherium catalaunicum* from sites across the Iberian Peninsula. The fossils span an age range from approximately 10 ka to 10 Ma. Some of them were found in close proximity to remains of the hominoid *Hispanopithecus*, and thus represent an important proxy for potential peptide conservation in these fossils. We sequenced the ancient peptides using nanoscale liquid chromatography coupled to tandem mass spectrometry (nano-LC-MSMS). The palaeoproteomic data revealed the simultaneous presence of two isoforms of Amelogenin X. Currently, we are exploring the palaeoproteomic data for phylogenetically informative peptide sequence variants that could shed some light on equid evolution.

Acknowledgements: This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement

No.861389, R+D+I project PID2020-117289GB-I00 (MCIN/AEI/10.13039/501100011033/), Generalitat de Catalunya/CERCA Programme, and AGAUR (2021 SGR 00620).

ECOMORPHOLOGY AND MACROEVOLUTION OF THE AVIAN QUADRATE

P.-C. Kuo[1*], G. Navalón[1], R.B.J. Benson[2,3], D.J. Field[1,4,5]

[1]Department of Earth Sciences, University of Cambridge, Downing St, Cambridge CB2 3EQ, England, UK.

[2]Department of Earth Sciences, University of Oxford, 3 S Parks Rd, Oxford OX1 3AN, England, UK.

[3]American Museum of Natural History, 200 Central Park West, New York, NY, USA.

[4]Museum of Zoology, University of Cambridge, Downing St, Cambridge CB2 3EJ, England, UK.

[5]Fossil Reptiles, Amphibians and Birds Section, Natural History Museum, Cromwell Road, London SW7 5BD, UK.

*presenting author, pck30@cam.ac.uk

Keywords: *birds*, *quadrate*, *ecomorphology*, *integration*

In birds and reptiles, the quadrate bone acts as a hinge between the mandible and the skull, playing an important role in cranial kinesis. Specifically, the quadrate directly transmits forces from the adductor muscles at the back of the skull towards the beak and lower jaw. Therefore, it is expected that the evolution of avian quadrate morphology may have been influenced by selective pressures related to feeding ecology. However, the shape variation of quadrate in living birds and its potential relationship with ecology have never been quantitatively characterised. Here, we used three-dimensional geometric morphometrics to quantify shape variation of the quadrate and its relationship with an array of key ecological features across ~200 bird species covering all major lineages of extant birds. We found a generally weak association between quadrate shape and ecology, although the strength of this relationship varies across phylogenetic scale. Instead, other factors, such as allometry and phylogeny, exhibit stronger relationships with quadrate shape. Furthermore, our results suggest that the avian quadrate evolved as an integrated unit, and it exhibits strong associations with the morphologies of neighbouring bones with which it articulates. However, these associations vary in terms of their nature and strength among lineages (e.g., Telluraves versus non-Telluraves), perhaps reflecting differences in biomechanical aspects of the kinetic systems among different clades. We suggest that the strong association between quadrate shape and phylogeny provides an excellent opportunity to use aspects of geometric shape to place isolated fossil quadrates in a phylogenetic context using an explicitly quantitative framework.

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

VIRTUAL RECONSTRUCTION OF A FOSSIL TURTLE SHELL USING BLENDER

C. Kyriakouli[1,2*], D. Dróżdż[3], T. Szczygielski[3], G.S. Ferreira[1,2]

[1]Senckenberg Centre for Human Evolution and Palaeoenvironment at the Eberhard Karls Universität Tübingen, Hölderlinstrasse 12, 72074, Tübingen, Germany.

[2]Fachbereich Geowissenschaften, Eberhard Karls Universität Tübingen, Hölderlinstrasse 12, 72074, Tübingen, Germany.

[3]Department of Evolutionary Paleobiology, Institute of Paleobiology, Polish Academy of Sciences, Twarda 51/55, 00-818, Warsaw, Poland.

*presenting author, christina.kyriakouli@senckenberg.de

***Keywords**: retrodeformation, reconstruction, 3D modeling, Blender,* Proterochersis

Fossil morphologies often undergo deformation or damage caused by taphonomic processes. 3D modeling is a valuable tool in accurately retrieving a fossil's original morphology, allowing further study into an otherwise extinct taxon. Here we present the digital retrodeformation and reconstruction process of the complete shell of the Late Triassic turtle genus *Proterochersis*, using the open-source 3D modeling software Blender. The 3D surface models of six specimens were acquired through structure from motion photogrammetry, including the least deformed and virtually complete shell specimen of the species *Proterochersis robusta*, SMNS 17561. Although its inner structure is embedded in matrix and thus inaccessible, its preservation quality rendered it ideal as a reference of the taxon's shape and outer surface. Each *Proterochersis* specimen was scaled and aligned to fit the reference and the best-preserved parts were isolated. Each of the parts visible on the reference specimen were then scaled and retrodeformed using the sculpting and editing tools of Blender to fit the morphology of the reference shell. 2D reconstructions from literature were used for the position and scale of the pelvis and the vertebral column. All individually retrodeformed parts were cut and mirrored along the anteroposterior axis to maintain a level of symmetry and finally merged with the outer surface of the reference carapace. Finally, missing structures were sculpted onto the model from literature. After correcting for errors, the resulting mesh was then used for downstream analyses, such as finite element analysis for the further investigation of its biomechanical properties.

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

INITIAL MORPHOLOGICAL DIVERSIFICATION OF EOSAUROPTERYGIA

A. Laboury[1*], T.M. Scheyer[2], N. Klein[3], T.L. Stubbs[4], V. Fischer[1]

[1]Evolution & Diversity Dynamics Lab, Université de Liège, Allée du Six Août 14, 4000, Liège, Belgium.

[2]Department of Palaeontology, University of Zurich, Karl-Schmid-Strasse 4, 8006 Zurich, Switzerland.

[3]University of Bonn, Institute of Geosciences, Paleontology, Nußallee 8, 53115 Bonn, Germany, Germany.

[4]School of Earth Sciences, University of Bristol, Wills Memorial Building, Bristol BS8 1RL, UK.

*presenting author, A.Laboury@uliege.be

Keywords: *Triassic, Pachypleurosauroidea, Nothosauroidea, Pistosauroidea, feeding specialization*

The Triassic biotic recovery following the Permian–Triassic boundary mass extinction was marked by a rapid radiation of reptiles secondarily adapted to marine environments. The initial radiation of Eosauropterygia, the most speciose clade, is a key part of that rise to dominance of marine reptiles. Recent studies on Mesozoic marine reptile disparity highlighted that eosauropterygians had greatest morphological diversity during the Middle Triassic, with the co-occurrence of pachypleurosauroids, nothosauroids, and pistosauroids, mostly along the margins of the Tethys Ocean. However, these previous studies quantitatively analysed the disparity of Eosauropterygia as a whole without focussing on Triassic taxa. As a result, our understanding of the diversification of Middle Triassic eosauropterygians along the Tethys and the pattern of their morphospace occupation is highly limited. To tackle this issue, we reinvestigated and quantified morphological diversification of long-bodied Triassic eosauropterygians. We defined 31 biomechanically informative traits on teeth, mandible, limbs, and the axial skeleton for 185 specimens from 36 species belonging to Pachypleurosauroidea, Nothosauroidea, and Pistosauroidea. We submitted our trait data to ordination methods to recreate the evolution of morphospace occupation by Triassic eosauropterygians. Our multivariate morphometric analyses highlight clear ecomorphological distinction between the three clades, with no evidence of important whole-body convergent evolution. This pattern is mostly due to craniodental differences and strongly linked to feeding specializations. We also highlight a clear regional disparity pattern evolution differing between nothosauroids and pachypleurosauroids, the latter of which likely experienced a remarkable diversification in the eastern Tethys during the Pelsonian.

Acknowledgements: We would like to thank all the museum curators and staff for granting us access to specimens: Dr. Ingmar Werneburg, Dr. Anne Krahl, Prof. Dr. Christian Klug, Dr. Erin Maxwell Natasja den Ouden, and William Simpson.

ENDOSSEOUS LABYRINTHS OF ANHANGUERID PTEROSAURS WITH IMPLICATIONS FOR THEIR EVOLUTION AND LIFESTYLE

J.S. Lagerström[1,2,3*], D.F.A.E. Voeten[1,4], M.A.D. During[1]

[1]Department of Organismal Biology, Uppsala University, Norbyvägen 18 A, 752 36, Uppsala, Sweden.

[2]Department of Earth Sciences, Uppsala University, Villavägen 16, 752 36, Uppsala, Sweden.

[3]Department of Earth Sciences, University of Lille, Avenue Paul Langevin - Cité Scientifique, 59655, Villeneuve d'Ascq, France.

[4]Frisian Museum of Natural History, Schoenmakersperk 2, 8911 EM Leeuwarden, Netherlands.

*presenting author, julia.s.lagerstrom@gmail.com

Keywords: *Pterosauria, Anhangueridae, synchrotron tomography, endosseous labyrinth, lifestyle*

The relative size and shape of the inner ear complex offers proxies for inferring sensory and behavioural characteristics, including visual acuity and locomotory agility. Changes in endosseous labyrinth morphology over time can also be used to trace evolutionary patterns in extinct taxa, such as pterosaurs. Synchrotron X-ray microtomography data of two anhanguerid pterosaur crania from the Araripe Basin (Lower Cretaceous, Northeastern Brazil), the holotype of *Tropeognathus mesembrinus* and a specimen representing *Anhanguera* sp., were used here to extract digital endocasts of their endosseous labyrinths. Visual comparison revealed that the inner ear morphologies of the two taxa are remarkably similar. The semicircular canals of *Anhanguera* sp. are marginally slenderer, especially in the region of the common crus, and more rounded than those of *T. mesembrinus*. We furthermore confirm that the inner ear morphology of *Anhanguera* sp. is virtually identical to that of *Anhanguera santanae* (AMNH FARB 25555). Relative to earlier pterosaurs, such as *Rhamphorhynchus muensteri* and *Allkaruen koi*, anhanguerids document an evolutionary shift towards proportionally taller anterior semicircular canals, in absence of well-sampled intermediate taxa. The inner ears of the two anhanguerid pterosaurs analyzed are relatively large and positioned close to one another, compared to other archosaurs. They also encircle proportionally large floccular lobes, suggesting that anhanguerids had a high degree of visual acuity, which was likely a sensory adaptation for their presumed piscivorous lifestyle.

Acknowledgements: We thank the European Synchrotron Radiation Facility, in particular Vincent Beyrand and Paul Tafforeau, for scanning the pterosaur skulls and making their data publicly available for further study. We would like to thank the reviewers for their comments, which greatly improved the quality of our abstract.

HYBODONTIFORM SHARKS FROM MIDDLE TRIASSIC CHANG 7 MEMBER OF THE ORDOS BASIN, SHAANXI, NORTH CHINA: PALAEOBIOLOGICAL AND PALAEOECOLOGICAL SIGNIFICANCE

J.C. Li[1*], Z.Y. Sun[1], G. Cuny[2], Q.Q. Meng[3], D.Y. Jiang[1]

[1]Department of Geology and Geological Museum, Peking University, Yiheyuan Street 5, Beijing 100871, China.

[2]Univ Lyon, Université Claude Bernard Lyon 1, CNRS, ENTPE, UMR 5023 LEHNA, F-69622, Villeurbanne, France.

[3]Petroleum Exploration and Production Research Institute, China Petroleum and Chemical Corporation, Beijing 100088, China.

*presenting author, jiachun.li@univ-lyon1.fr

Keywords: *re-examination, heterodonty dentition, top predator, lacustrine ecosystem*

The lacustrine ecosystem of the early Ladinian (Middle Triassic) of Chang 7 Member of Yanchang Formation in the Ordos Basin (Shaanxi, North China) was proposed as the earliest known Mesozoic-type, trophically multileveled lacustrine ecosystem after the end-Permian mass extinction (EPME). However, the speculated top predator shark was a mere conjecture from coiled coprolites. Herein, 31 shark teeth from the organic-rich mudstones of the Chang 7 Member at the Bawangzhuang section, Tongchuan City, Shaanxi Province, North China are described in detail. Two taxa of hybodontiformes, ?*Hybodus youngi* and *Hybodus* sp., are identified. Based on new material and a re-examination of previous findings, *H. youngi* is substantially revised by adding several newly recognized anatomical features that include flared lateral cusplets, orthodont crown with a pulp cavity surrounded by numerous dentine tubules, and a monognathic heterodonty. The results indicate that at least two different hybodont sharks (crown width: 3.2–12.0 mm, crown height: 1.8–6.6 mm), associated with *Saurichthys* (ca. 1 m in total length based on complete skeleton), occupied the higher trophic levels of the Chang 7 Member's lacustrine ecosystem. The re-establishment of large predator niches encompassing diverse large predators with multiple dietary habits further supports the full recovery of the lacustrine ecosystem structure 10 Myr after the EPME.

Acknowledgements: This study was financially supported by the National Natural Science Foundation of China (Nos. 41876124, 42172009) and State Key Laboratory of Shale Oil and Gas Enrichment Mechanisms and Effective Development (No. G5800-19-ZS-KFGY003).

"ONCE MORE INTO THE BREACH, DEAD FRIENDS": DYNAMIC BEHAVIOUR IN THE GIANT SUSPENSION-FEEDING PACHYCORMID *LEEDSICHTHYS*

J.J. Liston[1,2,3*], D.W. Naish[4]

[1]Preservation & Research, Royal Tyrrell Museum of Palaeontology, Drumheller, AB TOJ OYO, Canada.

[2]Fachgruppe Paläoumwelt, GeoZentrum Nordbayern, Friedrich-Alexander Universität Erlangen-Nürnberg, 91054 Erlangen, Germany.

[3]Palaeobiology Section, Department of Natural Sciences, National Museums Scotland, Chambers Street, Edinburgh, EH1 1JF, Scotland.

[4]School of Biological Sciences, Faculty of Environment and Life Sciences, University of Southampton, University Road, Southampton, SO17 1BJ, UK.

*presenting author, leedsichthys@gmail.com

Keywords: *Pachycormidae, planktivory, breaching,* Cetorhinus*,* Leedsichthys

The zenith of osteichthyan suspension-feeding, *Leedsichthys* is a giant planktivorous actinopterygian from the Middle/Late Jurassic, the largest individual known reaching an estimated 16.5 m in standard length. Fossils of this pachycormid from South America and Europe represent occurrences in the Western Tethys and the east of Panthalassa, indicating a global distribution via the Viking and/or Hispanic Corridors. Efforts to visualise its behaviour have mostly involved slow swimming, near-surface feeding on plankton with occasional considerations of its ability to avoid and survive predation. Based on integration of physiological evidence, velocity modelling and energy budgets, we propose that *Leedsichthys* might have performed far more dynamic and extreme behavioural acts during its life. Perhaps most often observed in humpback whales, breaching is a widespread behaviour in pelagic fishes, known in rays, sharks, billfishes, ocean sunfishes, tuna, and others. Although many of these fish are recognised as being able to travel at high speeds, thus making attainment of aquatic escape velocity relatively unsurprising, recent observations have confirmed that a comparatively slow extant giant planktivorous marine fish—*Cetorhinus*, the basking shark—is a capable breacher, some breaches resulting in whole-body escape from the water and involving ascent speeds (2.7 m/s^{-1}). Breaching behaviour may serve several functions, including parasite removal, play and signalling associated with territoriality or sexual advertising. Given the applicability of these criteria to this animal and its modelled physiological constraints, we conclude that *Leedsichthys* was indeed able to perform what must have been a truly spectacular event to witness atop the Jurassic seas.

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

AN ARMORED MARINE REPTILE FROM THE EARLY TRIASSIC OF SOUTH CHINA WITH IMPLICATIONS FOR THE PHYLOGENY OF ARCHELOSAURIA

J. Liu[1*], A.S. Wolniewicz[1], Y. Shen[1], Q. Li[1], Y. Qiao[1], Y. Sun[1], Y.-W. Hu[1]

[1]School of Resources and Environmental Engineering, Hefei University of Technology, Hefei 230009, China.

*presenting author, junliu@hfut.edu.cn

Keywords: *Sauropterygia, Saurosphargidae, body plan, Testudinata, Archosauromorpha*

Sauropterygia is a taxonomically and ecomorphologically diverse clade of Mesozoic marine reptiles spanning from the Early Triassic to the Late Cretaceous. Sauropterygians are traditionally divided into two groups representing two markedly different body plans—the short-necked, durophagous Placodontia and the long-necked Eosauropterygia—whereas Saurosphargidae, a small clade of marine reptiles possessing a dorsal 'rib-basket', were previously recovered as the sauropterygian sister group. However, the early evolutionary history of sauropterygians and their phylogenetic relationships with other groups within Diapsida are still incompletely understood. Here, we report a new saurosphargid from the late Early Triassic (late Olenekian) of South China, representing the earliest known occurrence of the clade. An updated phylogenetic analysis, focusing on the interrelationships within diapsid reptiles, recovers saurosphargids as nested within sauropterygians, forming a clade with eosauropterygians to the exclusion of placodonts. Furthermore, a clade comprising *Eusaurosphargis* and *Palatodonta* is recovered as the sauropterygian sister group. The phylogenetic position of several Early and Middle Triassic sauropterygians of previously uncertain phylogenetic affinity, such as *Atopodentatus*, *Hanosaurus*, *Majiashanosaurus,* and *Corosaurus*, is also clarified, elucidating the early evolutionary assembly of the sauropterygian body plan. Finally, our phylogenetic analysis recovers Testudinata and Archosauromorpha within Archelosauria, a result strongly supported by molecular data but until now rarely recovered by any phylogenetic analysis using a morphology-only dataset. Our study provides evidence for the rapid diversification of sauropterygians in the aftermath of the Permo-Triassic mass extinction event and emphasises the importance of broad taxonomic sampling for reconstructing phylogenetic relationships among extinct taxa.

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

NEW FOSSIL REMAINS AND HISTOLOGICAL STUDY OF *DIPLOCYNODON RATELII* (CROCODYLIA: DIPLOCYNODONTIDAE) FROM THE MIDDLE MIOCENE SITE OF ELS CASOTS (CATALONIA)

P. Logrosán Soriano[1*], À.H. Luján[1,2], C. Nacarino-Meneses[1], A. Villa[1], J. Abella[3,1,4], J. Madurell-Malapeira[5,6], I. Casanovas-Vilar[1]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Cerdanyola del Vallès, Barcelona, Spain.

[2]Department of Geological Sciences, Faculty of Sciences, Masaryk University, 611 37 Brno, Czech Republic.

[3]Grup d'investigació en Paleontologia de Vertebrats del Cenozoic (PVC-GIUV), Departament de Botànica i Geologia, Universitat de València, 46100 Burjassot, Valencia, Spain.

[4]Instituto Nacional de Biodiversidad (INABIO). Pje. Rumipamba N. 341y Av. de los Shyris (Parque La Carolina), Quito, Ecuador

[5]Earth Science Department, University of Florence,Via G. La Pira 4, 50121 Florence, Italy.

[6]Departament de Geologia, Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting autor, paula.logrosan@gmail.com

Keywords: *Eusuchia, Alligatoroidea, Vallès-Penedès Basin, bone histology, growth rates*

Els Casots (Subirats, Catalonia) is one of the richest vertebrate localities in the Vallès-Penedès Basin and is considered a major reference site for the European early Middle Miocene (MN5, early Aragonian subzone Cb). The fossil remains of crocodylians are abundant, but only the skulls and isolated elements, such as osteoderms and teeth, had been found so far, being attributed to *Diplocynodon ratelii*. During the 2021 excavation campaign, a nearly complete skeleton was found in anatomical connection (IPS127899). A combination of cranial and postcranial features supports its assignment to *D. ratelii*, such as: (1) a distinct dorsoventral step on the frontal, (2) the slightly concavo-convex frontoparietal suture, and (3) keeled dorsal osteoderms and bipartite ventral osteoderms. Estimated total length of the individual is 1.38 m, the size of the smallest crocodylian species. Like extant small crocodylians (e.g., *Paleosuchus trigonatus* and *Paleosuchus palpebrosus*), *D. ratelii* was likely a generalist predator that preyed on small animals. To provide an initial insight into the paleobiology of the species, we also analyzed the histology of an isolated femur of *D. ratelii* (IPS35075) found in previous excavations. The primary bone tissue found in the thin sections studied (i.e., parallel-fibered bone) suggests similar growth rates to extant alligators. Future histological studies will focus on the analysis of vascular canals and lines of arrested growth to obtain more detailed information on the growth pattern of *D. ratelii*.

Acknowledgements: Funded by R+D+I project PID2020-117289GB-100 (MCIN/AEI/10.13039/501100011033/), OSIC project CLT0009_22_000019 (Departament de

Cultura, Generalitat de Catalunya), Generalitat de Catalunya/CERCA Programme, AGAUR (2021 SGR 00620, 2019 BP 00154 to À.H.L, 2021 BP to C.N.M.), Agencia Estatal de Investigación (FCI2019-039443-I/AEI/10.13039/501100011033 to A.V). Preparation of IPS127899 was defrayed by the Ajuntament de Subirats.

RE-EVALUATION OF THE TOMISTOMINE CROCODYLIAN REMAINS FROM THE LUTETIAN LOCALITY OF TURÓ DEL CASTELL, BANYOLES MARL FORMATION (CATALONIA)

P. Logrosán Soriano[1*], A. Sellés[1,2], K.A. Vega-Pagán[1], S. Mestres[1], J. Gamarra[3], À.H. Luján[1,4]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Museu de la Conca Dellà, c/ del Museu 4, 25650 Isona, Lleida, Spain.

[3]Departamento de Paleobiología, Museo Nacional de Ciencias Naturales-CSIC, c/ José Gutiérrez Abascal 2, 28006 Madrid, Spain.

[4]Department of Geological Sciences, Faculty of Sciences, Masaryk University, Kotlářská 267/2, 611 37 Brno, Czech Republic.

*presenting author, paula.logrosan@gmail.com

Keywords: *taxonomy, Tomistominae, osteoderm, Eocene, Ebro Basin*

The crocodyliform assemblage from the Eocene of the Iberian Peninsula is composed of an array of lineages, including the sebecosuchian *Iberosuchus*, the crocodylid *Asiatosuchus*, the planocraniid *Duerosuchus*, and the basal alligatoroid *Diplocynodon*, being particularly well-represented in the Duero Basin and the central Ebro Basin. However, scarce evidence has been recovered from the eastern part of the Ebro Basin. In 1960, skeletal remains of a crocodylian were found in the middle Lutetian (middle Eocene) locality of Turó del Castell (Banyoles Marl Formation, NE Iberian Peninsula). Earliest studies speculated about the taxonomic attribution of these remains, proposing a tomistomine affinity based on the fact that tomistomines were, according to the knowledge of that time, the only Iberian crocodylian inhabitant of coastal-to-marine environments, being interpreted as such for Turó del Castell. However, morphological evidence supporting this attribution was missing. Here, we re-evaluate the previously described crocodylian remains (13 elements), as well as several associated additional cranial (teeth, skull) and postcranial (radius, metapodial, ischium, dorsal osteoderms, and thoracic, cervical and caudal vertebrae) remains. The diagnostic features preserved in the teeth (large, elongated, and conical) and osteoderms (with few and large subcircular pits along the surface) corroborate the original assignment of the material to the subfamily Tomistominae. This study confirms, therefore, the presence of this clade in the eastern Ebro Basin, where the genus *Diplocynodon* is the most common crocodylian taxon. Furthermore, the evidence of hyaline foraminiferans at the Turó del Castell site confirms a marine/estuarine sedimentary environment suitable for the habitat preferences of tomistomines.

Acknowledgements: Funded by R+D+I project PID2020-117289GB-I00 (MCIN/AEI/10.13039/501100011033/), CERCA Programme/Generalitat de Catalunya, AGAUR (2021 SGR 00620, 2022 SGR 01192 BP 00154 to À.H.L., and 2022 FI_B 00362 to K.A.V.P.).

NEW INSIGHTS ON *DIPLOCAULUS* PALEOBIOLOGY BASED ON COMPUTATIONAL FLUID DYNAMICS

M. López-Pachón[1*], J. Marcé-Nogué[1,2], O. Sanisidro[3], J. Fortuny[2]

[1]Department of Mechanical Enginering, Universitat Rovira i Virgili, Address, 43007 Tarragona, Spain.

[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[3]Departmento de Botánica y Geología, Universitat de València, C/ Dr. Moliner 50, 46100 Burjassot, Valencia, Spain.

*presenting author, matheo.lopez@urv.cat

Keywords: *hydrodynamics, Nectridea, fluids, drag, lift, turbulence*

Some members of Lepospondyli are renowned for their bizarre cranial morphology with hyperextended tabular horns, with *Diplocaulus* being the most iconic case with a boomerang shape skull. However, its function and the covering of the skin are not yet clear. Two 3D models of the Permian taxon *Diplocaulus magnicornis* were studied using computational fluid dynamics (CFD). The first model includes a head membrane within both tabular horns while the other model is faithful to its bone structure. Hybrid meshes were used with prisms near the skin surface to capture the boundary layer and tetrahedra in the far field, specifically in the volume control. The boundary conditions for both models were analyzed using several speed conditions corresponding to the river habitats where this animal lived. In addition, oblique orientations of the models were tested to analyze the hydrodynamic behavior when moving up or down in the water column to feed. Numerical results in both models showed differences in the drag and lift coefficients, variation in their pressure, and important changes in the vorticity field around the horns, among other results, confirming the hydrodynamic influence of the membrane on the horns of this taxon. On the other hand, the oblique positions showed benefits in terms of downforce, which suggests that the best strategy to catch their prey would be from above.

Acknowledgements: This research has been funded by the European Union's Horizon 2020 research and innovation programme under the Marie Skodowska-Curie grant agreement No. 945413, the Universitat Rovira i Virgili,,the projects PID2020-117118GB-I00 (MCIN/AEI/10.13039/501100011033), AGAUR 2021 SGR 01184, CERCA Programme/Generalitat de Catalunya and Agencia Estatal de Investigación (RYC2021-032857-I MCIN/AEI/ 10.13039/501100011033 “European Union NextGenerationEU/PRTR”).

INTRODUCING 'TRIDENT': A FREE OPEN-SOURCE GRAPHICAL TOOL FOR DISCRIMINATING GROUPS USING DENTAL MICROWEAR TEXTURE ANALYSIS

M. Louail[1*], G. Thiery[1,2], A. Francisco[3], E. Berlioz[4], C. Blondel[1], N. Brunetière[3], A. Ramdarshan[1], A.E.C Walker[1], G. Merceron[1]

[1]PALEVOPRIM Laboratory, CNRS & University of Poitiers, TSA 51106, 86073 Poitiers Cedex 9, France.

[2]Center for Evolutionary Origins of Human Behavior EHUB, Kyoto University Museum, 606-8501 Yoshida-honmachi, Sakyo-ku, Kyoto, Japan.

[3]Pprime Institute, CNRS, University of Poitiers, TSA 41123, 86073 Poitiers CEDEX 9, France.

[4]Grupo de I+D+i EVOADAPTA (Evolución Humana y Adaptaciones Económicas y Ecológicas durante la Prehistoria), Dpto. Ciencias Históricas, Universidad de Cantabria, Av. Los Castros 44, 39005 Santander, Spain.

*presenting author, margot.louail@univ-poitiers.fr

***Keywords**: diet inference, dental abrasion, tribology, multivariate analysis*

Dental microwear texture analysis (DMTA) is a prominent 3D method for investigating diets of extant and extinct species of mammals. Despite its reliability, DMTA faces methodological challenges. Indeed, surfaces with distinct structures can be concealed in the average signal when considering some variables, while they have the potential to discriminate more significantly groups with different diets. To fill this gap, we introduce 'Trident', an open-source R package with user interface including a subsampling procedure for performing DMTA. It imports .SUR files, removes aberrant peaks from surfaces, and can subtract polynomial surfaces. Then, it can measure up to 384 variables, corresponding to 24 texture parameters and their statistics (mean, median, standard deviation, skewness…) of distribution over the surface. The computed variables can be classified according to their ability to discriminate discrete categories. At last, 'Trident' can display the results in univariate graphs and in multivariate analyses. We here present the use of 'Trident' in three case studies, showing how it helps answer questions commonly investigated by paleontologists and archaeologists. First, we separate microwear texture of four controlled-fed groups of pigs based on their diets. Second, we identify discriminant microwear texture parameters in 15 extant species of primates that we relate to biomechanical and ecological factors. Third, we infer the diet of an extinct antelope from the Pleistocene of Greece thanks to a present-day model set up with sympatric European species of ruminants. These case studies show how 'Trident' can leverage the results of DMTA.

Acknowledgements: This study was funded by the French National Agency for Research (ANR-13-JSV7-0008-01 Trident, PI: G.M.; ANR-17-CE27-0002-02 DIET-Scratches, PIs: G.M., Stéphane Ferchaud).

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

NEW DISCOVERY OF A THAUMASTOCYONINAE (AMPHICYONIDAE, CARNIVORA) FROM THE MIOCENE OF EAST ASIA

D. Lu[1,2*], X. Ni[1,2], G. Métais[3]

[1]Key Laboratory of Vertebrate Evolution and Human Origins, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Science, 142 Xizhimenwai Street, 100044, Beijing, China.

[2]University of Chinese Academy of Sciences, 19A Yuquan Road, 100049, Beijing, China.

[3]Centre de Recherche sur la Paléobiodiversité et les Paléoenvironnements, UMR 7207 (CNRS, MNHN, UPMC), Sorbonne Université, Muséum national d'Histoire naturelle, 8 rue Buffon, 75005, Paris, France.

*presenting author, ludan@ivpp.ac.cn

Keywords: *Thaumastocyonini,* Peignecyon*, Asia, China, Tongxin*

The family Amphicyonidae (Caniformia, Carnivora) was a highly prosperous and ecologically diverse group of extinct carnivorans widely distributed throughout Eurasia, North America, and Africa during the Miocene. Among them, the subfamily Thaumastocyoninae includes specialized taxa that show a trend towards hypercarnivory. Previously known thaumastocyonines are usually rare and represented by mandibles or isolated teeth, except for one species found in Spain. Here, we report new thaumastocyonine fossil remains from the late Early or early Middle Miocene of the Tongxin area of Ningxia Province, China. These include a cranium with articulated mandible and another nearly intact cranium. The reduced mesial premolars (P1–P3/p1–p3) and postcarnassial molars, and the moderately sectorial carnassials (P4/m1) retaining a metaconid suggest that these specimens represent a new species of the genus *Peignecyon*. The new species is distinguished from *Peignecyon felinoides* by its more reduced lingual cingula on the upper molars, larger p4 relative to m1, presence of a prominent mesial accessory cuspid on p4, and swollen lingual wall of the basal metaconid on m1. The new thaumastocyonine material represents the second record ever known of the subfamily and the most complete amphicyonid in Asia. We analyzed the phylogenetic relationships of the new species within the Thaumastocyoninae to explore the evolutionary sequence of the hypercarnivorous tribe Thaumastocyonini. The large size and hypercarnivorous teeth of the Chinese thaumastocyonine species indicate that it was undoubtedly one of the top predators in the local fauna.

Acknowledgements: This project has been supported by the Strategic Priority Research Program of Chinese Academy of Sciences (XDB26030300), the National Natural Science Foundation of China (41888101, 41988101, 41625005), and the China Scholarship Council scholarship (No. 202104910318).

THE EARLY PALEOGENE SALAMANDER ASSEMBLAGES OF EUROPE: PRELIMINARY DATA FROM THE COLLECTIONS OF THE MUSÉUM NATIONAL D'HISTOIRE NATURELLE

L. Macaluso[1,2]*, M. Delfino[1,3]

[1]Dipartimento di Scienze della Terra, Università degli Studi di Torino, Via Valperga Caluso 35, 10125, Turin, Italy.

[2]Zentralmagazin Naturwissenschaftlicher Sammlungen, Martin-Luther-Universität Halle-Wittenberg, Domplatz 4, 06108, Halle (Saale), Germany.

[3]Institut Català de Paleontologia Miquel Crusafont, Edifici ICTA-ICP, c/ Columnes, s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, loredana.macaluso@unito.it

Keywords: *Caudata, taxonomy, late Paleocene, early Eocene, isolated fossil remains*

The European Paleogene fossil record is essential to find the roots of the extant salamander groups. It includes several unclassified isolated specimens (mainly vertebrae) scattered among different collections, awaiting for a precise taxonomic identification. This study results from a preliminary analysis of the salamander material housed in the collections of the Muséum national d'Histoire naturelle. These collections host a large part of the material from the early Paleogene salamander-bearing localities in Europe, including the late Paleocene French complex of localities of Cernay (including the localities of Cernay, Rilly and Mt. Berru) and three early Eocene localities of Portugal (Silveirinha) and France (Le Quesnoy and Prémontré). From Cernay, the enigmatic species *Palaeoproteus gallicus* was firstly described and the recently revised material referable to this taxon counts at least six dentaries, 26 trunk vertebrae, and 17 atlantes, including the previously unreported, first complete isolated atlas of a European batrachosauroidid. From the same locality, two vertebrae attributed to genus *Koalliella* are among the oldest occurrences of a salamandrid in Europe, and a previously unreported isolated vertebra shares similarities with *Geyeriella mertensi* from the almost coeval locality of Walbeck (Germany). The three localities from the early Eocene yielded a couple dozen trunk vertebrae referable to *Koalliella*. The two French Eocene localities share the presence of a “large-sized” salamandrid taxon, which can be identified as *Chelotriton* sp. thanks to the thick and ornamented neural crest, whereas a newt morphologically close to the extant *Lissotriton* is present at Silveirinha and Le Quesnoy.

Acknowledgements: L.M. received support from the Synthesys+ Transnational Access grant (application number FR-TAF_Call4_055) and thanks Jonathan Blettery and Damien Germain (Muséum national d'Histoire naturelle, Paris) for the kindness and helpful presence during her visit to the collections.

ON THE ONTOGENETIC OSSIFICATION OF THE ETHMOID COMPLEX IN SAUROPODS THROUGH THE STUDY OF A TURIASAUR BRAINCASE FROM THE BERRIASIAN/EARLY VALANGINIAN OF ANGEAC-CHARENTE, FRANCE

B. Maggia[1*], R. Allain[1]

[1]Centre de Recherche en Paléontologie – Paris (CR2P), CNRS/MNHN/Sorbonne Université, Muséum national d'Histoire naturelle, CP 38, 57 rue Cuvier, F-75231, Paris cedex 05, France.

*presenting author, brunomaggia@gmail.com

***Keywords**: braincase, sauropod, turiasaur, Cretaceous, Angeac-Charente*

The ethmoidal complex corresponds to the anterior part of the olfactory bulb cavity and is composed of two parts: the sphenethmoid and mesethmoid. This complex is usually cartilaginous in sauropods. However, four ossified sphenetmoids have been reported in sauropods (*Camarasaurus*, *Diplodocus*, *Amargasaurus*, and *Bonatitan*). This phenomenon is polymorphic and is present in only one specimen for each of those sauropods. The ossification is rare and the origin of this ossification is poorly understood. In 2018, a sauropod braincase (ANG 18-5962) was found in the Early Cretaceous (Berriasian/Early Valanginian) locality of Angeac-Charente, France. The study of cranial anatomy suggests turiasaur affinities, such as the presence of two small pits on the supraoccipital similar to the pits described in *Turiasaurus* and *Mierasaurus*. The exceptional preservation of the braincase also allowed a detailed study of rare structures in sauropod anatomy, such as the ossified sphenethmoid. ANG 18-5962 presents numerous proofs of advanced ontogeny, like the completely fused interfrontal suture, the almost completely fused interparietal suture, and the ossified crista interfenestralis, which are characteristic of mature sauropod individuals. The braincases of both *Amargasaurus* (MACN-N 15) and *Bonatitan* (MACN-PV RN 821) are also characterized by an advanced ontogeny. Furthermore, we identified in the largest braincase of *Moabosaurus* (BYU 14494) the most complete ossified ethmoid complex in sauropods, with the presence of both sphenethmoid and mesethmoid. In conclusion, the ossification of the ethmoidal complex in sauropods seems to correspond to a mature or hypermature ontogenetic stage even if some other parameters like phylogeny may be involved.

Acknowledgements: We want to thank Colas Bouillet, Yohan Depres, Florent Goussard, and Lilian Cazes for preparing, digitizing, and photographing ANG 18-5962. We also want to thank Rafael Royo-Torres, Lawrence M. Witmer, Ariana Paulina-Carabajal, Paul C. Sereno, Michael D'Emic, and Jose Carballido for sending us pictures and/or 3D models of sauropod braincases.

ABELISAURID TEETH FROM THE UPPER CRETACEOUS OF POYOS (GUADALAJARA, SPAIN)

E. Malafaia[1,2*], R.A. Coria[3], F. Escaso[2], F. Ortega[2]

[1]Instituto Dom Luiz, Faculdade de Ciências, Universidade de Lisboa, Edifício C6, Campo Grande, 1749-016 Lisboa, Portugal.

[2]Grupo de Biología Evolutiva, Facultad de Ciencias, Universidad Nacional de Educación a Distancia (UNED), Avda. Esparta s/n, 28232 Las Rozas de Madrid, Madrid, Spain.

[3]Museo Carmen Funes, Av. Córdoba 55 (8318), Plaza Huincul, Neuquén, Argentina.

*presenting author, efmalafaia@ciencias.ulisboa.pt

Keywords: *Dinosauria, Theropoda, Abelisauridae, Late Cretaceous, Spain*

The Campanian–Maastrichtian locality of Poyos (Villalba de la Sierra Formation, Guadalajara, Spain) has yielded an abundant fossil record of reptiles, mostly composed of eggs and bones of sauropod dinosaurs, but also by materials attributed to turtles, crocodiles, pterosaurs, and theropod dinosaurs. Among those, elements belonging to a medium-sized theropod have been preliminarily attributed to Abelisauroidea. Here we describe a sample of isolated theropod teeth collected in Poyos and discuss their taxonomic attribution based on statistical (including morphometric) and morphological analyses. The sample includes about twenty isolated, relatively complete, and well-preserved tooth crowns. They correspond to relatively large-sized teeth with crown heights between 22 and 58 mm (38 mm in average) and are strongly labiolingually compressed (crown base ratio = 0.6 in average). The combination of morphological and morphometric features is compatible with that described for abelisaurid lateral teeth, based on the crowns with a weakly convex to almost straight distal profile, a mesial carina mostly extending to the cervix or very close to it, and a distal carina centrally placed on the distal margin. The Poyos specimens have relatively elongated and distally curved crowns, which are similar to the teeth associated with the holotype of *Arcovenator escotae* from the late Campanian of France and to some isolated teeth referred to this species from various Upper Cretaceous localities of Spain. This analysis supports the presence of a medium-sized abelisaurid in Poyos and confirms that this clade was a relatively common component on the theropod fauna from the European Late Cretaceous.

Acknowledgements: This research is funded by projects PID2019-111488RB-I00 (Ministerio de Ciencia e Innovación del Gobierno de España); SBPLY/21/180801/000045 and SBPLY/22/180801/000027 (Junta de Comunidades de Castilla-La Mancha), and by the Portuguese Fundação para a Ciência e a Tecnologia (FCT) I.P./MCTES through national funds (PIDDAC) – UIDB/50019/2020 and CEECIND/01770/2018.

DRIVERS OF INTRASPECIFIC VARIATION IN *IGUANODON BERNISSARTENSIS* (ORNITHISCHIA, DINOSAURIA): A PRELIMINARY 3D INVESTIGATION OF FOOT BONES

C. Mallet[1*], R. Rocchi[2], F. Bertozzo[3], P. Godefroit[3], V. Fischer[1]

[1]Evolution & Diversity Dynamics Lab, UR Geology, University of Liège, Quartier Agora, Allée du six Août, 14, 4000 Liège, Belgium.

[2]Department of Biological, Geological, and Environmental Sciences, Alma Mater Studiorum University of Bologna, Via Zamboni, 33, 40126 Bologna, Italy.

[3]Operational Directorate Earth and History of Life, Royal Belgian Institute of Natural Sciences, Rue Vautier, 29, 1000 Bruxelles, Belgium.

*presenting author, cmallet@uliege.be

Keywords: Iguanodon*, Bernissart, phalanges, 3D geometric morphometrics, allometry*

Within vertebrates, age, sex, and mass are factors that can drive intraspecific variation in bone shape. The observed variation can thus help to understand the palaeobiology of an extinct species or a population. A proper apprehension of intraspecific variation requires a sampling threshold that is rarely met in fossil taxa, notably in dinosaurs. The dozens of specimens of *Iguanodon* found at Bernissart (Belgium) are thus an exception and still constitute to this day the largest assemblage of articulated skeletons of heavy dinosaurs worldwide. Yet, despite this unparalleled concentration of skeletons, their intraspecific variation remains poorly understood, due to the difficult access to the specimens and the severe taphonomic processes that have damaged them. Data gathered by the project Iguanodon 2.0, aiming at a complete 3D digitization of all well-preserved specimens (using white-light surface scanners), allows the first 3D exploration of the intraspecific shape variation in *Iguanodon*. Our first analyses focus on 120 foot bones of 32 specimens, which are the less deformed and likely to bear a marked functional signal. Geometric morphometric analyses indicate that shape variation is dominated by ontogenetic allometry. The supposed individual mass has little effect on shape and no evidence of sexual dimorphism can be clearly observed. These preliminary results call for an extension of this approach to the more versatile hand bones to fully apprehend what factors drive variation in the autopodium of *Iguanodon*.

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

TESTING HOMOGENEITY OF CRANIAL MECHANICAL PROPERTIES IN A *GALLOTIA* SKULL BY INDENTATION METHODS: IMPLICATIONS FOR FOSSIL GIANT LIZARDS

J. Marcé-Nogué[1,2*], N. Cuadrado[3,4], E. Vidales[3], P. Cruzado-Caballero[5,6], C. Castillo[5], J. Fortuny[2]

[1]Department of mechanical engineering, Universitat Rovira i Virgili, Avinguda Països Catalans, 26, Campus Sescelades, 43007, Tarragona, Spain.

[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[3]Eurecat, Centre Tecnològic de Catalunya, Unit of Metallic and Ceramic Materials, Plaça de la Cièncica 2, 08243, Manresa, Spain.

[4]Department of Science and Material Engineering, Universitat Politècnica de Catalunya, Av. Eduard Maristany, 10-14, 08019, Barcelona, Spain.

[5]Departamento de Biología Animal, Edafología y Geología, Universidad de La Laguna, Av. Astrofísico Francisco Sánchez s/n, San Cristobal de La Laguna, 38200, Spain.

[6]Grupo Aragosaurus-IUCA, Facultad de Ciencias, Universidad de Zaragoza, C/ Pedro Cerbuna, 12, 50009 Zaragoza, Spain.

*presenting author, jordi.marce@urv.cat

Keywords: Gallotia*, indentation methods, material properties, sutures, skull*

Gallotia is an endemic genus of lizards from the Canary Islands (Spain). Different extant and extinct *Gallotia* species are known from each island, being *Gallotia stehlini* (Lacertidae, Gallotiinae) the largest endemic living species. Fossil records of this gigantic species existed since the Pleistocene being surpassed in size only by the extinct *Gallotia goliath*. We used nanoindentation techniques to determine the Young's modulus along the cranium, mandible, teeth, and sutures of the skull of the giant *G. stehlini*. Nanoindentation mappings were performed using a nanoindenter equipped with a Berkovich tip and covering a specific bone area. In that manner, with a single nanoindentation mapping, skull bones were characterized by their mechanical behavior. Young's modulus mappings were obtained in different locations representing different bones of the cranium and mandible, such as the frontal, parietal, quadrate, pterygoid, coronoid, the dentary, and the surrounding suture areas of each of these bones, as well as teeth. The obtained values of the Young's modulus showed a homogeneous distribution of the mechanical properties along the bones of the cranium but were higher in some areas of the mandible. As expected, suture values were lower, describing a softer material, while dentine was in the same range as the bones. The results obtained help to elucidate how bony properties can explain the mechanical behavior of the skull of extant *G. stehlini* during feeding and they will be crucial in further steps to test cranial mechanics of the extinct giant *G. goliath* for deepening its paleoecology.

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

Acknowledgements: This research has received support through the project PID2020-117118GB-I00 funded by MCIN/AEI/10.13039/501100011033, the consolidated research group 2021 SGR 01184, and the CERCA Programme/Generalitat de Catalunya. J.F. acknowledges RYC2021-032857-I grant funded by MCIN/AEI/10.13039/501100011033 and by "European Union NextGenerationEU/PRTR".

RESTORATION AND MOUNTING OF A LARGE SAUROPOD HUMERUS FROM THE LATE JURASSIC OF MOURISCAS (POMBAL, PORTUGAL)

F. Marcos-Fernández[1,2*], J. Fernández Martínez[2], E. Fernández Fernández[2], P. Mocho[3,2,4], A. Páramo[2], F. Ortega[2]

[1]Facultad de Bellas Artes, Universidad Complutense de Madrid, C/ Pintor el Greco 2, 28040 Madrid, Spain.

[2]Grupo de Biología Evolutiva, Universidad Nacional de Educación a Distancia (UNED), Avda. Esparta s/n, 28232 Las Rozas, Madrid, Spain.

[3]Instituto Dom Luiz, Faculdade de Ciências da Universidade de Lisboa, Edifício C6, Campo Grande, 1749-016 Lisboa, Portugal.

[4]Dinosaur Institute, Natural History Museum of Los Angeles County, 900 Exposition Blvd., 90007 Los Angeles, California, USA.

*presenting author, famarcos@ucm.es

***Keywords**: conservation, supports, preparation, large fossils, dinosaurs*

Some fossil remains, such as the appendicular elements or the ribs of large sauropods, reach large sizes and weights, making their conservation and handling complex and risky. The remains of a giant sauropod, whose humerus is 1.95 m long, were extracted from the Late Jurassic site of Mouriscas (Pombal, Portugal). The volume of this humerus was estimated at 124,000 to 187,000 cm^3 and its weight at 240 to 360 kg. At the time of its accidental discovery during the construction of the irrigation pond, the humerus was fragmented in three pieces. Here, the process of restoration and mounting of this humerus on a metal support is described. The surfaces were cleaned with a solution of an anionic agent gelled with carboxymethylcellulose until the matrix and superficial iron crusts were removed. After cleaning, it was consolidated with Paraloid® B72. The fossil was considered more stable in an upright position (close to its in vivo position). The iron support has a heavy base and a vertical iron stem from which some polyethylene foam covered fasteners protrude to hold the fossil. The three fragments were glued with loaded epoxy resin, using an intermediate layer of Paraloid® B72 to make the process reversible. After placement on the support, the three large pieces fit over each other, so no structural reinforcement was required. Finally, the fossil was reintegrated with glass microspheres bonded with Paraloid® B72 and coloured with acrylic paints.

Acknowledgements: Research funded by PID2019-111488RB-I00 (Ministry of Science and Innovation), and SBPLY/21/180801/000045 and SBPLY/22/180801/000027 (Junta de Comunidades de Castilla-La Mancha) projects.

TAPHONOMIC ANALYSIS OF A LATE JURASSIC ASSEMBLAGE FROM ALPUENTE (VALENCIA, SPAIN), THE CORRAL DE MARÍN SITE

M.D. Marin-Monfort[1], A. Gamonal[2], S. Sánchez-Fenollosa[3*], C. de Santisteban[4], M. Suñer[2]

[1]INGEOSUR, Departamento de Geología Universidad Nacional del Sur (UNS)-CONICET, C/ San Juan 670, 8000, Bahía Blanca, Argentina.

[2]Museo Paleontológico de Alpuente, Av. San Blas 17, 46178 Alpuente, Spain.

[3]Fundación Conjunto Paleontológico de Teruel-Dinópolis / Museo Aragonés de Paleontología, Av. Sagunto S/N, 44002 Teruel, Spain.

[4]Departamento de Botánica y Geología, Universitat de València, Av. Dr. Moliner 50, 46100 Burjassot, Spain.

*presenting author, sfenollosa@fundaciondinopolis.org

***Keywords**: taphonomy, Mesozoic, Los Serranos Region, vertebrates, deltaic environment*

The Corral de Marín site is located in the municipality of Alpuente (Los Serranos region, NW Valencia Province, Spain), at the eastern part of the Iberian Range, in the base of the Villar del Arzobispo Formation (late Kimmeridgian in age). The fossil assemblage is dominated by bones (mainly vertebrae) and teeth of a large teleosaurid thalattosuchian, but some turtle plates and invertebrate fossils (bivalves and gastropods) were also recovered. In this work, a preliminary taphonomic study is carried out through the examination of 76 vertebrate fossils. All the remains were found isolated, dispersed and with a low degree of breakage. Pre-burial weathering includes slight cracking in scarce elements. Abrasion is slightly developed and only in some elements. No signs of tooth marks were recognized in this preliminary analysis. After burial, the specimens were not deformed by lithostatic pressure. Root-etching was observed on some fossil bone surfaces, but the presence of modern plants associated to the fossils suggests that these marks were produced during recent times. Sedimentologic investigations indicate a deltaic paleoenvironment; the presence of laminated marls with anoxic characteristics containing the remains of vertebrates (absence of bioturbation, good preservation of the lamination, and abundance of limonite crusts and casts of plant remains) suggests estuarine conditions prior to a deltaic progradation. All these features point to a short time of subaerial exposure of a few remains and, for most of them, a relatively short transport, although enough for the disarticulation, scattering, and displacement of skeletal components.

Acknowledgements: The authors thank J.P. Albir and D. Romero their participation in this project. S.S.F. acknowledges the Unidad de Paleontología de Teruel financed by the Ministerio de Ciencia e Innovación, Gobierno de España.

THE NEW PROBLEM OF *CHINLESTEGOPHIS* AND THE ORIGIN OF CAECILIANS (AMPHIBIA, GYMNOPHIONOMORPHA) IS HIGHLY SENSITIVE TO OLD PROBLEMS OF SAMPLING AND CHARACTER CONSTRUCTION

D. Marjanović[1*], H.C. Maddin[2], J.C. Olori[3], M. Laurin[4]

[1]Evolutionary Morphology, Dynamics of Nature, Museum für Naturkunde Berlin – Leibniz Institute for Evolution and Biodiversity Science, Invalidenstraße 43, 10115 Berlin, Germany.

[2]Earth Sciences, Carleton University, 2115 Herzberg Laboratories, 1125 Colonel By Drive, Ottawa, ON K1S 5B6, Canada.

[3]Biological Sciences, State University of New York at Oswego, 30 Centennial Drive, Oswego, NY 13126, USA.

[4]CR2P (Centre de Recherches en Paléontologie – Paris), CNRS/MNHN/Sorbonne Université, Muséum National d'Histoire Naturelle, 43 rue Buffon, Paris cedex 75005, France.

*presenting author, david.marjanovic@gmx.at

***Keywords**: phylogeny, majority-rule consensus, Amphibia, Gymnophiona,* Chinlestegophis

The description of the small Late Triassic temnospondyl *Chinlestegophis* ushered in a potentially radically new understanding of the origins of the extant amphibian clades: together with the fragmentary *Rileymillerus*, *Chinlestegophis* was argued to link the extant caecilians to the Permo-Triassic stereospondyl temnospondyls. We discuss previously published and newly discovered problems with the comparative description of *Chinlestegophis* and with the accompanying phylogenetic analyses. Most of the features previously interpreted to be shared by caecilians, *Chinlestegophis* and/or other stereospondyls have different distributions than scored in the analysis. We find no evidence for an incipient tentacular sulcus in *Chinlestegophis*, and note that its vertebrae and unreduced ribs, dermal shoulder girdle, and ulna are unlike those of any extant amphibians (nor their likely sister group Albanerpetidae). Furthermore, the original matrices contain misscores accreted over more than a decade (some of which were reported more than a decade ago but subsequently ignored) that likewise influence the results. Some features are coded as multiple redundant characters—seven in the case of the double toothrow of *Chinlestegophis*, other stereospondyls, and caecilians. Analysis of the unmodified matrix yields much less resolution than originally reported, and topology is altered by small changes to the taxon sample, limited revisions of irreproducible scores, and ordering the most obviously clinal characters; any one of these changes removes *Chinlestegophis* from Lissamphibia. We also show that reports of adsymphysials in temnospondyls are unconvincing and find it unlikely that this bone bears the lingual mandibular toothrow of caecilians.

Acknowledgements: Jason Pardo and Adam Huttenlocker kindly sent us both matrices, and J. Pardo and Ben Kligman discussed certain characters with us. D.M.'s understanding of current issues

in phylogenetics benefited from a course taught by Tiago Simões and Oksana Vernygora and organized by Transmitting Science.

DISCOVERY OF SEVERAL MEDIUM-SIZED MORADISAURINE CAPTORHINIDS (REPTILIA) IN THE PERMIAN OF MALLORCA (WESTERN MEDITERRANEAN)

R. Matamales-Andreu[1,2*], E. Mujal[3,2], À. Galobart[2,4], J. Fortuny[2]

[1]Museu Balear de Ciències Naturals, FJBS-MBCN, Carretera Palma-Port de Sóller km 30,5, 07100 Sóller, Illes Balears, Spain.

[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[3]Staatliches Museum für Naturkunde Stuttgart, Rosenstein 1, 70191, Stuttgart, Germany.

[4]Museu de la Conca Dellà, c/ Museu 4, 25650, Isona i Conca Dellà, Lleida, Spain.

*presenting author, rafel.matamales@icp.cat

***Keywords**: Cisuralian, tetrapod, taxonomy, vertebrate palaeontology, central Pangaea*

Moradisaurine captorhinids are a group of high-fibre herbivores that inhabited the low latitudes of Pangaea during the Permian. Typical of this group are the tooth plates, with teeth arranged in 3–13 rows in both the maxilla and the dentary, depending on the species. Several moradisaurine taxa have been described from southern North America, and this subfamily is also known from South America, central and northern Africa, central Asia, eastern Europe, and the Mediterranean. In this last region, moradisaurine body fossils have been found in the Balearic Islands, both in Menorca and in Mallorca. In the latter, only a single maxillary fragment of an indeterminate, large species, was known until recently. During recent fieldwork campaigns on the island, four new moradisaurine specimens were recovered: two subadults and two juveniles. Three of them were discovered in an area of less than 1 m^2, in different horizons overlaying each other. They consist of semiarticulated skeletons with varying degrees of completeness, and represent the moradisaurines with the most complete postcrania recovered to date. The most complete subadult specimen (DA21/17-01-02) has been described as a new genus and species characterised by a unique combination of craniodental characters. It represents a different species from that of the large fragment of maxilla previously reported from the island, and sheds new light on the palaeobiodiversity of equatorial ecosystems along the eastern margin of central Pangaea.

Acknowledgements: To the Departament de Cultura, Patrimoni i Política Lingüística (Consell Insular de Mallorca) for funding of the project ref. 15 - 619/2020. To AGAUR (2021 SGR 01184), CERCA Programme/Generalitat de Catalunya, and Agencia Estatal de Investigación (PID2020-117118GB-I00 and RYC2021-032857-I to J.F., MCIN/AEI/10.13039/501100011033 “European Union NextGenerationEU/PRTR”).

WHY DO ICHTHYOSAURS HAVE A HYPOCERCAL TAIL? ADAPTATION VS. CONSTRAINT IN CONVERGENT EVOLUTION

E.E. Maxwell[1*]

[1]Staatliches Museum für Naturkunde Stuttgart, Rosenstein 1, 70191 Stuttgart, Germany.

*presenting author, erin.maxwell@smns-bw.de

***Keywords**: Convergence, hypocercal fin, Mesozoic, marine reptiles*

The way in which questions are framed can bias how we view longstanding problems in palaeontology. Such is the case for the evolution of the caudal fin in axially propelled secondarily aquatic tetrapods. In aquatic diapsids, a dorsal lobe lacking skeletal support and a lower (hypaxial) lobe supported by the ventral deflection of the vertebral column form a hypocercal caudal fin. This configuration evolved at least three times independently in Mesozoic marine reptiles. The reverse pattern, an epicercal fin, is found in sharks. The difference between these configurations has been framed as a question of differing functional requirements related to respiration and buoyancy, which has structured how the problem is approached. However, the epicercal fin of selachians is a primitive configuration; thus, is not necessarily adaptive for a particular habitat or swimming style, whereas the hypocercal fin in secondarily aquatic reptiles is an evolutionary novelty. Whereas, in theory, an epicercal or hypocercal fin should be equally likely to evolve in aquatic diapsids, either selection or constraint appears to bias the outcome in favour of a hypocercal configuration. A constraint-based hypothesis, in which an unsupported fin is more likely to evolve on the dorsal surface of the tail in a semiaquatic ancestral form, creates an adaptive landscape in which a hypocercal fin is the most frequent outcome during the early evolution of a caudal fin in secondarily aquatic reptiles. Viewing morphological convergence through a slightly different lens can lead to novel insights and better define adaptation constraints in body plan evolution.

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

EARLIEST VALLESIAN SUID REMAINS FROM CASTELL DE BARBERÀ (VALLÈS-PENEDÈS BASIN, NE IBERIAN PENINSULA)

S. McKenzie[1*], S.G. Arranz[1], S. Almécija[2,3,1], D. DeMiguel[4,1], D.M. Alba[1]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Division of Anthropology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024, USA.

[3]New York Consortium in Evolutionary Primatology, New York, NY 10016, USA.

[4]ARAID Foundation/Universidad de Zaragoza, Departamento de Ciencias de la Tierra, and Instituto Universitario de Investigación en Ciencias Ambientales de Aragón (IUCA), c/ Pedro Cerbuna 12, 50009 Zaragoza, Spain.

*presenting author, sharrah.mckenzie@icp.cat

Keywords: *Suidae,* Propotamochoerus*,* Versoporcus*,* Parachleustochoerus*, Late Miocene*

The earliest Vallesian (~11.2 Ma; Late Miocene) site of Castell de Barberà (CB), in the Vallès-Penedès Basin (NE Iberian Peninsula), records a rich vertebrate fauna that remains to be fully described. Regarding its suid assemblage, the taxonomic identity of tetraconodontines remains uncertain, given controversies among authors and the limited material published so far. We describe the abundant sample of (mostly unpublished) suine and tetraconodontine remains from CB, including 208 isolated teeth and 14 dentognathic fragments/tooth series representing up to 274 teeth. Almost half of the sample belongs to the suine *Propotamochoerus palaeochoerus*, whose presence at CB is consistent with the Vallesian age supported by magnetostratigraphic data. Tetraconodontines are recorded by two species: the more abundant *Parachleuastochoerus valentini*, considered by some a junior synonym of *Conohyus simorrensis*; and a species of *Versoporcus*. The remains of *Pa. valentini* improve the knowledge of this species but do not resolve whether it is best attributed to *Parachleuastochoerus* or *Conohyus*. Those of *Versoporcus* encompass the variation of the two described species of this genus, supporting that *Versoporcus grivensis* is a junior synonym of *Versoporcus steinheimensis*, to which the CB fossils are consequently attributed. The suid assemblage from CB resembles that of the coeval locality of Creu de Conill (CCN20) in the dominance of *P. palaeochoerus* and the presence of *Pa. valentini*, but differs in the presence of a second tetraconodontine, the higher abundance of *Albanohyus*, and the presence of *Listriodon*. These differences suggest that CB records a more densely forested and humid environment than CCN20.

Acknowledgements: Funded by R+D+I project PID2020-117289GBI00 (MCIN/AEI/10.13039/501100011033 Generalitat de Catalunya/CERCA Programme, AGAUR (2021 SGR 00620), Departament de Cultura of the Generalitat de Catalunya (CLT0009_22_000018), a

predoctoral grant from the Confederated Tribes of Grand Ronde (CTGR) to S.M., and INVESTIGO Program 2022 (100027TC1, Next Generation EU) to S.G.A.

OVERVIEW OF THE SAUROPODA PALEODIVERSITY OF THE BLESA FORMATION (LOWER CRETACEOUS, TERUEL, SPAIN)

E. Medrano-Aguado[1*], J. Parrilla-Bel[1], J.I. Canudo[1,2]

[1]Grupo Aragosaurus-IUCA, Paleontología, Facultad de Ciencias, Universidad de Zaragoza, C/ Pedro Cerbuna 12, 50009 Zaragoza, Spain.

[2]Museo de Ciencias Naturales de la Universidad de Zaragoza, Universidad de Zaragoza, Plz. Basilio Paraíso 4, Ed. Paraninfo, 50005 Zaragoza, Spain.

*presenting author, emedranoaguado@unizar.es

***Keywords**: Barremian, Maestrazgo Basin, Titanosauriformes, Euhelopodidae*

The Blesa Formation is one of the richest formations of the Barremian of the Iberian Peninsula in terms of vertebrate biodiversity. It is divided in three depositional sequences and several vertebrate fossil sites have been registered in the last decades along all of them. The richest site is La Cantalera-1, in the Lower Blesa Sequence, with more than 32 vertebrate taxa identified. Before this study, the only sauropod remains found in this site were three isolated teeth related to Euhelopodidae. New sauropod material has been found: a tooth, a fragmented cervical vertebra, and a caudal vertebra assigned tentatively to Euhelopodidae. Furthermore, a left tibia, a left ischium, and a caudal vertebra have been recovered from different fossils sites in the Lower, Middle, and Upper Blesa sequences, respectively. These new sauropod remains from sites other than La Cantalera-1 have been assigned to Titanosauriformes, the most common group of dinosaurs in the Barremian of the Iberian Peninsula. The isolated character of the fossils prevents us from providing a more precise taxonomic assignment. There is no evidence in this formation of the presence of other sauropod groups described in the Iberian Peninsula, such as diplodocimorphs or titanosaurs. Sauropod remains are scarcer in this formation in comparison with other Barremian areas of the Iberian Peninsula where sauropod material is more common.

Acknowledgements: This work is funded by the Spanish Ministry of Science and Innovation (project PID2021-122612OB481) and by the Government of Aragón-FEDER (Group E18: Aragosaurus: Recursos Geológicos y Paleoambientales). Eduardo Medrano-Aguado is beneficiary of a PhD grant of the Aragón Government.

MORPHOLOGICAL EVOLUTION OF NORTH AMERICAN SQUIRRELS IN RESPONSE TO ENVIRONMENTAL CHANGE

I. Menéndez[1*], A.R. Gómez Cano[2], M.A. Álvarez-Sierra[3,4], M. Hernández Fernández[3,4]

[1]Museum für Naturkunde, Leibniz Institute for Evolution and Biodiversity Science, Invalidenstrasse 43, 10115, Berlin, Germany.

[2]Transmitting Science, c/ Gardenia 2, 08784 Piera, Barcelona, Spain.

[3]Departamento de Geodinámica, Estratigrafía y Paleontología, Facultad de Ciencias Geológicas, Universidad Complutense de Madrid, C/ José Antonio Novais 12, 28040 Madrid, Spain.

[4]Departamento de Cambio Medioambiental, Instituto de Geociencias (UCM, CSIC), C/ Severo Ochoa 7, 28040 Madrid, Spain.

*presenting author, iris.menendez@mfn.berlin

***Keywords**: Sciuridae, geometric morphometrics, adaptive peaks, diversification*

While it is known that the emergence of new habitats provides opportunities for species, which can lead to morphological adaptations and higher rates of diversification, the timing of such changes is not well understood. The adaptation of mammals to emerging North American grasslands during the Cenozoic is a well-studied case of adaptive evolution to new ecological opportunities. Previous research has suggested a decoupling between environmental change, morphological evolution, and diversification pulses. Here, we investigate whether squirrels (Sciuridae), one of the emblematic mammals that adapted to North American grasslands, followed the same pattern. Combining information from extinct and extant squirrels, we applied geometric morphometric analyses to their fourth lower premolar (p4) and explored their morphological evolution in North America. We used phylogenetic and multivariate comparative methods to model the evolution of morphological optima, and a Bayesian framework to estimate squirrel diversification patterns. The results show that new morphological optima related to eating grasses appeared during the Middle–Late Miocene and Pliocene, but there was an evolutionary lag between the emergence of arid grasslands in North America around 25 Ma and the morphological evolution of squirrel teeth. Despite this lag, we found synchronic changes in morphological and diversification trends, suggesting that climatic changes, such as aridification and increasing seasonality, were driving forces in mammalian evolution beyond the emergence of new resources alone.

Acknowledgements: I.M. acknowledges a Postdoctoral Fellowship from the Alexander von Humboldt Foundation.

THE PRESERVATION OF DINOSAUR TRACKS IN A WETLAND SYSTEM—AN EXAMPLE FROM THE LATE JURASSIC OF NORTH AMERICA (MORRISON FORMATION; PURGATOIRE VALLEY, COLORADO, USA)

C.A. Meyer[1*], L. Sciscio[2,3], M.G. Lockley[4], B.A. Schumacher[5], M. Belvedere[6]

[1]Department of Environmental Sciences, University of Basel, Bernoullistrasse 32, CH-4056, Basel, Switzerland.

[2]Jurassica Museum, Route de Fontenais 21, 2900, Porrentruy, Switzerland.

[3]Department of Geosciences, University Fribourg, Chemin du Musée 6, 1700, Fribourg, Switzerland.

[4]Dinosaur Trackers Research Group, University of Colorado at Denver, Denver, CO, USA.

[5]Minerals and Geology Management, United State Forest Service, Lakewood, CO, US.

[6]Dipartimento di Scienze della Terra, Università di Firenze, Via G. La Pira 4, 50121 Firenze, Italy.

*presenting author, chris.meyer@unibas.ch

Keywords: *ichnology, oolite, lake margin, dinoturbation, Late Jurassic*

The preservation of dinosaur tracks is crucial for a deeper understanding of ichnotaxonomy. Preservation is affected by the microfacies of a specific tracklayer and this is often neglected in studies of dinosaur tracks and has led to an oversplitting. Recent excavations in North America's largest tracksite (Ralston Creek Member; Morrison Formation) on the north side of the Purgatoire River have expanded the track-bearing layer and revealed more than 800 additional tracks in a 2,600 m^2 area. The lower Morrison Formation (?Oxfordian to Kimmeridgian) was deposited in an intracratonic basin where a wetland system preceded an arid fluvial system towards the upper part of the Formation (i.e., Brushy Basin Member). A recent survey of the site focused on the preservation of sauropod tracks in different substrates; it is unique because it allows the study of track-bearing rocks that range from palustrine marlstones and lacustrine oolitic limestones to brecciated palaeosols. Some tracks are preserved as 3D fills in dried-up marls that were colonized by *Equisetum* meadows. True prints occur on oolitic grainstones which formed a microenvironment, acting as shallow pools, which led to their colonization by suspension feeding worms (*Skolithos* tracemakers). Other tracks were formed in soils and some show details of skin slip marks but the subsequent brecciation obliterated the true nature of the trackmaker. Moreover, as each of these footprints display a disparate morphology in all these substrates we recommend that future studies on ichnotaxonomy of dinosaur tracks should include a proper sedimentological description of the substrate.

Acknowledgements: Support for this study came from the Swiss National Science Foundation, Grant ID: SNF 200021_192036, Title: Jurassic Globetrotters. Unlocking palaeobiogeographic analyses of Late Jurassic ichnocoenoses of Europe, North Africa and North America through computational ichnology.

A NEW ICHTHYOSAUR FROM THE MIDDLE JURASSIC OF SWITZERLAND SHEDS LIGHT ON THE ORIGINS OF THE OPHTHALMOSAURIDAE

F. Miedema[1,2*], D. Bastiaans[1], T.M. Scheyer[1], C. Klug[1], E.E. Maxwell[2]

[1]Paläontologisches Institut, Universität Zürich, Karl-Schmid-Strasse 4, 8006, Zürich, Switzerland.
[2]Paläontologie, Staatliches Museum für Naturkunde Stuttgart, Rosenstein 1, 70191, Stuttgart, Germany.

*presenting author, feiko.miedema@gmail.com

Keywords: *Ichthyosauria, Bajocian, Middle Jurassic, Ophthalmosauridae, phylogeny*

The Middle Jurassic is an important transitional phase for macropredatory tetrapods such as ichthyosaurs in the marine ecosystems. In the Early Jurassic, early-branching parvipelvian ichthyosaurs dominate. They are almost completely replaced in the Late Jurassic by the ophthalmosaurids. Unfortunately, Middle Jurassic macrovertebrate-bearing strata are rare worldwide, which hinders our understanding of this transition, both ecologically and phylogenetically. Here, we present a new genus of ichthyosaur based on a single specimen found in a shallow marine deposit of late Bajocian age (Klingnau Formation, Upper Hauptrogenstein, *Parkinsonia parkinsoni* ammonite Zone) from the Canton of Aargau, Switzerland. The specimen consists of a largely complete associated trunk including vertebrae and dorsal ribs, two partially complete clavicles, and a nearly complete, largely disarticulated cranium with hardly deformed elements. We reconstructed the cranium digitally using surface- and CT-scans. The new genus shows more basal parvipelvian features such as an extensive extracondylar area of the basioccipital. It also shares characters with derived parvipelvians (i.e., ophthalmosaurids), such as the absence of a basioccipital peg and undivided internal carotid foramen in the parabasisphenoid. Other noteworthy details include some minor pathologies on the anterior left dentary, a major pathology on a dorsal rib, and high neurovascularization of the anterior dentaries and premaxillae. The vascularization combined with the large orbit may indicate deep-diving behavior. Preliminary phylogenetic analyses place the new taxon as sister to Ophthalmosauridae, and sometimes in a polytomy with *Stenopterygius*. Therefore, the new taxon gives us vital information regarding the origination and paleobiology of highly specialized Ophthalmosauridae.

Acknowledgements: We want to thank Thomas Imhof for preparing the specimen, Markus Hitz and Pedro Aquino from Eurofins Qualitech AG for CT-scanning, and Thore Friesenhagen and Loic Costeur for lending us their Artec Spider. Numerous other colleagues helped with excavation and preparation. Elmar Meier discovered and excavated most of the specimen.

PALEOENVIRONMENTAL INFERENCES FOR THE LATEST MIOCENE TO EARLIEST PLEISTOCENE IN THE GUADIX-BAZA BASIN (SOUTHEASTERN SPAIN) ON THE BASIS OF MICROMAMMAL ASSEMBLAGES

R. Minwer-Barakat[1,2*], A. García-Alix[1], E. Martín-Suárez[1], M. Freudenthal[1], S. De Esteban-Trivigno[2,3], P. Piñero[4], A. Bolet[1,2,5]

[1]Departamento de Estratigrafía y Paleontología, Universidad de Granada, Avda. Fuente Nueva s/n, 18071 Granada, Spain.

[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Spain.

[3]Transmitting Science, Gardenia 2, 08784, Piera, Barcelona, Spain.

[4]Institut Català de Paleoecologia Humana I Evolució Social (IPHES), 43007 Tarragona, Spain.

[5]School of Earth Sciences, University of Bristol, Life Sciences Building, 24 Tyndall Avenue, Bristol, BS8 1TQ, UK.

*presenting author, rminwer@ugr.es

***Keywords**: rodents, eulipotyphlans, Turolian, Ruscinian, Villanyian*

Micromammals (mainly rodents and eulipotyphlans) are commonly used as paleoenvironmental indicators because they are in general sensitive to changes in climatic conditions and restricted to particular habitats. In the central sector of the Guadix-Baza Basin (SE Spain), several stratigraphically superposed levels ranging in age from the late Turolian (MN13) to the late Villanyian (MN17) have yielded abundant small mammal remains, thus offering an exceptional opportunity to analyze the evolution of the micromammal communities. The only time span poorly represented in the studied area is the early Ruscinian (MN14), but other localities situated in the eastern sector of the basin contain abundant fossils that allow for paleoenvironmental reconstruction. The changes in the relative abundances of different groups and the presence of several taxa with specific ecological requirements (e.g., gerbil rodents, water moles or flying squirrels) allow interpreting the environmental conditions for this area in the referred interval. Late Turolian (MN13) assemblages include several taxa typical of warm and dry conditions, including some African immigrants that reached the Iberian Peninsula in the context of the Messinian Salinity Crisis (*Myocricetodon, Debruijnimys*). Ruscinian and early Villanyian micrommamal assemblages (MN14–MN16)—characterized by abundant eulipotyphlans, some taxa typical of forested biotopes (*Eliomys, Pliopetaurista, Apodemus atavus*), and even animals with semiaquatic habits (Desmaninae)—indicate temperate and humid conditions. Finally, the late Villanyian (MN17) micrommamal faunas reflect a change to colder and dryer conditions, together with a greater development of open environments, as indicated by the dominance of arvicolids over other groups and the scarcity of forest dwellers.

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

Acknowledgements: This work was supported by project P20_00066, group RNM190 (Junta de Andalucía), project PID2020-116908GB-I00 (Ministerio de Ciencia e Innovación) and CERCA Programme/Generalitat de Catalunya. A.B. holds a María Zambrano Junior Fellowship (Ministerio de Universidades and NextGenerationEU programme). P.P. holds a "Juan de la Cierva-Incorporación" contract (IJC2020-044108-I), MCIN/AEI/10.13039/501100011033 and "EU NextGenerationEU/PRTR".

EXPLORING THE PRESENCE OF NEW TITANOSAURIAN TAXA IN THE CAMPANIAN–MAASTRICHTIAN OF THE IBERIAN PENINSULA

P. Mocho[1,2,3*], F. Escaso[2], F. Marcos-Fernández[4,2], A. Páramo[2,5], D. Vidal[2,6], F. Ortega[2]

[1]Instituto Dom Luiz, Faculdade de Ciências da Universidade de Lisboa, Edifício C6, Campo Grande, 1749-016, Lisboa, Portugal.

[2]Grupo de Biología Evolutiva, Facultad de Ciencias, Universidad Nacional de Educación a Distancia (UNED), Avda. Esparta s/n, 28232 Las Rozas de Madrid, Madrid, Spain.

[3]Dinosaur Institute, Natural History Museum of Los Angeles, 900 Exposition Blvd, 90007, Los Angeles, California, USA.

[4]Facultad de Bellas Artes, Universidad Complutense de Madrid, C/ Pintor el Greco 2, 28040 Madrid, Spain.

[5]Centro de Interpretación Paleontológica de La Rioja, Government of La Rioja, Calle Mayor 10, 26525 Igea, La Rioja, Spain.

[6]Department of Organismal Biology, University of Chicago, 1027 E 57th St, Chicago, Illinois 60637, USA.

*presenting author, p.mochopaleo@gmail.com

***Keywords**: phylogeny, Cretaceous, Sauropoda, Lithostrotia, Ibero-Armorican Island*

Titanosauria were the main lineage of sauropods during the Late Cretaceous, reaching a cosmopolitan distribution. In Europe, this clade is represented by many occurrences, especially in the Ibero-Armorican domain, with eight described species. However, a higher diversity has been hypothesized by many authors. The evolutionary history of these taxa is still uncertain, and their progressive inclusion in phylogenetic analyses is providing a better understanding about their affinities. In addition, the systematics of some of these titanosaurs is complex, because some are based on incomplete specimens and assemblages from multitaxic bone beds. The Campanian–Maastrichtian deposits of the Iberian Ranges are rich in titanosaurian discoveries, including the sites of Lo Hueco (Cuenca) and Poyos (Guadalajara), which are currently providing significant data on the phylogeny of the European titanosaurs. We present four new specimens from Lo Hueco that are currently in preparation and study and explore the presence of a new titanosaurian species in this quarry (distinct from *Lohuecotitan pandafilandi*). These specimens correspond to individuals that were found in full to partial articulation or in sets of associated elements, including almost complete sequences of dorsal-to-caudal vertebrae. Our phylogenetic analyses, including seven European titanosaurian species, suggests that lithostrotians are a diverse group in Europe during the Campanian–Maastrichtian (at least two lineages), including the probable endemic lirainosaurines and lithostrotian from a non-lirainosaurine lineage, which includes the new specimens of Lo Hueco. Some of these lineages come from dispersal events into Europe in the later part of the Early Cretaceous, probably from Gondwana.

Acknowledgements: Funded by FCT/MCTES (CEECIND/00726/2017), Ministerio de Ciencia e Innovación (PID2019-111488RB-I00), Junta de Comunidades de Castilla-La Mancha (SBPLY/22/180801/000027).

THE ARCHAIC–MODERN ASPECT PRIMATE TRANSITION WAS MARKED BY SIGNIFICANT SHIFTS IN LOCOMOTOR BEHAVIOUR: EVIDENCE FROM CALCANEAL SHAPE

O. Monclús-Gonzalo[1*], D.M. Alba[1], A.-C. Fabre[2,3,4], J. Marigó[5,1]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA/ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Naturhistorisches Museum Bern, 3005, Bern, Switzerland.

[3]Institute of Ecology and Evolution, University of Bern, 3012, Bern, Switzerland.

[4]Life Sciences Department, Vertebrates Division, Natural History Museum, SW7 5BD, London, UK.

[5]Universitat Autònoma de Barcelona, Departament de Geologia, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, oriol.monclus@icp.cat

***Keywords**: Palaeogene, calcaneus, locomotion, plesiadapiforms, euprimates*

The transition between archaic primates (plesiadapiforms) and primates of modern aspect (euprimates) is critical to understand the origin and early evolution of this order. We used calcaneal shape to reconstruct the locomotor repertoire of 25 early primate representatives, including plesiadapiforms (5), adapiforms (9), omomyiforms (8), and stem anthropoids (3). We implemented a two-block partial least-squares regression on a comparative sample of 143 species (representing all extant primate groups and living colugos and tupaias) to (1) assess the correlation between calcaneal shape (Procrustes shape coordinates) and locomotor behaviour (locomotor percentages) and (2) predict locomotion for the extinct species to study their early evolution and diversification. Plesiadapiforms are recovered as mainly relying on suspensory and scansorial behaviours, although the most primitive form, *Purgatorius*, displays a higher propensity for quadrupedal behaviours, similar to some extant tree shrews. By contrast, all euprimates show higher percentages of leaping and climbing behaviours. Adapiforms, except for the small-sized *Anchomomys frontanyensis*, are reconstructed as above-branch quadrupeds, while omomyiforms, as well as *A. frontanyensis*, display higher proclivity for leaping. One exception is the microchoerid *Necrolemur zitteli*, which approaches the specialized vertical clinger and leaper condition, shared by extant tarsiers and bushbabies. Finally, all three stem anthropoid representatives show increased preference for arboreal quadrupedalism compared to other behaviours. Overall, our results support that the transition between archaic and modern primates was characterized by profound changes in the locomotor repertoire and that euprimates displayed a diverse locomotor behaviour early on in their evolution.

Acknowledgements: Funded by R+D+I projects PID2020-116908GB-I00 and PID2020-117289GB-I00 (MCIN/AEI/10.13039/501100011033/), Generalitat de Catalunya/CERCA Programme, AGAUR (2021 SGR 01188 and 2021 SGR 00620), Departament de Cultura of the Generalitat de Catalunya

(CLT0009_22_000018), MCIN/AEI (RYC2021-034366-I to J.M.), and AGAUR/European Social Fund (2021 FI_B 00524 to O.M.G.).

FIRST APPROXIMATION TO THE LOCOMOTION OF *PROLAGUS SARDUS* (MAMMALIA, LAGOMORPHA) USING 2D GEOMETRIC MORPHOMETRICS

B. Moncunill-Solé[1,2*], E. Sherratt[3], A. Blanco[1], J. Martínez-Vargas[4,5,6], C. Angelone[2,7,8]

[1]Departamento de Física e Ciencias da Terra, Universidade da Coruña, Rúa da Fraga 10, 15008 A Coruña, Spain.

[2]Dipartimento di Scienze, Università degli Studi Roma Tre, Largo S. Leonardo Murialdo 1, 00146, Roma, Italy.

[3]School of Biological Sciences, University of Adelaide, 5005, Adelaide, Australia.

[4]Departament de Biologia Animal, de Biologia Vegetal i d'Ecologia, Universitat Autònoma de Barcelona, Campus de la UAB, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[5]Departament de Vertebrats, Museu de Ciències Naturals de Barcelona, Passeig Picasso s/n, 08003 Barcelona, Spain.

[6]Myrmex. Serveis Tècnics a les Ciències Naturals S.L., Carrer de Bailèn 148, 3r 1a, 08037 Barcelona, Spain.

[7]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[8]Key Laboratory of Vertebrate Evolution and Human Origins, Institute of Vertebrate Paleontology and Palaeoanthropology, 142 Xi Zhi Men Wai Da Jie, 100044, Beijing, China.

*presenting author, blanca.moncunill@udc.es

***Keywords**: eco-evolutionary adaptations, island syndrome, landmarks, Late Pleistocene*

Extinct small mammals from insular biotas show a set of parallel eco-evolutionary responses. The most renowned trend is the "Island Rule", whereby rodents, rabbits, shrews, etc. become giants under insular selective pressures. Besides, other adaptations have been noted, with regard to a more efficient chewing (e.g., hypsodonty), slow-gear lifestyle with new locomotion skills, and a slow life history. Traditionally, studies of their locomotion have been performed through the anatomical and metrical comparison of the fossil remains with those of extant species, and only a few have applied geometric morphometric (GM) approaches and tools for their assessment. The present study has the main aim to start to fill this gap in fossil lagomorphs by evaluating for first time the locomotion of *Prolagus sardus* (Sardinia, Italy) by means of 2DGM. The results will contribute to shed light on its ecology and reinforce the understanding of eco-evolutionary responses to insular regimes. We consider *P. sardus* to be the most suitable taxon to start this research line, in light of its large amount of skeletal remains. For this task, we used photos of femora and humeri of individuals of *P. sardus* (Late Pleistocene; Grotta della Medusa), as well as of extant species, covering all lagomorph locomotor range. GM procedures were carried out with MorphoJ software and patterns of shape changes were visualized through principal component analysis. Preliminary results suggest shape differences across extant locomotor groups, although an in-depth analysis (e.g., 3DGM, larger sample) is required to confidently inferr the locomotor behavior of *P. sardus*.

Acknowledgements: Xunta de Galicia (B.M.S., ED481D-2022-013), MCIN/AEI/10.13039/501100011033 & NextGenerationEU/PRTR (A.B., RYC2021-034269-I), Chinese Academy of Sciences (C.A.), Spanish AEI and the European Regional Development Fund of the European Union (C.A., CGL2016-76431-P), CERCA Programme/Generalitat de Catalunya (C.A.), and Grant to Department of Science, Roma Tre University (C.A., MIUR).

NEW PALEOPATHOLOGICAL RECORDS IN FOSSIL BONES FROM THE PLIO-HOLOCENE OF MENORCA (BALEARIC ISLANDS, WESTERN MEDITERRANEAN)

B. Moncunill-Solé[1*], J. Quintana Cardona[2,3]

[1]Departamento de Física e Ciencias da Terra, Universidade da Coruña, Rúa da Fraga 10, 15008 A Coruña, Spain.

[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[3]C/ Gustau Mas 79, 1er, 07760 Ciutadella de Menorca, Illes Balears, Spain.

*presenting author, blanca.moncunill@udc.es

***Keywords**: fracture, insular ecosystem, endemisms, low extrinsic mortality.*

The presence of paleopathologies in fossil bones is not rare. Indeed, there is a significant amount of research reporting and describing abnormal conditions found in a wide range of extinct taxa, including vertebrates, invertebrates, and plants. Although, at first, it seemed just curiosities, their systematic study has revealed that they can inform about meaningful biological data of the extinct species. Here, we describe and assess new pathologies in long bones, ribs, teeth and dentaries belonging to individuals of *Latonia* sp. (Amphibia, Discoglossidae; Pliocene of Punta Nati-6), *Podarcis lilfordi* (Lepidosauria, Lacertidae; Middle Pleistocene of Punta Esquitxador-17), and *Myotragus balearicus* (Mammalia, Bovidae; Pleistocene of sa Cigonya and Holocene of Pas d'en Revull-Sa Penya Fosca), from Menorca (Western Mediterranean). The macroscopic examination reveals that most of them consist of healed traumatic injuries (fractures showing bone remodeling), resulting in some cases in shortening, angulation, and deformation of the bone. This kind of disorders are frequent in insular taxa as a consequence of the lesser presence in insular environments of terrestrial predators, whose targets are frequently injured and juvenile individuals. However, these pathologies can influence the normal life of the individual, hampering their locomotion, behavior, and so on. Future examinations at the microscopic level (microCT) will provide information about the microanatomy of these pathologies, allowing for a refinement of their diagnosis, etiology, and probably, cause of death.

Acknowledgements: This research is funded by Consellería de Cultura, Educación, e Universidade, Xunta de Galicia (B.M.S., ED481D-2022-013), R+D+I project PID2020-117118GB-100 (MCIN/AEI/10.13039/501100011033/) to J.Q.C., and CERCA Programme/Generalitat de Catalunya.

NEW BARYONYCHINAE (SPINOSAURIDAE, THEROPODA) REMAINS FROM HISTORICAL SAMPLES FROM THE EARLY CRETACEOUS (UPPER BARREMIAN) OF MORELLA, SPAIN

A. Montealegre[1], O. Castillo-Visa[1], A. Sellés[1,2*]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, c/ Escola Industrial 23, 08201 Sabadell, Barcelona, Spain.

[2]Museu de la Conca Dellà, c/ Museu 4, 25650 Isona, Lleida, Spain.

*presenting author, albert.selles@icp.cat

***Keywords**: Spinosauridae,* Baryonyx*, Early Cretaceous, Iberian Peninsula*

Between 1978 and 1980, paleontologists Lourdes Casanovas and José V. Santafé of the former Institut de Paleontologia de Sabadell performed excavations along the red marls surrounding the village of Morella (Valencia, Spain), discovering abundant remains attributed to brachiosaurids, *Iguanodon*, and tetanuran theropods. Most of those fossils have been published, except for the theropod. Here, we describe an unpublished large theropod tooth and four caudal centra from the upper Barremian (Early Cretaceous) Arcillas de Morella Formation. The tooth (IPS919) is characterized by a curved, conical, and laterally compressed crown, with serration along its distal carina, and six to seven flutes on both labial and lingual sides. The combination of these features enables its identification as cf. *Baryonyx* sp. Principal component analyses based on dental variables support this taxonomic attribution, being morphologically similar to an indeterminate baryonychine species from the same formation. On the other hand, all vertebral elements (IPS37450) are amphicoelus and characterized by a constricted hourglass morphology, with no pleurocoel. However, they differ from each other in the presence/absence of ventral ridges or groove. Despite these differences, the elements strongly resemble those of spinosaurids, and more precisely ML 1190 from Portugal, tentatively assigned to *Baryonyx walkeri*. Although the presence of this species in the Iberian Peninsula is debated, there is a general agreement about the occurrence of new baryonychine species closely related to *Baryonyx* in the region. In this regard, the remains reported here add further evidence supporting the presence of cf. *Baryonyx* in the Barremian of Spain.

Acknowledgements: This research funded by R+D+I project PID2020-119811GB-I00 funded by MCIN/AEI/10.13039/501100011033/ andproject PLEC2021-007903 funded by MCIN/AEI/10.13039/501100011033 and "NextGenerationEU"/PRTR. Additional funding was provided by the CERCA Programme/Generalitat de Catalunya, and project CLT0009_22_000021 funded by the Departament de Cultura of the Generalitat de Catalunya.

FISH HUNTING TRACES IN LA VIRGEN DEL CAMPO SITE (ENCISO, LA RIOJA): THE FIRST EVIDENCE OF FISH PREDATION ATTEMPT IN THE CRETACEOUS OF SPAIN

J. Mora[1*], S. Mestres[2], A. García-Vizcaíno[1], A. Torices[1]

[1]Área de Paleontología, Facultad de Ciencias Geológicas, Universidad Complutense de Madrid, C/ José Antonio Novais 12, 28040 Madrid, Spain.

[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, jmora08@ucm.es

***Keywords**: ichnofossil,* Osculichnus*, palaeoenvironment, Lower Cretaceous*

The Lower Cretaceous site of La Virgen del Campo (Enciso, Spain) is a tracksite located in the northeast of the Cameros Basin. The sedimentological data of previous studies suggest that the palaeoenvironment of this site consisted of a siliciclastic-carbonaceous lacustrine system with cyclic evidence of subaerial exposure. Although La Virgen del Campo site is renowned for its abundance of dinosaur and crocodile tracks, it also presents a high diversity of bioturbation structures. One of these bioturbation structures has been interpreted as cf. *Osculichnus*, an ichnogenus described as a fish hunting trace that has been found in only five localities: the Lower Devonian of Poland, the Upper Devonian of China, the Upper Jurassic of Spain, the Lower Cretaceous of Mexico, and the Eocene–Oligocene of Turkey. The behaviour inferred from this type of traces is a predation attempt on endobenthonic invertebrates (bivalves, annelids, gastropods) by penetrating the sediment layer. The fact that these traces are often associated with other bioturbation structures produced by smaller organisms might be an evidence for this hunting behaviour. The study of this type of traces is not only important for being the first evidence of this kind in the Lower Cretaceous of Spain, but also for helping to understand La Virgen del Campo site and the complex relationships among its various taxa. A diligent revision of other sites in the Cameros Basin is needed to gain further knowledge of fish hunting traces and fish behavioural traits in Lower Cretaceous ecosystems.

Acknowledgements: Thanks to Enciso's city hall and to the Facultad de Ciencias Geológicas, Universidad Complutense de Madrid, and CERCA Programme/Generalitat de Catalunya.

THE AUDITORY REGION OF *INDOHYUS* (ARTIODACTYLA, RAOELLIDAE): FIRST STEPS TOWARDS UNDERWATER HEARING IN CETACEANS

M.J. Mourlam[1*], J.G.M. Thewissen[2], M.J. Orliac[1]

[1]Institut des Sciences de l'Évolution de Montpellier (ISEM) - Université de Montpellier, Institut de recherche pour le développement [IRD] : UR226, Centre National de la Recherche Scientifique : UMR5554 - Place E. Bataillon CC 064, 34095, Cedex 05 Montpellier, France.

[2]Department of Anatomy and Neurobiology, Northeast Ohio Medical University, 4209 State Route 44, Rootstown, OH 44272, USA.

*presenting author, mick.mourlam@gmail.com

***Keywords**: Cetancodonta, petrotympanic complex, malleus, bony labyrinth, ecoacoustic niche*

To dwell and thrive in their underwater world, modern cetaceans rely on an acute sense of hearing. Owing to the physicochemical properties inherent to their biotope, the sound reception pathway of these aquatic mammals differs radically from that of their terrestrial kin. This involves a profound modification of their auditory region. Thanks to a reasonably rich fossil record, the evolutionary history of this anatomical region is relatively well understood in cetaceans. Nonetheless, some lacunae remain, notably concerning the first steps of this underwater acoustic adaptation. Raoellids, the first cetacean offshoot, hold the keys to filling these gaps. This family of small bunolophodont artiodactyls, from the early-middle Eocene (ca. 55–45 Ma), includes the aquatic wader *Indohyus.* Here, we describe its auditory region from two specimens from the middle Eocene deposit of Sindkhatudi (Kalakot, Kashmir, India). The µCT-scan investigation of the petrotympanic complex, along with an integrative anatomical and functional study (e.g., comparative anatomy, geometric morphometric analyses), highlighted that the tympanic bulla of *Indohyus* exhibits an external auditory meatus typical of terrestrial artiodactyls, coupled with a thin lateral wall displaying the main features of the more derived cetaceans' tympanic plate. This mosaic of plesiomorphic and derived character states at the Artiodactyla scale foreshadows the dual sound reception apparatus observed in protocetid whales. Simultaneously, the analysis of nine functional parameters of its cochlea (e.g., length, coiling) points to rather terrestrial hearing habits, illustrating the differences in evolutionary tempo and mode of the various modules composing the chain of sound integration.

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

THE VIRTUAL BRAIN ENDOCAST OF THE MIOCENE HEDGEHOG *POSTPALERINACEUS VIRETI* (EULIPOTYPHLA, MAMMALIA)

R. Moya-Costa[1,2*], O.C. Bertrand[1], À.H. Luján[1,3], I. Casanovas-Vilar[1], M. Furió[4,1]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Department of Earth Sciences, Universidad de Zaragoza, c/ Pedro Cerbuna 12, 50180, Zaragoza, Spain.

[3]Department of Geological Sciences, Faculty of Sciences, Masaryk University, 611 37 Brno, Czech Republic.

[4]Serra Húnter Fellow in Departament de Geologia, Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, raquel.moya@icp.cat

***Keywords**: Erinaceidae, paleoneurology, Late Miocene, phylogeny, Iberian Peninsula*

The spiny hedgehogs, Erinaceinae, are a subfamily of Eulipotyphla that are rare in the fossil record compared with other small mammals. Erinaceinae are known in Europe since the Oligocene, usually represented by isolated teeth, mandibles, and maxillary fragments. Complete cranial material, suitable to infer phylogenetic relationships and paleobiology, is scarce. One of the few exceptions is an almost complete cranium (IPS698) that was found during the 1940s in the site of Can Trullars 1 in Viladecavalls (9.4 Ma; Vallès-Penedès Basin, Catalonia, Spain) and designated as the holotype of *Postpalerinaceus vireti*. The cranium is well preserved and allows for the first time reconstructing the endocranial anatomy of a Miocene Erinaceinae using microcomputed tomography. IPS698 was scanned and, based on the generated CT data, we segmented the virtual brain endocast of *P. vireti* and compared it to the virtual endocasts of extant Erinaceidae, including the Erinaceinae *Erinaceus*, *Atelerix*, and *Hemiechinus* and the Galericinae *Podogymnura* and *Echinosorex*. The right side of the endocast is damaged, so we mirrored the left side to generate a complete endocast. The olfactory bulbs are dorsoventrally flat and laterally wide, and the circular fissure is short. In dorsal view, the cerebrum is wider than long as in *Erinaceus*. The paraflocculi are large and similar in size to those of *Hemiechinus*, but bigger than in the two other Erinaceinae. Further work on this endocast will provide a better understanding of the phylogenetic relationships of *P. vireti* with other Erinaceinae and brain evolution in this group.

Acknowledgements: Funded by R+D+I project PID2020-117289GB-I00 (MCIN/AEI/10.13039/501100011033/), Generalitat de Catalunya/CERCA Programme, AGAUR (2021 SGR 00620, 2021 SGR 00127, 2021 BP 00042 to O.B., and 2019 BP 00154 to À.H.L.), and Spanish MIU-NextGenerationEU to R.M.C. (Margarita Salas).

MESOZOIC REIGN OF TERROR: DECAPITATION IN THE LONG-NECKED TRIASSIC ARCHOSAUROMORPH *TANYSTROPHEUS*

E. Mujal[1,2*], S.N.F. Spiekman[1]

[1]Staatliches Museum für Naturkunde Stuttgart, Rosenstein 1, D-70191, Stuttgart, Germany.
[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193, Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, eudald.mujalgrane@smns-bw.de

***Keywords**: marine reptiles, 'bite marks', trophic interactions, taphonomy, palaeoecology*

During the Mesozoic several clades of reptiles diversified into a wide range of marine niches. One of the most striking and evolutionary successful strategies among these adaptations included extreme neck elongation combined with the presence of a relatively small head. This bauplan evolved independently in the archosauromorphs *Tanystropheus* and *Dinocephalosaurus* during the Triassic and several times among plesiosaurs between the Late Triassic and Cretaceous. Despite its evident evolutionary success, it has been speculated that such an elongated neck was particularly vulnerable to attack and predation. However, no clear evidence for traumatic cervical injuries in long-necked marine reptiles had thus far been described. Here, we present evidence for decapitation in two specimens of *Tanystropheus*, representing two different species, coming from the Middle Triassic marine Fossil-Lagerstätte of Monte San Giorgio (Switzerland). The last preserved vertebra and associated cervical ribs in each specimen are cut in clean spiral and oblique fractures, with bone-splintering characteristic of perimortem breakage (i.e., the bones were fresh when they were broken). Likewise present are oval punctures and a score in the large specimen (*T. hydroides*) and a pit in the small specimen (*T. longobardicus*), interpreted as bite traces produced by pointed teeth. Although scavenging cannot be totally excluded, the low number of bite traces, plus lack of disarticulation, scattering, and destruction of elements favour predation over scavenging. The occurrence of decapitation in two distinct *Tanystropheus* species suggests that, despite their success throughout the Mesozoic, their bauplan indeed left at least some long-necked marine reptiles vulnerable to predation.

Acknowledgements: To Christian Klug and Torsten Scheyer for specimen access, and Adam Rytel, Torsten Scheyer, Erin Maxwell for discussions. To Valentin Fischer and anonymous reviewers for comments on the research. Supported by: DFG (SCHO 791/7-1 to R.R. Schoch) to S.N.F.S; CERCA Programme/Generalitat de Catalunya and PID2020-117118GB-I00 (MCIN/AEI/10.13039/501100011033) to E.M.

THE ROSTRAL NEUROVASCULAR SYSTEM OF *TETHYSHADROS INSULARIS* (ORNITHISCHIA, HADROSAUROIDEA)

M. Muscioni[1], F.M. Rotatori[2,3*], D. Dreossi[4], D. Sandro[5,6], F. Fanti[1]

[1]Dipartimento di Scienze Biologiche, Geologiche e Ambientali, Alma Mater Studiorum, Università di Bologna, Via Zamboni 33, 40126 Bologna, Italy.

[2]GEOBIOTEC, Department of Earth Sciences, NOVA School of Science and Technology, P-2829 516 Campus de Caparica, Caparica, Portugal.

[3]Museu da Lourinhã, Rua João Luis de Moura 95, 2530-158 Lourinhã, Portugal.

[4]SYRMEP Group, Elettra-Sincrotrone Trieste S.C.p.A. S.S. 14, km 163,5 in Area Science Park 34149 Basovizza, Trieste, Italy.

[5]Department of Physics and STAR Lab, University of Calabria, via P. Bucci 31C, Rende (CS), I-87036 Italy

[6]INFN Division of Frascati, via E. Fermi 54, Frascati I-00044, Italy.

*presenting author: f.rotatori@campus.fct.unl.pt

***Keywords**: virtual palaeontology, Dinosauria, Cretaceous, anatomy*

Recent advances in virtual palaeontology have largely expanded our knowledge on the cephalic inner anatomy of dinosaurs and other amniotes. The application of CT and µCT techniques for the acquisition of volumetric data and related production of virtual endocasts allow precise identification of anatomical elements. These data can be used to infer the palaeobiology of extinct taxa. Variations in the endocasts of well-developed bony crests of hadrosaurid dinosaurs have been virtually documented in several studies, but nothing is known for earlier-diverging hadrosauroids. Although many authors consider the rostral region of the skull pivotal to infer sensory capacities, regulation of body temperature, ecology, and even sexual dimorphism, no detailed information combining external and inner morphology has been reported in the literature. We present preliminary results of a synchrotron µCT scan of the rostrum of the type specimen (SC 57021) of the hadrosauroid *Tethyshadros insularis* (Campanian, Italy). Both the premaxilla and predentary of this specimen were µCT-scanned at the Elettra-Sincrotrone (Trieste) with a resolution of 30 µm and manually segmented focusing on preserved elements of the neurovascular system. The extremely grooved premaxilla shows a dense dendritic neurovascular pattern, connecting with the circumnarial region. The predentary preserves enlarged neurovascular foramina, connecting its medial and lateral surfaces. Comparison with *Crocodylus* sp. and birds led us to identify several probable cephalic circulation patterns. Furthermore, we identify the premaxilla and the predentary as key sites for thermal exchange and we assess the relationship of the vascularization network with the development of the ramphoteca.

Acknowledgements: Soprintendenza Archeologia, Belle Arti e Paesaggio del Friuli Venezia Giulia; Museo Civico di Storia Naturale di Trieste. This study benefited from the Geobiotec grant

UIDB/04035/2020, BioGeoSauria Project PTDC/CTA-PAL/2217/2021, and the FCT fellowship SFRH/BD/146230/2019 to F.M.R.

COMMENTS ON THE PALAEOTEMPERATURE OF LATE PLEISTOCENE CYPRUS BASED ON OXYGEN STABLE ISOTOPES FROM BONES AND TEETH OF THE DWARF HIPPO OF AGHIA NAPA

M.A. Nakasi[1*], E. Stathopoulou[1], P. Nastos[2], M. Tassi[3], P. Karalis[3], G. Theodorou[1], E. Tsiolakis[4], E. Dotsika[3]

[1]Section of Historical Geology & Palaeontology, Department of Geology & Geoenvironment, National and Kapodistrian University of Athens, Panepistimiopolis, 15784 Zographou, Greece.

[2]Laboratory of Climatology & Atmospheric Environment, Department of Geology and Geoenvironment, National and Kapodistrian University of Athens, Panepistimiopolis, 15784 Zographou, Greece.

[3]Stable Isotope Unit, Institute of Nanoscience and Nanotechnology, National Center for Scientific Research "Demokritos", 15310 Ag. Paraskevi Attikis, Greece.

[4]Cyprus Geological Survey Department, 2064 Strovolos, Cyprus.

*presenting author, mariannakv@yahoo.com

***Keywords**: endemic species,* Phanourios minor*, oxygen isotope composition, Palaeoclimate*

Oxygen stable isotopes ($\delta^{18}O$) are a useful tool to reconstruct the palaeotemperature of fossil sites. Here, we performed isotopic analyses on 20 fossilized bones and teeth of the dwarf hippopotamus *Phanourios minor* from Aghia Napa (13,5–11 ka) to reconstruct the palaeotemperature of this site. Measurements were taken on the carbonate portion of both bone and teeth, as the latter preserve animal early age seasonal $\delta^{18}O$, while unaltered bone is preferred for palaeoclimate studies. Enamel $\delta^{18}O$ ranges from 26.90‰ to 29.73‰, while bone $\delta^{18}O$ ranges from 26.89‰ to 27.11‰. Comparing our results to those obtained in modern and other Pleistocene hippos, we estimated an average palaeotemperature for the site below 24 ˚C. We also obtained a mean $\delta^{18}O$ value of –4.56‰ for the Late Pleistocene of Aghia Napa. This result is very similar to the values reported for this area during the years 2000–2001, suggesting similar temperatures during the Late Pleistocene as compared to the present. This was an unexpected result, since *Phanourios minor* became extinct during the Younger Dryas cold event and therefore we expected to find lower $\delta^{18}O$ values. We propose that the warm waters of the Levantine Basin may have stabilized the water temperature around Cyprus during this cold event, not allowing for an intense environmental stress and temperature lowering. The disappearance of *Phanourios minor* might then be attributed to other factors, such as aridity or the presence of humans.

Acknowledgements: We are grateful to the Special Account for Research Grants of Athens University, the Geological Survey Department of Cyprus, and the Municipality of Aghia Napa for funding the study of the site. We would also like to thank the peers who shared their knowledge and advice with us.

NEW TAPHONOMICAL APPROACHES FROM THE QS-3 LEVEL OF QUIBAS-SIMA KARSTIC SITE (EARLY PLEISTOCENE, MURCIA, SPAIN)

A. Navarro-Gil[1*], P. Piñero[2,3], J. Agustí[2,3,4], M. Furió[5,6]

[1]Departament de Geologia, Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]IPHES-CERCA, Institut Català de Paleoecologia Humana i Evolució Social, Zona Educacional 4, Campus Sescelades URV, Edifici W3, 43007 Tarragona, Spain.

[3]Universitat Rovira i Virgili, Departament d'Història i Història de l'Art, Avinguda de Catalunya 35, 43002 Tarragona, Spain.

[4]ICREA, Institució Catalana de Recerca i Estudis Avançats, Pg. Lluís Companys 23, 08010 Barcelona, Spain.

[5]Serra Húnter Fellow in Departament de Geologia, Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[5]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, navarrogil1@gmail.com

***Keywords**: Jaramillo, accumulation, predators, bird, hydrodynamics*

The site of Quibas (Murcia, Spain) is a karstic complex of cavities filled by sediments of Early Pleistocene age. The main structures of this paleontological complex consist of a gallery called Quibas-Cueva and a vertical shaft known as Quibas-Sima. The Quibas-Sima sequence contains seven different detritic units (QS-1 to QS-7). Apart from these two main structures, there is a smaller one called Gruta-1. A previous taphonomical study of Quibas was based on this smaller structure. The Quibas sequence immediately postdates the oldest hominin record in the Early Pleistocene of Europe, as represented at the sites of Barranco León and Fuente Nueva 3 (both in the Guadix-Baza Basin), and Sima del Elefante (Atapuerca karstic complex). This study provides new evidence of the taphonomical processes that made possible the accumulation of microvertebrates in the level QS-3 of Quibas-Sima, by describing the alterations made by predators (digestion and chewing), root marks, precipitation of minerals, bone breakage, abrasion processes, corrosion alterations, and the count of hard bones. Based on this methodology, it is concluded that the accumulation of the remains was in situ and that nocturnal birds of prey as *Strix aluco* and *Otus scops* were the main accumulation factor, with limited hydrodynamic influence. We note differences relative to the previous taphonomic analysis of Gruta-1, which followed the same methodology and concluded that in Gruta-1 the main accumulator was *Athene noctua*, a species with a crepuscular behaviour that is smaller than the proposed ones in this new study.

Acknowledgements: PID2020-117289GB-I00 (MCIN/AEI/10.13039/501100011033/) and CERCA Programme/Generalitat de Catalunya to M.F. and "PALEOSTRAT: paleontological and stratigraphic record from Cretaceous and Cenozoic", Grup de Recerca de la Generalitat de Catalunya 2021 SGR

00127. P.P. is supported by a ‘Juan de la Cierva-Incorporación’ contract (grant IJC2020-044108-I) funded by MCIN/AEI/10.13039/501100011033 and ‘European Union NextGenerationEU/PRTR’.

DIET AND HABITAT OF PALEOMERYCID RUMINANTS, A STABLE ISOTOPE APPROACH

J. Navarro-Cascalló[1,2*], J. Abella[3,1,4], À.H. Luján[1,5], I.M. Sánchez[1], I. Casanovas-Vilar[1]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Facultat de Ciències de la Terra, Universitat de Barcelona, c/ Martí i Franquès s/n, 08028 Barcelona, Spain.

[3]Grup d'Investigació en Paleontologia de Vertebrats del Cenozoic (PVC-GIUV), Departament de Botànica i Geologia, Universitat de València, c/ Doctor Moliner 50, 46100 Burjassot, Spain.

[4]Instituto Nacional de Biodiversidad (INABIO), Pje. Rumipamba 341, Quito, Ecuador.

[5]Department of Geological Sciences, Faculty of Sciences, Masaryk University, 611 37 Brno, Czech Republic.

*presenting author, jaumenavacasc@gmail.com

***Keywords**: stable isotopes, Palaeomerycidae, paleodiet, paleoenvironment, Miocene*

Paleomerycids conform a clade of Eurasian Miocene three-horned giraffomorphs possessing a largely plesiomorphic brachyodont dentition that was classically associated with the processing of soft plants present in dense humid or boggy forested environments. The hypothesis of palaeomerycids as consumers of soft plant material can be further tested using carbon and oxygen stable isotope analysis of dental enamel. Available published data on stable isotopes for this group refer to *Palaeomeryx eminens* and *Ampelomeryx fahlbuschi* (formerly in *Germanomeryx*) from Sandelzhausen (MN5, North Alpine Foreland Basin, Germany), and *Triceromeryx pachecoi* from La Hidroeléctrica (MN5, Madrid Basin, Spain) and Sandelzhausen. We expand this dataset with the addition of *Ampelomeryx ginsburgi* from els Casots (MN5, Vallès-Penedès Basin, Spain), and compare $\delta^{13}C$ and $\delta^{18}O$ values (expressed as ‰ relative to VPDB reference standard), analyzed in carbonate from the enamel, among various paleomerycids and ruminants (cervids, moschids) from the same or geographically close localities. The range of $\delta^{13}C$ values for all the studied paleomerycids is slightly more negative than those of other ruminants in the sample and indicate a diet consisting exclusively of C_3 plants (–12.6‰ to –8.4‰). $\delta^{18}O$ values show a considerable range (–7.7‰ to 4.1‰) even within a single species but are overall more positive than those of other ruminants. These are interpreted as indicative of water intake from a ^{18}O-enriched source, such as highly evaporated surface water bodies or ^{18}O-enriched leaves defining the upper canopy. Our results agree with the classical view of paleomerycids as specialized browsers consistently associated to woodlands.

Acknowledgements: Funded by R+D+I project PID2020-117289GB-I00 (MCIN/AEI/10.13039/501100011033/), OSIC project CLT0009_22_000019 (Departament de Cultura, Generalitat de Catalunya), Generalitat de Catalunya/CERCA Programme, and AGAUR

(2021 SGR 00620 and 2019 BP 00154 to À.H.L.). We thank X. Aymerich and J.M. Robles (ICP) for their assistance during the sampling process.

REVISION OF SPECIMENS OF *CHELUS LEWESI* AND DESCRIPTION OF A NEW SPECIMEN OF THE GENUS *CHELUS* (TESTUDINES, CHELIDAE) FROM THE MIOCENE OF THE BRAZILIAN AMAZON

D.J.M. Neto[1,*], A.S. Hsiou[1], E. Guilherme[2], G.S. Ferreira[3,4]

[1]Department of Biology, Universidade de São Paulo, Av. Bandeirantes,3900, Monte Alegre, 14040-901, Ribeirão Preto, Brazil.

[2]Department of Biology, Universidade Federal do Acre, Distrito Industrial, 69920-900, Rio Branco, Brazil.

[3]Senckenberg Centre for Human Evolution and Palaeoenvironment at the Eberhard Karls Universität Tübingen, Hölderlinstrasse 12, 72074, Tübingen, Germany.

[3] Fachbereich Geowissenschaften, Eberhard Karls Universität Tübingen, Hölderlinstrasse 12, 72074, Tübingen, Germany.

*presenting author, donatomartucci@usp.br

Keywords: Chelus colombianus, Chelus lewisi, *taxonomy, Pleurodira, Testudines*

Testudines are a clade composed of two sister lineages, Cryptodira and Pleurodira, with living and fossil representatives, and which differ mainly by how the neck is retracted into the shell: vertically and laterally, respectively. Fossil Testudines are quite common throughout the South American Cenozoic, mostly represented by elements of the carapace and plastron, which are easily preserved due to the hardness of the elements and their tight articulation. Currently, the genus *Chelus* includes four species, two extant (*Chelus fimbriatus* and *Chelus orinocensis*) and two extinct (*Chelus colombianus* and *Chelus lewisi*). Still, there are many discussions about the morphological characteristics that define these four species, with some authors defending that the morphological diagnoses of the extinct taxa can be fitted within the spectrum of intraspecific variation, and that only *Chelus colombianus* is taxonomically valid. Here, we present a revision of the specimens that were previously attributed to *Chelus lewisi* and are deposited in the paleontological collection of the Federal University of Acre. We reassign the specimens to *Chelus colombianus* and we discount the presence of *Chelus lewesi* for the Miocene of the Brazilian Amazon. Additionally, we describe a new specimen of *Chelus colombianus* that was collected in 2006 in the state of Acre, Brazil. The taxonomic classification of these specimens is based on the morphological characteristics of the carapace, including the presence of two ridges on the nuchal bone and an axillary scar that extends over almost the entire ventral surface of the second costal bone.

Acknowledgements: We express our gratitude to the Universidade de São Paulo and the Universidade Federal do Acre, as well as to the funding agency FAPESP for supporting this research (Process number: 2023/01348-2, 2021/13200-4).

PROJECT OF EDUCATIONAL EXPERIENCE "PALEO IN THE NEIGHBOURHOOD: SCIENCE OF PROXIMITY"

A. Oliver[1,2*], R. de Iriarte[3], T. Gallego[3]

[1]Departamento de Paleobiología, Museo Nacional de Ciencias Naturales-CSIC, C/ José Gutiérrez Abascal 2, 28006 Madrid, Spain.

[2]Centro de Investigación Mariña (CIM), Universidade de Vigo, Grupo de Ecoloxía Animal (GEA), MAPAS Lab, 36310, Vigo, Spain.

[3]Vicedirección de Comunicación y Cultura Científica, Museo Nacional de Ciencias Naturales-CSIC, C/ José Gutiérrez Abascal 2, 28006 Madrid, Spain.

*presenting author, aoliverp5@gmail.com

Keywords: *Outreach, science dissemination, palaeontology, primary education, women in science*

"Paleo in the neighbourhood: science of proximity" is a project aimed at the neighbourhood of Villaverde (Madrid, Spain), a district with a low socioeconomic status. Villaverde has a great paleontological and archaeological heritage but it is unknown to the public. Therefore, in this project we have carried out outreach actions that allow valorising the district through the development of projects in the neighbourhood. In order to promote inclusive science, the project focuses on two target profiles: 5th-grade students of primary education and the general public of the Villaverde district (especially users of the sociocultural centres, the public library, equality spaces, and neighbourhood associations). This project aims to make science more attractive in general and palaeontology in particular, bringing the science of the National Museum of Natural Sciences and Complutense University closer to society, so that they value the natural and cultural heritage of their neighbourhood, as well as to make students aware of the importance of science in our daily lives and its presence around us, encouraging innovation through research projects and a free app. Therefore, we will present the results of this project, where the fossils have been our tool to create social impact, encourage scientific interest at early ages, and show diversity in science.

Acknowledgements: This project (FCT-21-16799) is funded by the Spanish Foundation for Sciencie and Technology (FECYT, Ministerio de Ciencia e Innovación).

DIPLODOCOID DINOSAUR LATITUDINAL BIODIVERSITY: EVERYTHING EVERYWHERE ALL AT ONCE?

J. Órfão[1,2*], P. Mocho[1,2,3], F. Ortega[2]

[1]Instituto Dom Luiz, Faculdade de Ciências, Universidade de Lisboa, Edifício C6, Campo Grande, 1749-016 Lisboa, Portugal.

[2]Grupo de Biología Evolutiva, Facultad de Ciencias, Universidad Nacional de Educación a Distancia (UNED), Avda. Esparta s/n, 28232 Las Rozas, Madrid, Spain.

[3]Dinosaur Institute, Natural History Museum of Los Angeles County, 900 Exposition Blvd., 90007, CA, Los Angeles, USA.

*presenting author, orfao.jo@gmail.com

***Keywords**: Sauropodomorpha, Neosauropoda, Mesozoic, biogeography, paleoecology*

Sauropodomorpha is one of the main clades of non-avian dinosaurs with diverse and widespread lineages. As large herbivores with a near-global distribution, they played an important ecological role in most terrestrial ecosystems. The relatively abundant sauropodomorph fossil record and their global distribution make them particularly suited to explore and analyze long-term biodiversity patterns. The Latitudinal Biodiversity Gradient (LBG) is a pattern observed in modern biodiversity in which species richness peaks in the tropics and declines toward the poles; it is considered one of the most important diversity patterns. Fossil record data can provide insight into the factors that limit or promote biodiversity, as it contains information regarding past climate and land mass distribution scenarios. Although older literature states that it is unclear if the LBG existed for Sauropodomorpha, current research suggests a presence of a latitudinal constraint for the distribution of these taxa. Diplodocoidea are a neosauropod group with a wide paleogeographic distribution, being particularly diverse during the Late Jurassic. Here, we collected Diplodocoidea fossil occurrence data from both literature and online databases (e.g., Paleobiology Database), and built latitudinal biodiversity curves using both traditional biodiversity metrics and shareholder quorum subsampling to: (1) identify the existence of biogeographic patterns that may be correlated with their phylogeny; (2) understand whether a LBG existed for this group; and (3) assess the differences between the results yielded by each biodiversity metric. Among other results, we found that biodiversity peaks for Diplodocinae, Rebbachisauridae, and Dicraeosauridae happened at different time intervals.

Acknowledgements: This work was supported by the Portuguese Fundação para a Ciência e a Tecnologia (FCT) I.P./MCTES through the PhD scholarship grant (UI/BD/151441/2021), CEEC individual contract (CEECIND/00726/2017), and national funds (PIDDAC) – UIDB/50019/2020-IDL.

NEW INSIGHT INTO THE EARLY MIOCENE EVOLUTION OF SNAKE COMMUNITIES IN CENTRAL EUROPE

V. Paclík[1*], M. Ivanov[1], À.H. Luján[2,1]

[1]Department of Geological Sciences, Faculty of Science, Masaryk University, Kotlářská 2, 611 37, Brno, Czech Republic.

[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, 358290@mail.muni.cz

***Keywords**: snakes, Early Miocene, Germany, climate*

The Early Miocene replacement of European Palaeogene snakes, largely represented by Amerophidia and Booidea, with “modern” caenophidian groups is the last important event in the evolution of European snake communities. Although the Oligocene climate was relatively warm in Europe, with prevailing subtropical conditions at mid-latitudes, the decrease in temperatures around the Oligocene/Miocene transition strongly affected the distribution of Amerophidia and Booidea within this area. The Aquitanian to early Burdigalian increase in temperatures was reflected in snake diversity. Viperidae and Colubroidea are present in the earliest Miocene, as documented, e.g., by the recent descriptions of one of the oldest known viperids reported from Weißenburg 6 (MN1–MN2?). Although other known rare Aquitanian localities (Weisenau, MN1?–MN2; Amöneburg, MN2a) provided several post-Oligocene newcomers, the most diverse snake fauna comes from new research we present on material from Wintershof-West (MN3). The small-sized *Bavarioboa* (centrum length <4.5 mm) from Wintershof-West represents one of the earliest Miocene re-appearances of this genus in Europe. It differs from other Miocene species of *Bavarioboa*, but shares morphological affinities with trunk vertebrae of congenerics from the late Oligocene of France. The small dimensions of early Burdigalian Booidea agree with a subtropical climate, which preceded the Early Ottnangian Cooling event (18.1–17.8 Ma). Viperids are common in Wintershof-West, being among the earliest known occurrence of “Oriental vipers” in Europe. Colubroids, with one new species of *Natrix*, differ from those of the coeval Ahníkov I locality, Czech Republic, but this is most probably the result of different palaeoenvironmental conditions.

Acknowledgements: This project was supported by the MUNI/A/1261/2022 Specific Research Project at the Faculty of Science, Masaryk University in Brno, as well as by the R+D+I project PID2020-117289GB-I00 (MCIN/AEI/10.13039/501100011033/), CERCA Programme/Generalitat de Catalunya, and AGAUR (2019 BP 00154 to À.H.L.).

PRELIMINARY RESULTS ON NEW *HYAENICTIS GRAECA* GAUDRY, 1861 (HYAENIDAE, MAMMALIA) REMAINS FROM GREECE, WITH REMARKS ON ITS ECOMORPHOLOGY AND BIOGEOGRAPHY

N. Paparizos[1,2*], N. Kargopoulos[3,4], D. Liakopoulou[1], S. Roussiakis[1]

[1]Faculty of Geology and Geoenvironment, National and Kapodistrian University of Athens, Panepistimioupoli Zografou, 15784, Athens, Greece.

[2]School of Geology, Aristotle University of Thessaloniki, University campus, 54124, Thessaloniki, Greece.

[3]Department of Biological Sciences, University of Cape Town, Private Bag X3, Rhodes Gift, 7701, Cape Town, South Africa.

[4]Giraffe Conservation Foundation, Eros, P.O. Box, 86099, Windhoek, Namibia.

*presenting author, nipaparizos@gmail.com

***Keywords**: Hyaenictis, graeca, Hyaenidae, Pikermi, Miocene*

Hyaenictis graeca is a medium- to large-sized 'cursorial' hyaenid from the Turolian locality of Pikermi (Attica, Greece) that has remained shrouded in mystery for more than 150 years, due to the fact that this taxon is only known from some extremely limited number of specimens only from its type locality. Additional specimens were recovered during the last decades in the process of fossil preparation from old excavations, which are stored in the Museum of Palaeontology and Geology of the National and Kapodistrian University of Athens. The new specimens, five in total, which includes maxillary fragments, isolated upper teeth and two partially preserved crania, shed light on this elusive taxon, as this new sample constitutes both (1) the most complete and (2) the most abundant remains of *H. graeca*, as well as (3) the first material from Pikermi attributed to this taxon since Gaudry in 1863. Their study enables a more detailed description of its upper dentition and an evaluation of its intraspecific variation, as well as a more in-depth comparison with the other two large hyaenids from Pikermi: the also 'cursorial', but smaller *Lycyaena chaeretis*; and the similarly sized, bone-cracking *Adcrocuta eximia*, which differs in cranial morphology from *H. graeca*. In addition, the new remains make possible some preliminary remarks about its possible ecomorphology and biogeography. Concerning the latter, there are indications about its presence in the also Turolian localities of Halmyropotamos in Euboea Island, Greece, and Cerro de la Garita in Teruel, Spain.

Acknowledgements: The authors would like to thank the director of the Museum Professor E. Koskeridou for providing access to the material studied herein.

IN THE SHADOW OF THE COLOSSUS: UNDERSTANDING THE PELVIC LIMB MODULE EVOLUTION IN TITANOSAURIFORMES

A. Páramo[1,2*]

[1]Centro de Interpretación Paleontológica de La Rioja, C/ Mayor 10, 26525, Igea, La Rioja, Spain.
[2]Grupo de Biología Evolutiva, Departamento de Física Matemática y de Fluidos, UNED, Av. de Esparta s/n, 28290 Las Rozas, Madrid, Spain.

*presenting author, paramoblazquez@gmail.com

***Keywords**: 3D geometric morphometrics, modularity, Titanosauriformes, Titanosauria*

The sauropod pelvic and limb skeleton experienced an important change in the subclade Titanosauriformes with the acquisition of wide-gauge posture. It is hypothesized that this posture is part of the gigantism evolutionary cascade. However, recent studies indicate the contrary, i.e., that deeply-branched titanosaurians may have undergone a phyletic body size reduction. Such evolutionary changes are still poorly understood because of the scarcity of complete pelvic and limb skeletons of titanosaurians. In this study, the evolution and modularity of the pelvic and limb skeleton of Titanosauriformes are approached via 3D geometric morphometrics. A small sample (n= 11 taxa) of pelvic girdle and femoral specimens, representative of the Titanosauriformes lineage (e.g., ranging from early-braching Euhelpodidae up to Saltasauridae) were digitized via stereophotogrammetry. Landmarks and semilandmark curves were placed via Slicermorph® software and analyzed using R statistical software (e.g., test for allometric relationships, principal component analysis, partial least squares, phylomorphospaces). For evolutionary analyses this study followed current phylogenetic hypotheses, summarized via supertree methodology, and trimmed to the current titanosauriform sample. The results are coherent with previous results that indicate a negative phylogenetic allometry; instead of the trend toward gigantism exhibited in non-titanosaurian Eusauropoda, deeply-branched titanosaurians are progressively smaller. The covariation of the pubic-ischial module and its relationship with the limb musculature and posture in titanosaurian sauropods are here discussed. The caveats resulting from the scarcity of the pelvic sauropod sample and its effects on the reported results are also discussed, as it does not allow for deploying stronger statistical tests.

Acknowledgements: This project was funded by the Ministry of Economy of Spain project PID2019-111488RB-I00. A.P. received financial support for collecting the data from a EAVP 2020 research grant. Thanks to D.M.A. and two anonymous reviewers for comments and suggestions that improved this contribution.

NEW EVIDENCE TO SUPPORT THE REASSESSMENT OF *MYOBRADYPTERYGIUS HAUTHALI* (ICHTHYOSAURIA: OPHTHALMOSAURIDAE) FROM THE EARLY CRETACEOUS OF CHILE AND ARGENTINA

J. Pardo-Pérez[1,2*], E. Maxwell[3]

[1]Macropaleontology area, Instituto de la Patagonia, Universidad de Magallanes, Avenida Bulnes 01890, 6200000, Punta Arenas, Chile.

[2]Centro de Investigación GAIA-Antártica, Universidad de Magallanes, Avenida Bulnes 01855, 6200000, Punta Arenas, Chile.

[3]Staatliches Museum für Naturkundemuseum Stuttgart, Rosenstein 1 70191, Stuttgart, Germany.

*presenting author, judith.pardo@umag.cl

***Keywords**: Ichthyosaurs,* Platypterygius*, Hauterivian, Valanginian, taxonomy*

Ichthyosaurs were the marine reptiles most adapted to a pelagic lifestyle. Their fossil record has historically been better documented in the Northern Hemisphere than in the Southern. Since 2003, paleontological expeditions to the border of the Tyndall Glacier, in the south of Chile, have led to the discovery of 87 ichthyosaur skeletons, most of them complete and articulated. Some of this material can be referred to *Myobradypterygius hauthali* von Huene, 1927. The genus was synonymized with *Platypterygius* in 1972 without any morphological justification. The holotype of *M. hauthali* consists of fragmentary material from the Barremian of Argentina, including an incomplete forefin. Our objective is to describe more completely the anatomy of this species based on the new material from the Tyndall Glacier and to reassess the generic referral of *M. hauthali*. We took new data from in situ material, built photogrammetric models, and excavated a complete pregnant female. Our results support previous studies in showing that *M. hauthali* has a unique combination of features in the humerus and zeugopodium. We also add new information related to the cranium and postcranium (body proportions, basioccipital, stapes, lacrimal, nasal, sclerotic ring, vertebral column, and pelvic girdle). The species is characterized by tooth bases that are quadrangular in cross section, with abundant osteocementum external to the dentine, and well-developed plicidentine. Our research increases the knowledge of Early Cretaceous ichthyosaurs from the southern Pacific margin of Gondwana and can lead to a better understanding of their evolution, adaption, and dispersion during the late Mesozoic.

Acknowledgments: To the Agencia Nacional de Investigación y Desarrollo de Chile, Project PAI77200036 to J.P-P. The Corporación Nacional Forestal and Consejo de Monumentos Nacionales de Chile allowed access to the study area and excavation. We acknowledge the excavators and the Natural History Museum Río Seco (Punta Arenas, Chile).

OVERVIEW OF THE *DAMA*-LIKE DEER FOSSIL RECORD FROM THE ITALIAN PENINSULA

E.M. Parparousi[1*], M. Breda[2], M. Cherin[1]

[1]Dipartimento di Fisica e Geologia, Università degli Studi di Perugia, Via A. Pascoli, 06123, Perugia, Italy.

[2]Museo di Zoologia, Università di Padova, Via G. Jappelli, 35131 Padova, Italy.

*presenting author, elpinikimaria.parparousi@studenti.unipg.it

***Keywords**:* Pseudodama*, deer, Italy*

The small to medium-sized cervids inhabiting Europe during the Plio-Pleistocene, known as *Dama*-like deer, have been referred to several different genera such as *Dama*, *Pseudodama*, and *Metacervocerus*, amongst others. Despite the extensive studies conducted during the last decades, the scientific community has not yet reached a consensus on the phylogenetic relationships and taxonomy of this group. In this work, we present an overview of the fossil record attributed to this clade in the Italian Peninsula, by considering the genus *Pseudodama* as distinct from *Dama*. Both the biochronological ranges and the geographical distribution of each species are reappraised. In addition to that, we summarize the state-of-the-art regarding the phylogenetic relationships of the group and address the possible synonymies. Six distinct species are represented in the Italian fossil record, including (in chronological order): *P. pardinensis* (Aulla Quarry), *P. lyra* (Ponte a Elsa, Collepardo, Spicchio, Montopoli, Valle Catenaccio), *P.* cf. *rhenana* (Coste San Giacomo, ?Cava Toppetti), *P. nestii* (Olivola, Pantalla, Torre Picchio, Upper Valdarno, Podere San Lorenzo, Casa Frata, Monte Riccio), and *P. farnetensis–P. vallonnetensis* (Val di Chiana, Selvella, Pietrafitta, Mugello, Pirro Nord, Capena, Collecurti, Ellera, Monte Peglia, Frantoio, Redicicoli1, Slivia). Finally, we present the preliminary results of the study of new *Dama*-like deer material from Umbria (central Italy).

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

NEW IGUANODONTIAN DINOSAUR REMAINS FROM THE LOWER CRETACEOUS OF THE MAESTRAZGO BASIN (ESTERCUEL, TERUEL, SPAIN)

J. Parrilla-Bel[1*], E. Medrano-Aguado[1], J.M. Gasca[2], J.I. Canudo[1,3]

[1]Grupo Aragosaurus-IUCA, Paleontología, Facultad de Ciencias, Universidad de Zaragoza, C/ Pedro Cerbuna 12, 50009 Zaragoza, Spain.

[2]Departamento de Geología, Universidad de Salamanca, 37008 Salamanca, Spain.

[3]Museo de Ciencias Naturales de la Universidad de Zaragoza, Universidad de Zaragoza, Plz. Basilio Paraíso 4, Ed. Paraninfo, 50005 Zaragoza, Spain.

*presenting author, jarapbel@gmail.com

***Keywords**: Barremian, Maestrazgo Basin, Ornithopoda, ilium*

New data from the Barranco del Hocino-1 fossil site (Blesa Formation), concerning a potentially new dinosaur taxon, is presented here. The Blesa Formation represents the lowermost Cretaceous (Barremian) sedimentary fill of the Oliete Subbasin (Maestrazgo Basin, NE Spain). Vertebrate fossils are abundant in this formation and many sites have been discovered, excavated, and studied since the 1990s. Barranco del Hocino-1 is in the Upper Sequence of the Blesa Formation. The depositional environment has been interpreted as a palustrine area within a distal alluvial plain and with palaeosol development. Most of the recovered fossils (fragmentary remains of several taxonomic groups, coprolites, and eggshell fragments) show evidence of substantial transport and weathering, and sometimes bioerosion. In this context, new material of a styracosternan ornithopod is described. This specimen is characterized by a unique combination of axial and iliac characters: first caudal vertebra with a ventral keel, ilium with preacetabular process twisted along its long axis, slender and entirely straight dorsal surface of preacetabular process and iliac plate, dorsal surface above the ischiadic peduncle slightly ‘swollen' but not forming an everted rim, and ventral surface of ischiadic peduncle and postacetabular process straight and parallel to dorsal surface of iliac plate. The new material represents the most taxonomically informative remains of a styracosternan of the Oliete Subbasin and would be potentially a distinct taxon. However, the fragmentary nature of the material prevents a consistent diagnosis and description of a new taxon, pending the recovery of more preserved fossils.

Acknowledgements: This study was subsidized by the Spanish Ministerio de Economía y Competitividad (project CGL2017-85038-P), the Spanish Ministerio de Ciencia e innovación (project PID2021-122612OB-I00), and by the Aragón Regional Government and European Regional Development Fund (research group E18_20R Aragosaurus: recursos geológicos y paleoambientes).

A RICH DENTAL PROTEOME OF AN HIPPARIONIN HORSE FROM THE PLIOCENE (3.8 Ma) OF CANADA'S HIGH ARCTIC

R.S. Paterson[1*], M. Mackie[1,2], A.C. Strange[1], I. Patramanis[1,3], J. Krueger[4], E. Lizano[4,5], T. Marquès-Bonet[4,5], N. Rybczynski[6], R. MacPhee[7], E. Cappellini[1]

[1]Section for Geogenetics, University of Copenhagen, 5-7 Øster Voldgade, 1350, Copenhagen, Denmark.

[2]Novo Nordisk Foundation Center for Protein Research, University of Copenhagen, Blegdamsvej 3b, 2200, Copenhagen, Denmark.

[3]Section for Molecular Ecology and Evolution, Øster Farimagsgade 5 Building 7, 1353, Copenhagen, Denmark.

[4]Experimental and Health Sciences Department (DCEXS), Institut de Biologia Evolutiva, Universitat Pompeu Fabra-CSIC, Barcelona, Spain.

[5]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, C/ de les Columnes s/n, 08193, Cerdanyola del Vallès, Barcelona, Spain.

[6]Palaeobiology, Canadian Museum of Nature, 1740 Chemin Pink Road, J9J 3N7, Ottawa, Canada.

[7]Department of Mammalogy, American Museum of Natural History, 200 Central Park West, 10024, New York City, USA.

*presenting author, ryan.paterson@sund.ku.dk

***Keywords**: palaeoproteomics, Equidae, enamel, phylogenetics, biomolecules*

The application of ancient DNA research has revealed the complexity of equid evolution, recalibrating several evolutionary events in the equid family tree and uncovering unexpected diversity. However, the periods of greatest equid diversity are beyond the reach of aDNA. Here, we use palaeoproteomic methods to recover biomolecular sequence data from a hipparionin horse, represented by a dental fragment from the Pliocene (3.9 Ma) Beaver Pond site of Canada's High Arctic. Despite the age of the fossil, our extraction protocols were successful in retrieving a remarkably rich proteome. Ultimately, we confidently identified over 60 proteins and 14,500 peptides, covering >7000 amino acids. STRING network analysis reveals three distinct proteomes: enamel, dentine/bone, and blood plasma. Each proteome displays a different level of preservation, indicating differential degradation rates for proteomes of different biological functions and tissue types. Authenticity is supported by markers of protein damage, such as high deamidation and shortened peptides. However, the damage is slight compared to that observed in Middle to Early Pleistocene mammalian dental proteomes from lower latitudes, and is more comparable to dental specimens from the Holocene, displaying limited arginine-to-ornithine conversion and few end products of tryptophan oxidation. Additionally, proteome sequence coverage is at least 10-fold higher than those Middle–Early Pleistocene dental proteomes, reflecting the wonderful preservative potential of ancient proteins in high latitudes. A phylogenetic analysis of extant and extinct perissodactyls, using a tip-dating approach, identified the High Arctic hipparionin as the earliest-diverging equid in the analysis, and allowed for dating key nodes in the tree.

Acknowledgements: This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement (No. 861389).

ISOLATED DINOSAUR TEETH FROM THE LOWER CRETACEOUS OF THE ALGARVE BASIN (SOUTHERN PORTUGAL)

H.J.R. Pereira[1,2*], S.C. Sweetman[3], P. Fernandes[2], P. M. Callapez[1,4]

[1]CITEUC, Centre for Earth and Space Research of the University of Coimbra, Faculty of Sciences and Technology, Earth Sciences Department, University of Coimbra - Pólo II, Rua Sílvio Lima, 3030-790 Coimbra, Portugal.

[2]CIMA, Centre of Marine and Environmental Research\ARNET - Infrastructure Network in Aquatic Research, University of Algarve, Campus de Gambelas, 8000-139 Faro, Portugal.

[3]School of the Environment, Geography and Geosciences, University of Portsmouth, Burnaby Building, Burnaby Road, Portsmouth, P01 3QL, UK.

[4]Grupo de Investigación PaleoIbérica, Universidad de Alcalá, 28805 Alcalá de Henares, Madrid, Spain.

*presenting author, helder.pereira@student.dct.uc.pt

***Keywords**: Arrifes, Barremian, Dromaeosauridae, Hypsolophodontidae, Iguanodontoidea*

The systematic trial and bulk sampling of the Arrifes coastal section (Albufeira, Algarve Basin, Portugal), which exposes a sedimentary succession of late Barremian–early Aptian age, has revealed several horizons yielding vertebrate remains. The description and a detailed palaeoenvironmental evaluation of the collected material as a whole is in progress. The fossil vertebrate assemblage identified to date includes numerous remains of chondrichthyans, osteichthyans, lissamphibians, lepidosaurs, turtles, crocodyliforms, and dinosaurs. Until now, the presence of dinosaurs in the Lower Cretaceous of the Algarve Basin has been documented primarily on isolated footprints and trackways. Here we report the recovery of isolated dinosaur teeth from a horizon particularly rich in vertebrate microfossils. Based on their gross morphologies, these teeth may be referred to both ornithischian and theropod dinosaurs. Three taxa have been recognized. They include indeterminate hypsolophodontid and iguandontoid ornithischians, as well as indeterminate and dromaeosaurid theropods. To assess the taxonomic assignments of the latter, we used SEM microphotographs to obtain measurements of the tooth crowns. These measurements were added to a large dataset including measurements of non-avian theropod teeth, and cladistic and discriminant analyses were performed. The results showed that at least one specimen can be assigned to Dromaesauridae. The teeth studied confirm the presence of different types of late Barremian dinosaurs living near marginal marine environments of the Algarve Basin, and shed new light on the palaeobiodversity and geographical distribution of Lower Cretaceous dinosaurs in Iberia.

Acknowledgements: This study was supported by the Fundação para a Ciência e Tecnologia (FCT) under the projects UIDB/00611/2020 and UIDP/00611/2020 CITEUC; and LA/P/0069/2020 granted to the Associate Laboratory ARNET and UID/00350/2020 CIMA.

USING THE CARNASSIAL COMPLEX TO DISTINGUISH BETWEEN SPECIES OF THE GENUS *LYNX*

M.T. Pérez[1*], I. Jiménez[1], N. García[1], M. Sanz[2], J. Daura[2]

[1]UCM Group Quaternary Ecosystems, Department of Geodynamics, Stratigraphy and Palaeontology, Complutense University of Madrid, C/ Jose Antonio Novais 12, 28040 Madrid, Spain.

[2]Group of Quaternary Research (GRQ)-SERP, Department of History and Archaeology, University of Barcelona, C/ Montalegre 6-8, 08001 Barcelona, Spain.

*presenting author, mperez72@ucm.es

***Keywords**: teeth,* Lynx pardinus spelaeus*,* Lynx issiodorensis*, geometric morphometrics, landmarks*

Bone structures involved in feeding (such as teeth and mandible) usually are the most variable between different species. Besides, teeth normally present an excellent preservation state in fossil deposits. One of the most important dental elements within the mammalian order Carnivora are those involved in the carnassial complex (upper fourth premolar and lower first molar). Previous work analyzing the size and shape of the carnassial complex with traditional methods and 2D geometric morphometrics enabled the distinction between Pleistocene and Holocene populations of *Lynx pardinus* Temmick, 1827, as the evolutionary history of the genus *Lynx* is far from being clear. Here, we applied that same methodology to a wider sample, including additional species of the genus *Lynx* and two species of the genus *Caracal*, both extant and extinct, to assess its capacity to discriminate between these species. To perform those analyses, we outlined the P4 and the m1 (the carnassial complex) with landmarks and semilandmarks (curves), and then performed a principal component analysis. We also completed some analyses of variance to test for significant differences in size. We were able to distinguish among the species of the genus *Lynx*, but some questions arise. Remains assigned to *L. issiodorensis* do not differ from those of *L. pardinus spelaeus*, and the latter do not differ from Pleistocene remains of *Lynx pardinus*. These results lead us to question the attribution of these fossils at the species rank. More research is needed to ascertain if they are all referrable to a single species.

Acknowledgements: We want to thank the MNCN-CSIC and the Estación Biológica de Doñana for facilitating us part of the materials used on this study. We want to thank as well the Sociedad de Ciencias Aranzadi, for facilitating some photographs of the lynx found in Pagolusieta cave.

GENOME SIZE EVOLUTION: ASSESSING THE LIMITATIONS OF INFERRING C-VALUES IN STEM SPECIES

C. Pérez-Ben[1*], N. Fröbisch[1,2]

[1]Evolutionary Morphology Department, Museum für Naturkunde-Leibniz Institute for Evolution and Biodiversity Science, Invalidenstraße 43, 10115, Berlin, Germany.

[2]Humboldt-Universität zu Berlin, Invalidenstraße 43, 10115, Berlin, Germany.

*presenting author, celeste.perez.ben@gmail.com

***Keywords**: fossil genomes, osteocyte lacunae, cell size, stem groups*

In vertebrates, genome size (C-value) displays a great variation that is not random, but clade-specific. To investigate when and why significant shifts in genome size occurred, researchers have attempted to infer C-values in stem species of crown groups with extreme genome sizes. These inferences are made from osteocyte lacuna sizes of fossil bones, on the basis that: (1) there is a well-known positive relationship between C-value and cell size; and (2) lacuna size reflects osteocyte size. Here, we argue that it might not be theoretically possible to confidently test whether the large changes in C-value observed in some extant clades have evolved within their stem group. Reanalyzing published data, we show that, even though there is a clear positive relationship between C-value and cell size, this correlation greatly varies among clades and, in particular, shifts in this correlation seem to coincide with large evolutionary changes of C-value, probably due to cell size constraints. This means that the sample of extant taxa used to build the inference models heavily biases the results by imposing a certain genome size–cell size correlation, even when using phylogenetic comparative methods. In this scenario, testing whether a stem group had similar extreme C-values as its crown group would be based on circular reasoning: the results will depend on whether it is assumed or not (i.e., by including or excluding certain crown species when building the inference models) that the stem had the same genome size–cell size correlation as their living relatives.

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

ASSESSING THE PRESENCE OF THE PODOCNEMIDID TURTLE *NEOCHELYS ZAMORENSIS* OUTSIDE ITS TYPE LOCALITY (SANZOLES, ZAMORA, CENTRAL SPAIN)

A. Pérez-García[1*], A. Guerrero[1], S. Martín de Jesús[2], F. Ortega[1]

[1]Grupo de Biología Evolutiva, Dpto. de Física Matemática y de Fluidos, Facultad de Ciencias, UNED, Avda Esparta s/n, 28232 Las Rozas, Madrid, Spain.

[2]Colección de Vertebrados Fósiles de la Cuenca del Duero (Sala de las Tortugas), Departamento de Geología, Facultad de Ciencias, Universidad de Salamanca, 37008 Salamanca, Spain.

*presenting author, a.perez.garcia@ccia.uned.es

***Keywords**: Testudines, Pleurodira, Iberian record, Duero Basin, middle Eocene*

Podocnemididae are one of the three extant lineages of pleurodiran turtles. Podocnemidids are currently restricted to the Southern Hemisphere, with freshwater African and South American representatives. However, this lineage, recognized from the Late Cretaceous, reached Europe during the early Eocene, where it is represented up to the upper Eocene record. The most abundant and diverse pleurodiran genus in the European Cenozoic record is the Eocene freshwater podocnemidid *Neochelys*. Its youngest representatives are two Iberian species defined in the Duero Basin (Central Spain): *Neochelys salmanticensis* and *Neochelys zamorensis*. Knowledge about the former has increased thanks to recent studies. In contrast, *N. zamorensis* is poorly known, lacking a sufficiently detailed diagnosis and being confidently reported exclusively through scarce material from its type locality: the Lutetian levels of Sanzoles, in the Zamora Province. Abundant and well-preserved material of pleurodires was found in the Cubillos-Monfarracinos synchronous area, also in Zamora. In addition to hundreds of isolated plates, more than forty partial or relatively complete shells or sets of articulated plates, as well as many other skeletal remains, were recovered. Since *N. zamorensis* is only known from shell remains, those from the Cubillos-Monfarracinos area are compared to those from the type locality. Our objective is to evaluate if the same species is represented in both locations, which seems very likely. If so, knowledge about the poorly known anatomy of *N. zamorensis* could be greatly increased, both through this study on shells and through future analyses of other skeletal regions (especially the cranium and appendicular skeleton).

Acknowledgements: This research has been funded by the Ministerio de Ciencia e Innovación (PID2019-111488RB-I00).

NEW DATA ON THE DIVERSITY OF PLEURODIRAN TURTLES FROM THE PALEOCENE OF MALI

A. Pérez-García[1*]

[1]Grupo de Biología Evolutiva, Dpto. de Física Matemática y de Fluidos, Facultad de Ciencias, UNED, Avda Esparta s/n, 28232 Las Rozas, Madrid, Spain.

*presenting author, a.perez.garcia@ccia.uned.es

***Keywords**: Testudines, Pleurodira, Bothremydidae, African record, Paleogene*

Pleurodira are one of the two lineages of crown Testudines. They are currently much less diverse than the members of Cryptodira, being restricted to freshwater environments at intertropical regions of the southern continents. However, Pleurodira were very abundant and diverse in the past, with a markedly greater paleobiogeographic distribution and adaptations to a greater range of environments. One of the most successful groups of Pleurodira in the fossil record is Bothremydidae, known from the Early Cretaceous to the Miocene. This lineage was especially abundant and diverse from the Late Cretaceous to the Paleocene, being recognized on several continents. Its greatest diversity is identified in the Southern Hemisphere. Thus, a relevant African record is known. Several bothremydid lineages are identified on that continent, including the one that reached the largest size: Nigeremydini, which groups large coastal bothremydids exclusively recognized as Maastrichtian and Paleocene inhabitants of the Trans-Saharan seaway. Nigeremydini are relatively well-known through the skull, but barely through the shell. One of the countries where they are recognized is Mali, two Paleocene representatives having been defined by the skull there. A large and almost complete Paleocene shell from that country, previously attributed to Pelomedusoides indet., is here analyzed in detail. Its potential attribution to Nigeremydini is evaluated. In addition, unpublished specimens from the same area and age are also studied. Some of them appear to correspond to another lineage within the Bothremydidae. The diversity of bothremydid turtles in the Paleocene of Mali is here analyzed.

Acknowledgements: This research has been funded by the Ministerio de Ciencia e Innovación (PID2019-111488RB-I00).

STORMS AND BONES: EVIDENCE FOR PALAEOCURRENTS IN THE RHAETIAN BONEBEDS OF BONENBURG (GERMANY)

M. Perillo[1*], J. Heijne[1]

[1]Department of Paleontology, University of Bonn, Meckenheimer Allee 176, 53115 Bonn, Germany.

*presenting author, marcelloperillo.96@gmail.com

***Keywords**: Rhaetian, taphonomy, bonebeds, Bonenburg, Exter Formation*

The annual excavation that takes place in Bonenburg (Warburg, Germany) uncovers large amounts of vertebrate fossil material every year from Rhaetic-type bonebed layers of the Exter Formation, deposited in the latest Rhaetian. These layers are part of the Contorta Beds, an 11 m-thick succession of dark fine-grained epicontinental shelf sediments that consist of alternating mudstones, siltstones, and at least four bonebed horizons. Up to now, no published data are available regarding evidence for palaeocurrents in the bonebeds from Bonenburg. Here we report, for the first time, evidence supporting the preferential deposition of macrofossils found in the so-called “bonebed 2A”. We describe a block preserving 130 specimens ranging from coprolites to macroscopic vertebrate remains that show two main orientation axes: 290–300° W and 30–40° N. Corroborating this observation, two fossil logs oriented 290–300° N are reported from the same bonebed layer, a few meters away from the aforementioned block. No previous reports or evidence of similar instances from other bonebed layers from Bonenburg are available, suggesting environmental or depositional energy-related differences, although further studies are needed to confirm this hypothesis. The fauna from the block could be identified as Chondrichthyes, Osteichthyes, Temnospondyli, and marine reptiles, and can be further used to assess the taxonomical diversity in these assemblages and allow for a comparison with the other bonebeds from Bonenburg. Microfaults, already known for the locality, appear to be propagating following the same main axes of direction shown by the fossil remains, with relevant consequences for the process of fossil excavations.

Acknowledgements: Thanks to LWL Museum and Bonn University for access to facilities and storage. Thanks to Sudipta Kalita, Andrea Prino, Dr. Dorota Konietzko-Meier, Dr. Sanjukta Chakravorti, Dr. Elżbieta Teschner and Dr. Achim Schwermann for counseling. We also thank Lucrezia Ferrari, Olaf Dülfer, and Michael Ludorf for assistance during preparation.

ONTOGENETIC VARIABILITY OF THE INTERTYMPANIC SINUSES IN CROCODYLIA AND ITS IMPLICATION FOR THE EUSUCHIAN PHYLOGENETIC TREE

G. Perrichon[1*], L. Hautier[2,3], Y. Pochat-Cottilloux[1], I. Raselli[4], J. Dubost[1], X. Valentin[5,6], G. Garcia[5], N. Rinder[1], V. Fernandez[7], J. Adrien[8], J. Lachambre[8], J.E. Martin[1]

[1]Univ Lyon, Univ Lyon 1, ENSL, CNRS, LGL-TPE, 69100, Villeurbanne, France.

[2]Institut des Sciences de l'Évolution, Université Montpellier, CNRS, IRD, EPHE, 34095 Montpellier, France.

[3]Mammal Section, Life Sciences, Vertebrate Division, the Natural History Museum, SW7 5BD, London, UK.

[4]Geoscience Department, University of Fribourg, Chemin du Musée 6, 1700 Fribourg, Jurassica Museum, Rue de Fontenais 21, 2900 Porrentruy, Switzerland.

[5]Université de Poitiers, Palevoprim, UMR CNRS 7262, 6 rue M. Brunet, 86073 Poitiers cedex 9, France.

[6]Association de recherche Palaios, 15 rue de l'Aumônerie, 86300 Valdivienne, France.

[7]Imaging and Analysis Centre, the Natural History Museum, SW7 5BD, London, UK.

[8]Laboratoire Matériaux, Ingénierie et Science, Institut National des Sciences Appliquées de Lyon, 69100 Villeurbanne, France.

*presenting author, gwendal.perrichon@univ-lyon1.fr

Keywords: *endocranial anatomy, pneumaticity, post-hatching development, 3D geometric morphometrics*

The phylogenetic relationships within Crocodylia are contentious due to conflicts between molecular and morphological hypotheses. Morphology-based datasets are historically constructed on external characters, overlooking the disparity observed in the neuroanatomy and pneumaticity of crocodylians. Additionally, taxonomical determinations are sometimes difficult based on cranial characters only. Investigating endocranial anatomy and searching for suitable internal characters is thus useful to develop a better picture of crocodylian evolution. Here, we present a 3D geometric morphometric study of the intertympanic diverticula in a large dataset of extant specimens to assess its significance in a taxonomic context. This pneumatic space, located above the brain and between the middle ears, displays a morphology that changes during ontogeny and differs among taxonomic groups. We found that the growth of the intertympanic diverticula is modulated by cranial shape, especially in longirostrine species. Still, developmental patterns and adult morphology distinguish specimens at the family, genus, and species level. We show a clear distinction between Alligatoridae and Longirostres, among *Crocodylus* species, and between *Tomistoma* and *Gavialis* lineages. Additionally, we put our results into a broader phylogenetic context using new data on the endocranial anatomy of some fossil eusuchians, such as *Allodaposuchus* and *Acynodon*, to polarize the newly suggested characters. Our observations provide a developmental perspective on endocranial

evolution, and mainly concurs with previous molecular topologies. We therefore propose that sinus anatomy could be added to the taxonomic and phylogenetic studies of fossil specimens, offering an alternative and a significant viewpoint to discuss current debates on crocodylian systematics.

Acknowledgements: we thank all curators from the Université Lyon 1, the Musée des Confluences, the Museum National d'Histoire Naturelle, the Musée Zoologique de Strasbourg, the Aix-Marseille Université, and from the Natural History Museum of United Kingdom, who allowed access and scanning of the studied specimens.

PLIOCENE PERSISTENCE OF THE MIOCENE MAMMALIAN BIOPROVINCES OF THE IBERIAN PENINSULA

P. Piñero[1,2*], J. Agustí[1,2,3], M.P. Sevilla[4], C. Laplana[5]

[1]IPHES-CERCA, Institut Català de Paleoecologia Humana i Evolució Social, Zona Educacional 4, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Spain.

[2]Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain.

[3]ICREA, Institució Catalana de Recerca i Estudis Avançats, Pg. Lluís Companys 23, 08010 Barcelona, Spain.

[4]Departamento de Geodinámica,Estratigrafía y Paleontología, Facultad de Ciencias Geológicas, Universidad Complutense de Madrid, Ciudad Universitaria, 28040 Madrid, Spain.

[5]MAR, Museo Arqueológico y Paleontológico de la Comunidad de Madrid, Plaza de las Bernardas s/n, 28801 Alcalá de Henares, Spain.

*presenting author, ppinero@iphes.cat

***Keywords**: rodents, Early Pliocene, biogeography, Spain*

Since 1978 (work by Agustí) two main mammalian bioprovinces (Ibero-Levant and Ibero-Central) are recognized in the Miocene of the Iberian Peninsula. The former included most of the Spanish Levantine basins, and was characterized by more humid, forested conditions, whereas the latter included internal basins, and was characterized by drier, more open environments. A later work recognized a third Atlantic bioprovince, mostly represented at the Duero Basin (open environments). The recent discovery of the new site of La Piquera in this basin enables for the first time to extend this bioprovincial partition to the Pliocene. La Piquera, together with Baza-1, has yielded the most extensive collection of Early Pliocene rodents from Spain. According to the ecological affinities of small vertebrates from La Piquera, the landscape was dominated by open herbaceous areas under relatively dry, warm environmental conditions. Its rodent assemblage is dominated by stephanodont murids and hypsodont cricetines such as *Stephanomys* (relative abundance 66%), *Ruscinomys* (13%), *Blancomys* (5%), and *Occitanomys* (5%). The relative abundance of *Paraethomys*, *Apocricetus*, *Apodemus*, and *Eliomys* is barely 4% altogether. In Baza-1, however, proportions are reversed, the dominant taxa being *Paraethomys* (39%) and *Apocricetus* (35%). *Eliomys* accounts for 8%, whereas *Stephanomys*, *Ruscinomys*, and *Blancomys* combined account just for 7%. Based on previous macromammalian dental ecometric analyses, the mean annual precipitation in Baza-1 was estimated at 873 mm, consistent with the dominance of forests. Therefore, the comparison between La Piquera and Baza-1 provides evidence for the persistence of at least two bioprovinces during the Early Pliocene in Spain.

Acknowledgements: This research is supported by projects PRP-PID2021-123092NB-C21 (Spanish Ministry of Science and Innovation), and 2021SGR 01238 (Generalitat de Catalunya). P.P.

is supported by a "Juan de la Cierva-Incorporación" contract (grant IJC2020-044108-I) funded by MCIN/AEI/10.13039/501100011033 and “European Union NextGenerationEU/PRTR”.

NEUROANATOMY AND PNEUMATICITY OF *HAMADASUCHUS* (NOTOSUCHIA; CRETACEOUS OF MOROCCO): PALEOECOLOGICAL INFERENCES ON PEIROSAURIDS

Y. Pochat-Cottilloux[1*], N. Rinder[1], G. Perrichon[1], J. Adrien[2], R. Amiot[1], S. Hua[3], J.E. Martin[1]

[1] Univ Lyon, Univ Lyon 1, ENSL, CNRS, LGL-TPE, 69100, Villeurbanne, France.
[2]Laboratoire Matériaux, Ingénierie et Science, Institut National des Sciences Appliquées de Lyon, 69100, Villeurbanne, France.
[3]Paléospace, 5 avenue Jean Moulin, 14640, Villers-sur-Mer, France.

*presenting author, yohan.pochat-cottilloux@univ-lyon1.fr

Keywords: *Crocodylomorpha, Kem Kem, paleoneuroanatomy, Peirosauridae,* Hamadasuchus

We describe the endocranial structures of a new specimen belonging to *Hamadasuchus*, a peirosaurid crocodylomorph from the late Albian–Cenomanian Kem Kem group of Morocco. The cranial endocast, associated nerves and arteries, endosseous labyrinths and cranial pneumatization, as well as the bones of the braincase are reconstructed and compared with extant and fossil crocodylomorphs, which represent different lifestyles. The cranial morphology and characters of this specimen allows its referral to *Hamadasuchus*, with close affinities with *Rukwasuchus yajabalijekundu*, another peirosaurid from the 'middle' Cretaceous of Tanzania. The endocranial structures are also comparable to those of *R. yajabalijekundu*, as well as baurusuchids and sebecids (sebecosuchians). Paleobiological traits of *Hamadasuchus*, such as alert head posture, ecology and behaviour are explored for the first time, using quantitative metrics. The expanded but narrow semicircular canals and enlarged pneumatization of the skull of *Hamadasuchus* are linked to a terrestrial lifestyle. Continuing work on the neuroanatomy of supposedly terrestrial crocodylomorphs needs to be broadened to other groups and will allow to characterize whether some internal structures are affected by the lifestyle in these organisms.

Acknowledgements: This work was supported by the Agence Nationale de la Recherche (SEBEK project no. ANR-19-CE31-0006-01 to J. E. Martin), Céline Salaviale, Emmanuel Robert and Nicolas Roumenoff (Université Lyon 1). We also acknowledge various collection curators around the world for access to extant and extinct comparison specimens.

A 'DUCK-BILLED' DINOSAUR FAUNA FROM THE AGUJA FORMATION (CAMPANIAN) OF TEXAS

A. Prieto-Márquez[1,2*], T.M. Lehman[3], K.L. Davies[4], J.F. Serrano[2], S.L. Wick[5], J.R. Wagner[6]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, c/ Escola Industrial 23, 08201 Sabadell, Barcelona, Spain.

[2]Museu de la Conca Dellà, c/ Museu 4, 25650 Isona, Lleida, Spain.

[3]Department of Geosciences, Texas Tech University, 1200 Memorial Circle, Lubbock, TX 79409, USA.

[4]Department of Vertebrate Paleontology, Sam Noble Museum, Norman, OK 73072, USA.

[5]Texas Vertebrate Paleontology Collections, 10100 Burnet Road, Austin, TX 78758, USA.

[6]6636 West William Cannon Drive, #628, Austin, TX 78735, USA.

*presenting author, albert.prieto@icp.cat

Keywords: *Cretaceous, evolution, phylogeny, systematics, anatomy*

Hadrosaurids form a nearly cosmopolitan clade of Late Cretaceous herbivorous dinosaurs. Much of their known diversity comes from North America, particularly the northern regions of the continent. Hadrosaurids are also common in southern North America but, with few exceptions, specimens are usually fragmentary and rarely diagnosable to lower taxonomic ranks. One of the geological units in southern North America that has provided more hadrosaurid material is the Campanian Aguja Formation (Texas). Although initial collections of hadrosaurid bones from the Aguja were made in 1938 as part of a Works Progress Administration (WPA) project, subsequent work has significantly expanded the collection. A revision of the material collected from the lower interval of the upper shale member of the Aguja Formation revealed a diverse hadrosaurid fauna, consisting of three saurolophines and, possibly, a lambeosaurine species. At least some of these forms are likely to be new genera and species. The saurolophines include a member of Brachylophosaurini, representing the southern-most occurrence of this clade, and two species of Kritosaurini. One of the kritosaurins, represented by a remarkably large individual from WPA-3 locality, is a close outgroup to Argentinian 'secernosaurs', adding support for the hypothesis of a southern Laramidian origin for these South American forms. The putative lambeosaurine displays a maxilla with an unusually short ectopterygoid shelf and long pendant anterior terminus. These forms evidence a greater southern Laramidian hadrosaurid diversity than previously recognized, featuring representatives of clades otherwise known from the central and northern regions of the continent.

Acknowledgements: Supported by CERCA Programme/Generalitat de Catalunya and grant PID2020-119811GB-I00 by the MCIN/AEI/10.13039/501100011033.

THE NEW TEMNOSPONDYL FOSSILS FROM THE RHAETIAN (LATE TRIASSIC) OF BONENBURG (NORTH RHINE-WESTPHALIA, GERMANY) AND THEIR IMPLICATIONS FOR TEMNOSPONDYL EXTINCTION

A. Prino[1*], D. Konietzko-Meier[1]

[1]Institute for Geosciences, University of Bonn, Nussallee 8, 53115, Bonn, Germany.

*presenting author, prino.andre@gmail.com

Keywords: *Temnospondyli, Rhaetian, Bonenburg, extinction, Triassic*

Temnospondyli are a group of amphibious tetrapods that appeared in Early Carboniferous and went extinct in Early Cretaceous, attaining a high diversity especially during the Permian and the Triassic periods. After the end-Permian mass extinction, only the suborder Stereospondyli survived, although it radiated originating different successful groups: Plagiosauroidea, Trematosauroidea, Metoposauroidea, Capitosauria, and Brachyopoidea. While Brachyopoidea survived until the Early Jurassic in Asia and the Early Cretaceous in Australia, the other groups disappeared gradually through the Late Triassic, and none of them was alive during the Rhaetian. This hypothesis was reinforced by the absence of unequivocally dated Rhaetian localities bearing fossils of Temnospondyli—until the clay pit of Bonenburg in North Rhein-Westphalia (Germany) was discovered. This locality has been unequivocally dated to the Rhaetian and has revealed fossils of temnospondyls assigned to Capitosauria. Here we describe the new Temnospondyli cranial and postcranial fossils, including diagnostic bones such as dentary, pterygoid and parietal found in Bonenburg. These fossils belong to Capitosauria and Plagiosauridae and represent the most recent fossil record of both clades. The specimens are all described at a morphological level, but for long bones and a clavicle fragment an histological study helped to reach more precise attributions. These findings shed light on the extinction of some major groups of Temnospondyli, demonstrating that at least two of them survived until the end of the Triassic instead of gradually disappearing before.

Acknowledgments: Special thanks to Thomas Martin (Uni Bonn), to the preparator Olaf Dülfer (Uni Bonn) and his team for sectioning the specimens, to Michael Mertens (private collector) and Achim Schwermann (LWL Münster) for making the study of these specimens possible, and to the AG non-mammal vertebrates research group in Bonn.

RIBOTA: A LACUSTRINE VERTEBRATE ASSEMBLAGE FROM THE JURASSIC–CRETACEOUS TRANSITION OF THE CAMEROS BASIN (SPAIN)

E. Puértolas-Pascual[1*], M. Aurell[1], D.D. Bermúdez-Rochas[2], J.I. Canudo[1], A.E. Fernandes[3,4], À. Galobart[5], M. Moreno-Azanza[1], A. Pérez-García[6], D. Castanera[7]

[1]Aragosaurus-IUCA Reconstrucciones Paleoambientales, Departamento de Ciencias de la Tierra, Facultad de Ciencias, Universidad de Zaragoza, C/ Pedro Cerbuna 12, 50009 Zaragoza, Spain.

[2]Área de Didáctica de las Ciencias Experimentales, Departamento de Didácticas Específicas, Facultad de Formación de Profesorado y Educación, Universidad Autónoma de Madrid, C/ Francisco Tomás y Valiente 3, 28049 Cantoblanco, Madrid, Spain.

[3]SNSB, Bayerische Staatssammlung für Paläontologie und Geologie, Richard-Wagner-Str. 10, 80333 Munich, Germany.

[4]Department of Earth and Environmental Sciences, Ludwig-Maximilians-Universität, Richard-Wagner-Str. 10, 80333 Munich, Germany.

[5]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, c/ Escola Industrial 23, 08201 Sabadell, Barcelona, Spain.

[6]Grupo de Biología Evolutiva, Facultad de Ciencias, UNED, Avda. Esparta s/n, 28232 Las Rozas, Madrid, Spain.

[7]Fundación Conjunto Paleontológico de Teruel-Dinópolis/Museo Aragonés de Paleontología, Avenida de Sagunto s/n, 44002 Teruel, Spain.

*presenting author, puertolas@unizar.es

Keywords: *Osteichthyes, Crocodylomorpha, Testudinata, Pterosauria, Matute Fm*

Ribota is a site with several bonebeds in the Matute Formation (eastern Cameros basin, Ágreda, Soria, Spain), originated around the Tithonian–Berriasian (Jurassic–Cretaceous) transition. The site is composed of various lacustrine carbonate layers outcropping over 10 ha and has around 100 identified vertebrate bone accumulations. Something interesting about the fossils found here is their unusual replacement of the original composition of the bioapatite by quartz, but preserving the bone tissue internal structure. This creates positive reliefs on top of the lacustrine limestone beds due to the greater hardness of silicified fossils. Over 80 specimens have been collected so far, composing an assemblage that includes osteichthyans, crocodylomorphs, turtles, and pterosaurs. A preliminary study of the collection has identified at least 5 different taxa: Halecomorphi indet. and Neoginglymodi indet.; Goniopholididae indet.; Testudinata indet.; and Pterodactyloidea indet. Therefore, the site is dominated by aquatic and semiaquatic vertebrates and was formed by attrition in the lake, possibly far from the shoreline. Ribota represents one of the few Iberian sites from the Tithonian–Berriasian transition that is preserved in a fully lacustrine environment, with a vertebrate assemblage composed of different vertebrates that presumably lived within (or flew over) the lake. This macrovertebrate assemblage provides additional data about the diversity in the faunal ecosystems around the

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

Jurassic–Cretaceous transition of the Iberian Basin Rift System. Overall, the Ribota site is an exciting new find that offers a unique perspective on the animal life of the region during this time period with scarce record in Iberia.

Acknowledgements: E.P.P. was supported by a postdoctoral contract María Zambrano. D.C. has been supported by the Beatriu de Pinós postdoctoral programme (BP2017-00195) and additional funding was provided by the CERCA Programme/Generalitat de Catalunya. Fieldwork has been funded thanks to an ERG Grant of the EAVP.

THE RELATIONSHIP BETWEEN CRANIAL MORPHOLOGY AND DIETARY PREFERENCES IN FLYING SQUIRRELS

Á. Quesada[1*], M. Hernández Fernández[1,2], I. Menéndez[3]

[1]Departamento de Geodinámica, Estratigrafía y Paleontología, Universidad Complutense de Madrid, C/ José Antonio Nováis 2, 28040, Madrid, Spain.

[2]Departamento de Cambio Medioambiental, Instituto de Geociencias (UCM-CSIC), C/ Severo Ochoa 7, 28040, Madrid, Spain.

[1]Museum für Naturkunde, Leibniz Institute for Evolution and Biodiversity Science, Invalidenstrasse 43, 10115, Berlin, Germany.

*presenting author, alvarque@ucm.es

***Keywords**: Sciuridae, Pteromyini, geometric morphometrics, cranium, diet*

There is a relationship between the diet of a species and its cranial morphology, although it depends on multiple factors that may interplay with it. Ecomorphological studies in modern species allow us to investigate such a relationship and use it to infer the diet of extinct species based on their cranial shape. We applied 2D geometric morphometric techniques to the cranium of extant flying squirrels (Pteromyini, Sciuridae) to determine this correlation, with the aim of inferring the diet of extinct flying squirrels whose crania are preserved. We selected 19 landmarks in the ventral view of the cranium and placed a series of semilandmarks forming four curves. We performed a phylogenetic generalized least-squares analysis to jointly analyze the influence of diet and cranium size on cranium shape, as well as the influence of size alone in shape (i.e., allometry). Finally, we applied a linear discriminant analysis to test how well the different diet categories can be distinguished. Our results show that there is a significant correlation between cranial shape and diet, as well as between shape and size. Folivorous species with hard, abrasive, and nutrient-poor diet require large chewing muscles and thus have large, wide, and robust crania. In contrast, frugivorous species tend to possess narrow and small crania. These results open a door to the precise inference of feeding habits for extinct flying squirrels, as long as cranial shape is accurately preserved, which can add valuable information to studies relying on other fossil remains such as teeth or mandibles.

Acknowledgements: This project is a contribution by the research group UCM 910607 to the projects PGC2018-094955-A-I00 and PID2020-116220GB-I00 (Spanish Ministry of Science and Innovation). A.Q. is funded by a predoctoral fellowship CT58/21-CT59/21 from the Complutense University of Madrid. I.M. is funded by a Humboldt Postdoctoral Fellowship.

A NEW TITANOSAURIFORM SAUROPOD FROM THE LATE JURASSIC OF ARGENTINA

O.W.M. Rauhut[1*], J.L. Carballido[2], D. Pol[2]

[1]SNSB-Bayerische Staatssammlung für Paläontologie und Geologie, Richard-Wagner-Str. 10, 80333 Munich, Germany.

[2]Museo Paleontológico Egidio Feruglio, Fontana 140, 9300 Trelew, Argentina.

*presenting author, rauhut@snsb.de

***Keywords**: Late Jurassic, Gondwana, Cañadón Calcáreo Formation, Sauropoda, Titanosauriformes*

Late Jurassic dinosaur faunas from Gondwana are still poorly known, with the fauna from the Kimmeridgian–Tithonian Tendaguru Formation of Tanzania representing the only good reference fauna for this time from the southern continents. However, in the absence of contemporaneous faunas, it cannot be evaluated in how far the Tendaguru fauna might be a “typical” Late Jurassic Gondwanan dinosaur assemblage. Furthermore, some taxa are still poorly known, including the supposed turiasaurians *Janenschia* and *Tendaguria*, and the proposed mamenchisaurid *Wamweracaudia*, all of which represent the so far only representatives of their respective clades in Gondwana. In South America, only the Oxfordian–Kimmeridgian Cañadón Calcáreo Formation of Argentina has so far yielded a diverse dinosaur fauna. A recently excavated specimen of a large sauropod represents a new taxon of titanosauriform. The material recovered includes dorsal and caudal vertebrae, partial pectoral and pelvic girdles, and fore- and hindlimb elements. Anterior dorsal vertebrae have massive centra, very short and broad neural spines, and strongly developed transverse processes, resembling *Tendaguria* in this respect. The posterior dorsal vertebrae are opisthocoelous, with large pleurocoels, high neural arches and spines, and well-developed distal triangular processes, resembling brachiosaurids, such as *Giraffatitan*. Anterior caudal vertebrae are procoelous, with anterolaterally directed transverse processes, as in *Wamweracaudia*. Finally, the limb elements bear resemblance to those of *Janenschia*. Thus, the new specimen might indicate that *Janenschia*, *Tendaguria*, and *Wamweracaudia*, known from non-overlapping material, represent a single taxon (as originally proposed), and a preliminary phylogenetic analysis puts the new taxon in the Brachiosauridae.

Acknowledgements: We thank all fieldwork crews who helped in the excavation of the new specimen and the preparators who prepared the material. Fieldwork was made possible by the authorities of the province of Chubut, Argentina. This work was supported by the Fundación Egidio Feruglio and the Deutsche Forschungsgemeinschaft (grant RA 1012/26).

THE PROXIMAL ULNAR MORPHOLOGY OF THE MIOCENE SMALL-BODIED CATARRHINE *PLIOBATES CATALONIAE*

G. Raventós-Izard[1*], S. Almécija[2,3,1], S. Moyà-Solà[1,4,5], D.M. Alba[1], J. Arias-Martorell[1]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Auntònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Division of Anthropology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024, USA.

[3]New York Consortium in Evolutionary Primatology, New York, NY 10024, USA.

[4]Institució Catalana de Recerca i Estudis Avançats, Pg. Lluís Companys 23, 08010 Barcelona, Spain.

[5]Unitat d'Antropologia Biològica (Dept. BABVE), Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, georgina.raventos@icp.cat

Keywords: *ulna, Miocene, fossil primates, geometric morphometrics, locomotion*

The Miocene (11.6 Ma) small-bodied catarrhine *Pliobates cataloniae* (Catalonia, Spain) exhibits a mix of primitive (stem catarrhine) and derived (modern hominoid-like) postcranial features that make its phylogenetic relationships uncertain. The humeroradial joint exhibits crown hominoid synapomorphies, but the humeroulnar joint is more plesiomorphic and lacks features related to elbow stabilization in extant apes. To evaluate the closest morphometric affinities of the *Pliobates* ulna and infer its locomotor repertoire, using landmark-based 3D geometric morphometrics, we compare its proximal shape with that of extant primates (137 specimens comprising 33 species from 20 anthropoid genera plus a lorisid, along with 10 fossil catarrhines including *Pliobates* and the Miocene great ape *Hispanopithecus*). Our results indicate that the primitive trochlear notch morphology of *Pliobates* displays similarities with non-hominoid primates and supports that this taxon was not adapted to perform acrobatic suspensory behaviors, being instead more compatible with generalized above-branch quadrupedalism. However, *Pliobates* differs from cercopithecoids (terrestrial ones in particular and arboreal ones—e.g., colobines—to a lesser extent) in radial notch features related to enhanced pronation–supination capabilities, closely resembling the condition convergently displayed by crown hominoids, *Ateles*, and *Loris*. This suggests that *Pliobates* would have frequently displayed non-stereotypical postures. Overall, the proximal ulnar morphology of *Pliobates* supports that its locomotor repertoire combined cautious above-branch quadrupedalism and eclectic climbing with non-acrobatic suspensory behaviors resembling those of *Ateles*.

Acknowledgements Funded by R+D+I projects PID2020-116908GB-I00 and PID2020-117289GB-I00 (MCIN/AEI/10.13039/501100011033/), Generalitat de Catalunya/CERCA Programme, MCIN and the European Union (PRE2021-099116 to G.R.I.), AGAUR (2001 SGR 01188, 2001 SGR 00620,

and BP-H2020 MSCA-Cofund No. 801370 to J.A.M.), and Departament de Cultura of the Generalitat de Catalunya (CLT0009_22_000018).

UNTANGLING OR CUTTING THE GORDIAN KNOT? DIVERSITY OF SAUROPODOMORPHS DURING THE NORIAN IN EUROPE

O.R. Regalado Fernández[1*], M. Bronzati[1], I. Werneburg[1,2]

[1]Fachbereich Geowissenschaften an der Universität Tübingen, Hölderlinstraße 12, 72074 Tübingen, Germany.

[2]Senckenberg Centre for Human Evolution and Palaeoenvironment an der Universität Tübingen, Sigwartstraße 10, 72076 Tübingen, Germany.

*presenting author, omar-rafael.regalado-fernandez@mnf.uni-tuebingen.de

***Keywords**: Late Triassic, Sauropodomorpha, palaeogeography, taxonomy*

The cumbersome taxonomy of the Late Triassic sauropodomorph *Plateosaurus* reflects the conflicting nature of the palaeontological species concept. Since 1837, the taxonomy of *Plateosaurus* has been built using different criteria: taphocoenosis and fossil communities, stratigraphy, morphological disparity and similarity, and morphometrics. In this work, we integrate specimen-level phylogenetics, comparative anatomy, and basin analysis of the Late Triassic to understand the diversity of early-diverging sauropodomorphs in Europe. Several iterations of specimen-level phylogenetics, performing equal-weighted and implied weighting analyses, found that the three specimens traditionally referred to as *Plateosaurus trossingensis* are placed at the base of a comb-like arrangement that includes robust forms, such as *Schleitheimia* and *Tuebingosaurus*—two sauropodomorphs that have been previously nested within Sauropodiformes. Moreover, *Pachysaurus*—a robust genus synonymised with *Plateosaurus*—is found nested within Plateosauria, and *Gresslyosaurus*—a robust genus recently resurrected—is more closely related to *Camelotia* than to *Plateosaurus*. A basin analysis found that, during the Late Triassic, the sauropodomorph-bearing localities from Baden-Württemberg, Halberstadt (Germany) and the Marnes irisées supérieures (France) were separated by a shallow epicontinental sea with a large volcanic activity due to the Neotethys Ocean rift system. The phylogenetic patterns in a comb-like arrangement suggest a combination of vicariance and migration. Furthermore, nearly 30% of the character states differ among the three specimens attributed to *Plateosaurus trossingensis*, and the fact that previously thought Sauropodiformes are nested with other plateosaurids suggests that the diversity within sauropodomorphs in Europe may reflect the effects of insularity and niche partitioning, favouring an increase in diversity.

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

NEW MOSASAUR EVIDENCE FROM COAHUILA, MEXICO

H.E. Rivera-Sylva[1*], J.R. Guzmán-Gutierrez[2], J. Flores-Ventura[1], D.A. Hernández-Dávila[3], F.A. Cabral-Valdés[1]

[1]Museo del Desierto, Blvd. Carlos Abedrop Dávila 3745, 25022, Saltillo, Coah., Mexico.

[2]Universidad Humanista de las Américas, Martín de Zavala 510, Monterrey, N.L., Mexico.

[3]Secretaría de Educación del Estado de Coahuila, Blvd. Francisco Coss s/n, Unidad Campo Redondo, 25000 Saltillo, Coah., Mexico.

*presenting author, hrivera@museodeldesierto.org

***Keywords**: Mosasauridae, Campanian, Santonian*

Most mosasaurid specimens from Mexico have remained undiagnostic, only referable to family rank. Several mosasaurid specimens have been discovered in the State of Coahuila (Northern Mexico) by amateur palaeontologists since 2020. Previously to that, remains of *Clidastes* sp. were mentioned from the Cerro del Pueblo Formation (Campanian). In addition, a plioplatecarpine skull identified as *Platecarpus* aff. *planifrons* and a yaguarasaurine mosasauroid were documented from the Boquillas Formation (Early Turonian). Later, other remains attributed to *Tylosaurus* from the Eagle Ford Formation of northern Coahuila as well as specimens of *Clidastes* sp. from the Aguja Formations were identified. The new specimens discovered mainly cover axial remains such as a partial isolated dorsal vertebra from the Austin Formation (Santonian–Coniacian). The most complete assemblage consists of 21 vertebrae and two phalanges, found in the Cerro del Pueblo Formation (Late Campanian) in Southeast Coahuila. Also within the same Formation but from three different localities, a tooth, several isolated caudal vertebrae, and an ulna are reported. One more tooth was found in the Pen Formation (Santonian) of northern Coahuila. From the Lower Member of the Las Encinas Formation (Late Maastrichtian), an isolated vertebra was collected, being the younger mosasaurid specimen recorded from Mexico to date. The remains mentioned here complement our knowledge of the fossil record of the area and contribute to a better understanding of the paleofaunal diversity and paleoecology of the Western Interior Seaway during the Late Cretaceous. Here we provide an overview of these specimens and discuss the recently collected material.

Acknowledgements: We are indebted to Claudio de León Dávila for allowing access to study the specimens under his care. We also thank Julio Robledo for his skillfull preparation of the specimens reported here.

THE AUDITORY REGION MORPHOLOGY OF SOME ENDEMIC EUROPEAN ARTIODACTYLS

S.V. Robson[1*], M. Mourlam[2], J.M. Theodor[1], M. Orliac[2]

[1]Department of Biological Sciences, University of Calgary, 2500 University Ave NW, T2N 1N4, Calgary, AB, Canada.

[2]Institut des Sciences de l'Évolution de Montpellier - Université de Montpellier, CC 065, Place Eugène Bataillon, 34095, Cedex 05 Montpellier, France.

*presenting author, selina.robson1@ucalgary.ca

***Keywords**: Artiodactyla, phylogenetics, petrosal, bony labyrinth, µCT scan*

The order Artiodactyla (even-toed hoofed mammals) includes pigs, ruminants, hippopotamuses, camels, and cetaceans. Artiodactyls originated during the earliest Eocene (~56 Ma) and rapidly radiated, with early forms (Dichobunoidea) found in both Eurasia and North America. Soon after their initial radiation, Europe became an island archipelago, leading to the evolution of eight endemic European artiodactyl families. The relationships of these families remain unclear, in part because of incomplete data; the auditory region of most taxa is undescribed but may be phylogenetically informative. To increase the completeness of this dataset and test proposed relationships, we µCT scanned four taxa: *Cebochoerus* (Cebochoeridae), *Amphimeryx* (Amphimerycidae), *Pseudamphimeryx* (Amphimerycidae), and *Mixtotherium* (Mixtotheriidae). We volumized their auditory region and compared them to other endemic European artiodactyls (anoplotheriids, cainotheriids, choeropotamids) and dichobunoids, and then conducted a preliminary parsimony phylogenetic analysis solely using auditory region characters. The *Cebochoerus* petrosal resembles that of *Acotherulum* (Cebochoeridae) and dichobunoids. The *Mixtotherium* petrosal is most like that of anoplotheriids but lacks the characteristic anoplotheriid anteromedial tuberosity and ventral depression. The amphimerycid petrosals unexpectedly resemble cainotheriids; both families have a dorsoventrally elongated petrosal with a subarcuate fossa immediately dorsal to the internal acoustic meatus. However, based on the results of our phylogenetic analysis, these families are not sister taxa. Furthermore, the auditory region morphology supports the monophyly of Cainotheriidae, Amphimerycidae, and Cebochoeridae, while Anoplotheriidae are found to be paraphyletic, and Choeropotamidae polyphyletic. *Mixtotherium* is recovered as basal to all other artiodactyls. Given the weak branch support and strong homoplasy, this topology requires further investigation.

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

ANALYSES ON CROCODYLIAN CRANIAL REMAINS FROM THE LATE CRETACEOUS OF SOUTHERN PYRENEES

R. Rocchi[1*], B. Vila[2,3]

[1]Dipartimento di Scienze Biologiche, Geologiche e Ambientali, University of Bologna, Via Zamboni 67, 40126 Bologna, Italy.

[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, c/ Escola Industrial 23, 08201 Sabadell, Barcelona, Spain.

[3]Museu de la Conca Dellà, c/ Museu 4, 25650 Isona, Lleida, Spain.

*presenting author, riccardo.rocchi4@studio.unibo.it

Keywords: *Crocodylia, Allodaposuchidae, Maastrichtian, Tremp Basin, phylogeny*

Allodaposuchids were among the most common crocodyliforms in the Late Cretaceous of Europe, with fossils currently found in Spain, France, and Romania. The clade, recently erected to include an abundant number of species described in the last decade, suggests a remarkable diversity that generated systematic controversies. Here we performed analyses on crocodyliform cranial remains from two lower Maastrichtian historical localities of the Tremp Basin (Catalonia, Spain). One of the specimens, collected in the late 1950s in the Suterranya-Mina de lignit locality, is a fragment of the interorbital region and bears characters that give clues about its relationships. Some already described isolated teeth could be assigned to the same specimen, reinforcing its taxonomic referral. The other specimen, a posterior fragmentary part of a skull from Els Nerets locality, had been previously described and is here reviewed. It shows some very peculiar features that do not allow to refer it to any known allodaposuchid taxon. Despite its small size, the skull bears some features that suggest it belonged to an adult individual clearly distinct from *Allodaposuchus palustris*, a species found in the same locality and level. After anatomical comparison with other eusuchians and phylogenetic analyses, both specimens can be ascribed to Allodaposuchidae and open new perspectives on the palaeoecology and distribution of members of this clade. The integration of evidence based on stratigraphy and invertebrate content suggests for both sites a brackish depositional environment, in accordance with the depositional environment of some other known allodaposuchid remains.

Acknowledgements: This research is part of R+D+I projects PID2020-119811GB-I00 (funded by MCIN/AEI/10.13039/501100011033/) and CLT0009_22_000021 (funded by the Departament de Cultura of the Generalitat de Catalunya), and is supported by the CERCA Programme/Generalitat de Catalunya.

RISE OF A DINASTY: MACROEVOLUTIONARY AND BIOGEOGRAPHIC PATTERNS OF IGUANODONTIAN DINOSAURS ACROSS THE JURASSIC–CRETACEOUS TRANSITION

F.M. Rotatori[1,2*], A.A. Chiarenza[3], M. Moreno-Azanza[1,2,4], O. Mateus[1,2]

[1]GEOBIOTEC, Department of Earth Sciences, NOVA School of Science and Technology, Universidade NOVA de Lisboa, P-2829 516 Campus de Caparica, Caparica, Portugal.

[2]Museu da Lourinhã, Rua João Luis de Moura 95, 2530-158 Lourinhã, Portugal.

[3]Departamento de Ecoloxía e Bioloxía Animal, Grupo de Ecología Animal, Centro de Investigacion Mariña, Universidade de Vigo, 36310 Vigo, Spain.

[4]Aragosaurus: Recursos geológicos y Paleoambientales-IUCA, Facultad de Ciencias, Universidade de Zaragoza, 50009 Zaragoza, Spain.

*presenting author, f.rotatori@campus.fct.unl.pt

Keywords: *Dinosauria, Ornithischia, phylogenetics, biogeography, macroevolution*

Iguanodontian dinosaurs are a speciose clade of ornithischians, with a fossil record spanning the Middle Jurassic to Late Cretaceous interval, and representing one of the most successful groups of Mesozoic dinosaurs. Iguanodontians underwent a major radiation from the Late Jurassic to the Early Cretaceous, diversifying into the Late Cretaceous as the main terrestrial herbivorous taxa of their ecosystems. However, their initial evolutionary radiation is still poorly characterised, with uncertainty in timing and modality of their diversification. Here we have compiled a novel dataset combining several phylogenetic matrices and new first-hand observed characters for performing phylogenetic analyses, employing both maximum parsimony (MP) and Bayesian inference (BI). This dataset includes 49 taxa and 215 characters, with the noteworthy addition of several so far neglected taxa from the Late Jurassic and Early Cretaceous of Europe. The topologies obtained with MP and BI are overall consistent and highlight the presence of two newly defined clades. Furthermore, a tip-dated analysis indicates sustained high rates of evolution for most of the Jurassic, preceding their morphological diversification at the beginning of the Cretaceous. Furthermore, we investigated iguanodontian biogeographic history using ancestral state reconstruction, identifying: (1) Europe as the main diversification area for Iguanodontia in the Jurassic, (2) dispersal event of Hadrosauroidea towards Asia preceding the Late Cretaceous, and (3) a subsequent immigration into Laurasia of early diverging hadrosauroids, likely happening around the mid-Cretaceous. This study underlines the pivotal role of the Iberian Plate for dispersal events between Laurasia and Gondwana during the Late Jurassic and Early Cretaceous.

Acknowledgements: This study benefited from the Geobiotec grant UIDB/04035/2020, BioGeoSauria Project PTDC/CTA-PAL/2217/2021 and the FCT fellowship SFRH/BD/146230/2019 to F.M.R.

DIFFEOMORPHIC ANALYSIS OF MALLEUS SHAPE IN CATARRHINES: PHYLOGENETIC IMPLICATIONS

J. Rubio-Coll[1*], A. Urciuoli[2,3,1], D.M. Alba[1]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Universitat Autonoma de Barcelona, Campus de la UAB, 08193 Cerdanyola del Valles, Barcelona, Spain.

[3]Division of Palaeoanthropology, Senckenberg Research Institute and Natural History Museum Frankfurt, Senckenberganlage 25, 60325 Frankfurt am Main, Germany

*presenting author, juliarubiocoll@gmail.com

***Keywords**: phylogeny, auditory ossicles, middle ear, geometric morphometrics,* Epipliopithecus.

Auditory ossicles—especially the malleus—show differences among major primate groups, and among closely related taxa, thus having potential for yielding phylogenetically informative characters. We analyzed the malleus in a sample (n=26) of extant catarrhine species from 21 genera and the pliopithecoid *Epipliopithecus*, to evaluate the usefulness of malleus for assessing phylogenetic affinities. We employed diffeomorphic surface matching (DSM)—a landmark-free 3D geometric morphometric method—to capture shape data, which were analyzed through principal components analysis. The analysis adequately distinguishes among extant catarrhine clades. Hominoids—which display greater morphological variation than cercopithecoids despite being represented by less species—differ in the X-Y angle (that between the head/neck axis and the manubrium axis). Among hominoids, hylobatids and orangutans appear distinctive in head shape and the position of the attachment of the tensor tympani ligament, whereas humans are autapomorphic in possessing a large head and a short manubrium. *Epipliopithecus* shows closest similarities with cercopithecoids in mallear head and anterior process shape, manubrium robusticity, spatula orientation, and X-Y angle, suggesting that cercopithecoids largely retain the crown catarrhine plesiomorphic condition. Ordinary and phylogenetic generalized least-squares regressions of mallear shape (principal components) against log-transformed centroid size indicate a weak negative allometry. Phylogenetic signal (K_{mult}<1) suggests that malleus overall shape might be functionally constrained, although differences in head and anterior process shape, X-Y angle, and manubrium length appear phylogenetically informative. Future research, including platyrrhines and additional extinct primates, will hopefully help disentangle the functional and phylogenetic implications of malleus shape.

Acknowledgements: Funded by R+D+I projects PID2020-116908GB-I00 and PID2020-117289GBI00 (MCIN/AEI/10.13039/501100011033/), CERCA Programme/Generalitat de Catalunya, AGAUR's consolidated research group 2021 SGR 00620, and European Union-NextGenerationEU to A.U. We thank Rolf Quam for scans, TBG Bioinformatik center at Senckenberg for computational hours, and Oriol Monclús, Josep Fortuny, and Josep Torres for technical help.

NEW DINOSAUR FOOTPRINTS IN SECTOR 3LVCB AT LA VIRGEN DEL CAMPO TRACKSITE (ENCISO, LA RIOJA, SPAIN)

J. Rubio-Nieto[1*], M. López-Miguel[1], J.P. Fraga-Hernández[2], M. Aragón-Huguet[1], R. Ramirez-Muñoz[3], C. Solana-Redondo[1], S. Garcia-Moreno[1], P. Navarro-Lorbés[4], A. Torices-Hernández[1]

[1]Departamento de Geodinámica, Estratigrafía y Paleontología, Universidad Complutense de Madrid, C/ José Antonio Novais 12, 28040 Madrid, Spain.

[2]Universidad de Alcalá, Pza. San Diego s/n, 28801 Alcalá de Henares, Madrid, Spain.

[3]Universidad de Huelva, C/ Dr. Cantero Cuadrado 6, 21004 Huelva, Spain.

[4]Cátedra Extraordinaria de Paleontología, Departamento de Ciencias Humanas, Universidad de La Rioja (UR), C/ Luis de Ulloa 2, 26004 Logroño, La Rioja, Spain.

*presenting author, jarubi05@ucm.es

Keywords: *ichnology, tracks, theropods, Upper Barremian–Upper Aptian, Cameros Basin*

In this study, we analysed the dinosaur footprints on the sector 3LVCb of La Virgen del Campo tracksite (Early Cretaceous, Enciso, La Rioja, Spain). In this area, two new trackways (i.e., 3LVCb.1 and 3LVCb.2) composed of >20 footprints each and arranged in an almost perpendicular orientation, were found. 3LVCb.1 goes from south to north, whereas 3LVCb.2 goes from southwest to northeast. Some of the ichnites of 3LVCb.2 directly deform 3LVCb.1 footprints, suggesting that 3LVCb.1 was left first. Both footprints show several characters usually present on theropod ichnites, such as claw traces, narrow interdigital angles, and V-shaped heel impressions. The tracks have an average length of 33 cm in 3LVCb.1, and 21 cm in 3LVCb.2, and can be attributed to medium and small theropods, respectively. Interestingly, no skeletal record of small theropods has been recorded in La Rioja so far. Moreover, 3LVCb.2 shows some variation in the stride length, reflecting different speeds while also changing direction, turning ~20º south. This finding is significant because it implies a new theropod footprint morphotype present at this site. Our study generally led to the following conclusions: first, we describe two new trackways that expand the ichnological record of the site with at least one new type of dinosaur that was previously unknown at this region; second, the range of behaviors recorded at the site are increased by the presence of a trackway that shows a change in speed and direction.

Acknowledgements: Thanks to Raúl San Juan Palacios and Mireia Ferrer Ventura for their invaluable help in carrying out this project.

THE REMARKABLE BIOMECHANICAL SIMILARITY OF THE MANDIBLES OF PEIROSAURIDS AND BAURUSUCHIDS (NOTOSUCHIA, CROCODYLIFORMES)

J.V. Ruiz[1,2,3,4], G.S. Ferreira[3,4*], G. Darlim[4], T.S. Marinho[5,6], A.G. Martinelli[7], P.H.M. Fonseca[8], F.C. Montefeltro[1]

[1]Laboratório de Paleontologia e Evolução de Ilha Solteira, Faculdade de Engenharia de Ilha Solteira/Universidade Estadual Paulista, R. Monção 226, 15385-000, Ilha Solteira, Brazil.

[2]Programa de Pós-Graduação em Biodiversidade, Instituto de Biociências, Letras e Ciências Exatas/Universidade Estadual Paulista, R. Cristóvão Colombo 2265, 15054-000, São José do Rio Preto, Brazil.

[3]Senckenberg Centre for Human Evolution and Paleoenvironment, Eberhard Karls University of Tübingen, Hölderlinstraße,12, 72074, Tübingen, Germany.

[4]Department of Geosciences, Eberhard Karls University of Tübingen, Hölderlinstraße,12, 72074, Tübingen, Germany.

[5]Centro de Pesquisas Paleontológicas "Llewelyn Ivor Price", Universidade Federal do Triângulo Mineiro, Estanislau Collenghi 194, 38039-755, Peirópolis, Uberaba, Minas Gerais, Brazil.

[6]Instituto de Ciências Exatas, Naturais e Educação, Universidade Federal Do Triângulo Mineiro, Departamento de Ciências Biológicas, Avenida Doutor Randolfo Borges Júnior, 38064-200, Uberaba, Minas Gerais, Brazil.

[7]Sección Paleontología de Vertebrados, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia"-CONICET, Av. Ángel Gallardo 470, C1405DJR, Buenos Aires, Argentina.

[8]Programa de Pós-Graduação em Geociências, Instituto de Geociências - UFRGS, Av. Bento Gonçalves, 9500, 91501-970, Porto Alegre, Brazil.

*presenting author, gabriel.ferreira@senckenberg.de

***Keywords**:* Uberabasuchus*,* Aphaurosuchus*, biomechanics, finite element analysis, Bauru Group*

The Bauru Group (Late Cretaceous of Brazil) has a rich assembly of Notosuchia, including the predatory baurusuchids and the usually smaller peirosaurids, which are recorded in the same formations. Nevertheless, most dietary inferences for these taxa are based solely on qualitative analyses. Here, we applied finite element analysis to a peirosaurid *Uberabasuchus terrificus* mandible to simulate possible hunting movements to the mandible and lower dentition in six extrinsic unilateral scenarios with a load of 600N: bite on D1, D4, and D12; head-shaking, head-twisting, and pulling-back in D4; and one bilateral scenario (bite on D4). Bone and teeth were modelled with the same isotropic material properties. We furthermore conducted the same tests with the mandible of the baurusuchid *Aphaurosuchus escharafacies*, which was scaled to the same area of smaller mandible of *Uberabasuchus*. Both species presented very similar results in stress average per element and distribution of von Mises stress. However, the mean stress is lower in *Uberabasuchus* in all scenarios except during head-shake and pull-back. Our results show that even with its dissimilar morphology, mandible biomechanics is not enough to explain possible differences in hunting

strategies. Given the very similar biomechanical performance, we suggest that the difference in tooth and cranial morphology, combined with the size of each taxon (and its behavioural implications) are perhaps more important factors leading to avoiding competition between coexisting baurusuchids and peirosaurids. Further analysis (e.g., testing intrinsic scenarios and also the cranium), may provide a more comprehensive view of the dietary habits of these singular Notosuchia.

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

TANYSTROPHEUS HOTSPOT IN A NEW MIDDLE TRIASSIC VERTEBRATE ASSEMBLAGE FROM SOUTHERN POLAND

A. Rytel[1*], M. Tałanda[2], Ł. Czepiński[1,2], W. Pawlak[2], T. Szczygielski[1], T. Sulej[1]

[1]Institute of Paleobiology, Polish Academy of Sciences, 00-818, Warsaw, Poland.
[2]University of Warsaw, Faculty of Biology, Biological and Chemical Research Centre, Institute of Evolutionary Biology, 02-089, Warsaw, Poland.

*presenting author, adam.rytel@twarda.pan.pl

Keywords: *Tanystropheidae, Ladinian, Germanic Basin, Keuper, mesohaline conditions*

The Middle Triassic constituted an important epoch for the evolution of many vertebrate groups, and a time of major faunistic turnovers. One of such shifts took place in Europe, during the Muschelkalk ("marine")–Keuper ("terrestrial") transition. The outcrops from this age, located predominantly in Germany, have yielded countless well-preserved fossils and a multitude of taxa, highlighting the important status of these sites in palaeontology. Here, we report a previously unpublished vertebrate assemblage from Miedary (southern Poland). This new locality is dated to the Ladinian—the first such site in this region, which helps to bridge the fossil record gap existing between the western part of the Germanic Basin and Cis-Uralian Russia. On the basis of thousands of bones, teeth, and scales found therein, more than 20 taxa have been recognised so far, including fish (sharks, actinopterygians, dipnoans), temnospondyls (plagiosaurids, mastodonsaurids), chroniosuchians, procolophonoids, sauropterygians, and archosauromorphs (tanystropheids, archosauriforms). Their burial environment was shallow-marine and mesohaline, with numerous aquatic and amphibious animals being found in the same strata as the rare remains of terrestrial reptiles. Novelties from the Miedary site include the presence of a new, enigmatic, armoured archosauromorph, as well as the surprising abundance of *Tanystropheus* remains, which quantitatively dominate over all other tetrapod taxa—contrary to what can be observed in the roughly contemporaneous localities from the Germanic Basin. Miedary is currently the richest source of three-dimensionally preserved *Tanystropheus* material around the world, which will be crucial for better understanding the preferred environment and lifestyle of this highly specialised reptile.

Acknowledgements: We thank all students, volunteers and personnel taking part in the fieldwork in the Miedary site, as well as the local authorities and the excavation area owner. This study was supported by grants NCN 2017/27/B/NZ8/01543, 2019/35/N/NZ8/03806, and 2020/39/O/NZ8/02301.

A NEW 'TRANSITIONAL' PLESIOSAUR FROM THE UPPERMOST LOWER JURASSIC OF GERMANY

S. Sachs[1], S. Eggmaier[2], D. Madzia[3*]

[1]Abteilung Geowissenschaften, Naturkunde-Museum Bielefeld, Adenauerplatz 2, 33602, Bielefeld, Germany.

[2] Urwelt-Museum Oberfranken, Kanzleistraße 1, 95444 Bayreuth, Germany.

[3]Institute of Paleobiology, Polish Academy of Sciences, Twarda 51/55, 00-818, Warszawa, Poland.

*presenting author, daniel.madzia@gmail.com

Keywords: *Plesiosauroidea, Plesiosauria, Lower Jurassic, Mistelgau*

Cryptoclidian plesiosaurs are a diverse and globally distributed clade of plesiosauroids that existed from the Middle Jurassic to the latest Cretaceous and comprised cryptoclidids, elasmosaurids, and leptocleidians. Their emergence is generally thought to be associated with the restructuring of the upper tier of marine ecosystems during the Early/Middle Jurassic transitional interval. However, no plesiosaur taxa have so far been discovered to bridge the gap between 'typical' plesiosauroid representatives of the Early Jurassic, such as microcleidids, and the 'typical' plesiosauroids of the Middle and Late Jurassic—the cryptoclidids. Here we report a new plesiosauroid taxon from the upper Toarcian (uppermost Lower Jurassic) of the Jurensismergel Formation of Mistelgau in Franconia, northern Bavaria, Germany. The new taxon is based upon two exquisite specimens, preserving most of the skeleton and including parts of the mandible, teeth, and a nearly complete postcranium. Phylogenetic analyses place the new plesiosauroid at a well-supported position as a sister taxon to Cryptoclidia, providing evidence for the presence of a 'transitional' plesiosaur that helps to fill the gap between the Early Jurassic and Middle to Late Jurassic plesiosaur faunas.

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

A CLOSE LOOK TO AN ANOMALOUS *IGUANODON BERNISSARTENSIS* TIBIAL BONE OVERGROWTH

J. Salas-Herrera[1*], F. Escaso[1], J.M. Gasulla[1], R. Tosca-Segura[2], F. Ortega[1]

[1]Grupo de Biología Evolutiva, Facultad de Ciencias, Universidad Nacional de Educación a Distancia (UNED), Avda. Esparta s/n, 28232 Las Rozas de Madrid, Spain.

[2]Department of Pediatrics, Hospital General Universitario de Castellón, Avda. de Benicàssim 128, 12004 Castellón de la Plana, Spain

*presenting author, jsalas@ccia.uned.es

Keywords: *Dinosauria, Styracosterna, computed tomography, neoplasm, osteofibrous dysplasia*

The evidence of paleopathological bone lesions in large-sized ornithopod dinosaurs is nowadays increasing significantly. However, most of these findings relate to hadrosaurids, whereas the record of pathologies associated with the styracosternan *Iguanodon bernissartensis* are mainly reported in elements of the axial skeleton. In the Iberian record, references to large-sized styracosternan limb bone lesions are extremely rare. Here, a detailed description of a paleopathological lesion on a right tibia from the Barremian Arcillas de Morella Formation (Eastern Spain) attributed to *Iguanodon bernissartensis* is provided. This tibia exhibits an anomalous overgrowth area at the midshaft, covering part of its posteromedial side. Gross examination reveals a smooth and swollen surface with a well-defined lobulated morphology that is thicker distally. CT scans reveal a moderate cortical expansion (i.e., hyperdense subperiosteal bone area). Differential diagnosis includes traumatic fracture callus, infections, and neoplastic growths. The studied anomaly is tentatively consistent with osteofibrous dysplasia, a fibro-osseous tumor commonly documented in mammalian tibiae and avian tibiotarsi. In most cases, this lesion is asymptomatic, although it can also appear associated with pain and swelling in the area of the deformity. Most tumors detected in fossil amniotes are usually cartilaginous or bony, and evidence of mesenchymal bone tumors, such as the one described here, is rare even in living genera. Hence, findings like this may be of valuable interest in expanding the spectrum of possible neoplastic paleopathologies in non-avian dinosaurs.

Acknowledgements: This research was funded by an FPI UNED fellowship. We are also grateful to the Hospital General Universitario de Castellón for allowing us to use their CT-scan equipment.

BEATING THE NO-WIN SCENARIO: *AFROTRAGULUS* (MAMMALIA, RUMINANTIA, TRAGULIDAE) AND THE EVOLUTION OF TRAGULIDS

I.M. Sánchez[1*], D. DeMiguel[2,1], V. Quiralte[3], J. Morales[4]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]ARAID Foundation/Universidad de Zaragoza, Departamento de Ciencias de la Tierra, and Instituto Universitario de Investigación en Ciencias Ambientales de Aragón (IUCA), c/ Pedro Cerbuna 12, 50009 Zaragoza, Spain.

[3]Museo Geominero IGME, C/ Ríos Rosas 23, 28003 Madrid, Spain.

[4]Departamento de Paleobiología, Museo Nacional de Ciencias Naturales-CSIC, C/ Pinar 25, 28006 Madrid, Spain.

*presenting author, micromeryx@gmail.com

***Keywords**: Miocene, morphology, phylogeny, Ruminantia, Tragulidae*

The Tragulidae (chevrotains and mouse deer) are the most basal and strange of extant Ruminantia, surviving as Old World tropical relics distributed in three genera: *Moschiola* (India and Sri Lanka), *Tragulus* (South-East Asia and the Philippines) and *Hyemoschus* (Africa from Sierra Leona to Uganda). Tragulids appeared in the Late Eocene (*Archaeotragulus*) but their record in the Paleogene is almost unknown. They reappear in the fossil record in Early Miocene strata of Asia, Africa, and Europe with a great diversity of morphologies and sizes. This diversity was historically hidden within the ubiquitous extinct genus *Dorcatherium*. The study of tragulid evolution has been historically neglected— widespread use of size as the main systematic criterion, dental and postcranial morphology usually not considered, no use of phylogenetic systematics—and hence it became a century-long dead-end road, a no-win scenario that needed a complete revamping. Here we present a résumé of our reassessment of tragulid evolution and systematics, represented by the description of the African genus *Afrotragulus* that led to the recognition of the real Miocene tragulid diversity. Cranial, dental, and postcranial characters were considered and described. Phylogenetic analyses recovered an ingroup tragulid tree including stem and crown lineages that demonstrated the paraphyly of *Dorcatherium* and also linked the fossil lineages with the living forms. A 'selenodont-clade' clustering *Afrotragulus* with the extant Asian forms show that these are ancient long lineages dating back to the Early Miocene. Finally, the genus *Afrotragulus* was uncovered as one of the longest-lived and most successful members of the Tragulidae.

Acknowledgements: R+D+I projects PID2020-117289GB-I00 to I.M.S. and PID2020-116220GB-I00 to D.DM. and I.M.S. (MCIN/AEI/10.13039/501100011033/), CERCA Programme/Generalitat de Catalunya to I.M.S. and D.DM., and the Government of Aragon (ref. E33_20R) to D.DM.

LATE JURASSIC THYREOPHORAN REMAINS FROM THE PROVINCE OF TERUEL (SPAIN): NEW FINDINGS AND FOSSIL SITES

S. Sánchez-Fenollosa[1*], A. Cobos[1]

[1]Fundación Conjunto Paleontológico de Teruel-Dinópolis / Museo Aragonés de Paleontología, Av. Sagunto S/N, 44002 Teruel, Spain.

*presenting author, sfenollosa@fundaciondinopolis.org

Keywords: *Dinosauria, Thyreophora, Upper Jurassic, eastern Iberia, Villar del Arzobispo Formation*

In recent years, the number of discoveries of thyreophoran remains from the Upper Jurassic has increased remarkably in the eastern Iberian Peninsula, and particularly in the province of Teruel (Aragón, Spain). In the present work, we report new findings related to armored dinosaurs from several localities. The fossils come from the Villar del Arzobispo Formation with an age of Kimmeridgian–Tithonian (Late Jurassic) and consist of a distal fragment of dermal spine, a cervical centrum, and five caudal vertebrae. The distal fragment of the dermal spine is heavily eroded, comes from the MR-9 fossil site (Mora de Rubielos, Teruel), and is tentatively referred to Thyreophora indet. Regarding vertebrae, the cervical centrum comes from the RD-17 fossil site (Riodeva, Teruel) and it is amphicoelous, elliptical, wider than long, and exhibits a wide ventral keel. The caudal vertebrae comprise an anterior caudal vertebra from the RD-5 fossil site (Riodeva, Teruel), a mid caudal vertebra from Riodeva (unknown fossil site), two posterior caudal vertebrae from the RD-29 fossil site (Riodeva, Teruel), and a posterior caudal vertebra from the CT-10 fossil site (El Castellar, Teruel). All caudal vertebrae are amphicoelous, heart-shaped, and wider than tall and long. These characters lead us to tentatively refer all vertebrae to cf. *Dacentrurus* sp. The abundant presence of localities with thyreophoran remains makes the province of Teruel a key place for the study of these dinosaurs, being one of the richest areas in Europe.

Acknowledgements: This research was funded by Research Group E04_20R FOCONTUR financed by Departamento de Ciencia, Universidad y Sociedad del Conocimiento (Gobierno de Aragón), the Instituto Aragonés de Fomento, and Unidad de Paleontología de Teruel funded by Ministerio de Ciencia e Innovación (Gobierno de España).

UNUSUAL *MEGALOOLITHUS SIRUGUEI* EGGSHELLS FROM THE VILLALBA DE LA SIERRA FM. (UPPER CRETACEOUS, CUENCA, SPAIN)

F. Sanguino[1*], A. de Celis[1], A. Pérez-García[1], F. Ortega[1]

[1]Grupo de Biología Evolutiva, Facultad de Ciencias, Universidad Nacional de Educación a Distancia (UNED), Avda. Esparta s/n, 28232 Las Rozas de Madrid, Madrid, Spain.

*presenting author, fernand1988sg@gmail.com

***Keywords**: parataxonomy, Megaloolithidae, Titanosauria, dinosaur eggs, reproductive biology*

Megaloolithus siruguei is to date the single megaloolithid oospecies recognized at two Campanian–Maastrichtian sites of the Villalba de la Sierra Fm. (Central Iberian Ranges): Portilla and Zafra de Záncara. This oospecies has also been reported at similarly aged sites in Southern France and the Tremp Fm. (Southern Pyrenees), and as *M.* aff. *siruguei* at the coeval Sierra Perenchiza Fm. (Southeastern Iberian Ranges). Interestingly, specimens from Villalba de la Sierra Fm show an uncommon combination of eggshell thickness and node shape that may represent extreme cases among this oospecies variability. The morphometric data obtained from measuring published thin sections from France, Southern Pyrenees, and Southeastern Iberian Ranges suggest that, overall, the eggshell units from specimens of the same site or formation show a similar range of spherolith width and height (and therefore eggshell thickness). Additionally, although its nodes can be bell-shaped, wave-shaped or dome-shaped, the latter morphology is seemingly the most common. The Portilla specimens, however, show a range of thickness variation comparable to all the considered French sites altogether, and the thickness of the Zafra de Záncara specimens is below the reported thickness range of the oospecies. The dome-shaped nodes are notably less frequent in the Villalba de la Sierra Fm. specimens, and bell-shaped nodes are the dominant morphology in Zafra de Záncara. The morphological data obtained from the specimens of this Formation may contribute to the understanding of the variability of this widespread European ootaxon and its relationship with biotic and abiotic factors.

Acknowledgements: This research is supported by a FPI fellowship to FS related to the research goals from project PID2019-111488RB-I00 of the Ministerio de Ciencia e Innovación del Gobierno de España, and to the research goals of projects SBPLY/21/180801/000045 and SBPLY/22/180801/000027 from the Gobierno de la Junta de Comunidades de Castilla-La Mancha.

3D GEOMETRIC MORPHOMETRIC ANALYSIS REVEALS DISPARATE CRANIAL SHAPE DIVERGENCES IN RHINOCEROTIDAE (MAMMALIA, PERISSODACTYLA)

O. Sanisidro[1*], I.A. Lazagabaster[2,3], Shijie Li[4], J.L. Cantalapiedra[1]

[1]Department of Life Sciences, GloCEE Global Change Ecology and Evolution Research Group, University of Alcalá, 28805 Madrid, Spain.

[2]Centro Nacional de Investigación sobre la Evolución Humana, CENIEH, 09002 Burgos, Spain.

[3]University of Liverpool, Department of Evolution, Ecology and Behaviour, L69 3BX, Liverpool, UK.

[4]Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences, Beijing, China.

*presenting author, oscarsanisidro@gmail.com

***Keywords**: Rhinocerotidae, Perissodactyla, geometric morphometrics, megaherbivores*

Living rhinoceros species are flagships of modern conservation efforts. Yet, we lack a quantitative understanding of their evolutionary history and, specifically, the morphological traits triggering the innovations of the group from a deep-time perspective. Here, we unfold the rich and well-studied fossil record of Rhinocerotidae, and investigate the correlation between the diversification of the group and the tempo and mode of their cranial innovations using 3D geometric morphometrics. More than 250 crania were digitized using structured-light and photogrammetry methods. Their external morphology was quantified using 121 landmarks and semilandmarks. Multivariate morphometrics generally requires the use of a relatively complete and undistorted sample. Restricting the studied sample to specimens in mint condition can dramatically hamper the size of the dataset. To avert this potential caveat, we performed a two-step missing/damaged landmark protocol. First, overall cranial deformation was corrected using bilaterally equivalent structures in a case-by-case scenario. Second, to test the prospective performance of the different missing data reconstruction methods, we used artificially landmark-depleted iterations of complete specimens. The resulting principal component ordination on Procrustes coordinates demonstrates patterns of shape change focused on the rostral elongation, shifts in the orientation of the occipital plate, and a relative reduction of the dental series. Phylogenetic generalized least squares analysis on principal component scores demonstrates that phylogeny and body size have sound effects on cranial shape. Our results corroborate previous research in finding convergent grazing specialization in some Rhinocerotini and Elasmotherinae species, and a broad range of cranial shapes within Teleoceratina and Aceratheriini.

Acknowledgements: Talent Attraction Program of the Madrid Government and the Universidad de Alcalá grant 2017-T1/AMB5298 and all the collection managers and curators involved in the multiple institutions hosting the specimens used in the present work.

PALAEOHISTOLOGY AND MINERALOGICAL COMPOSITION OF DINOSAUR FOSSILS FROM THE LOWER CRETACEOUS BONEBEDS OF MAS DE CLAPISES I AND II (CASTELLÓN, SPAIN)

A. Santos-Cubedo[1,2*], O. Marí[2], C. de Santisteban[3], B. Poza[2,4], S. Meseguer[1]

[1]Àrea de Cristal·lografia i Mineralogia, Departament de Biologia, Bioquímica i Ciències Naturals, Universitat Jaume I, 12071 Castelló, Spain.

[2]Grup Guix, C/ Santa Lucia 75, 12540 Vila-real, Castelló, Spain.

[3]Departament de Botànica i Geologia, Universitat de València, 46100 Burjassot, València, Spain.

[4]Museo de Ciencias Naturales, C/ General Elio s/n, 46010 València, Spain.

*presenting author, santos.cubedo@gmail.com

Keywords: *Fossil diagenesis, bone mineralogy, Iberian peninsula, dinosaurs*

Fifteen samples of dinosaur bones from the fossil sites of Mas de Clapises I and II at the Mirambell Formation (early Barremian, Early Cretaceous) are studied. This formation represents coastal environments and is situated at the locality of Portell (Castellón, Spain). Previous works at these sites suggested a tropical and humid environment, with episodes under a sheet of water (lacustrine and marine) and others of subaerial exposure with development of lateritic soils. Here, we aim to understand the mineralogical and chemical composition of the bones that were buried in these environments to try to determine the processes that transformed the initial biogenic phosphate. To do so, we used X-ray diffraction and bone palaeohistology. For the latter, we prepared thin sections from a rib fragment and from other eight random bone fragments. Our results show that initial bone has been transformed into fluorapatite, although other mineralogical phases include calcite, quartz, dolomite, goethite, and kaolinite. Mineralogically, two types of calcite can be recognised: an Fe-oxide-stained one, and a layer of clear crystalline calcite. Iron oxides and/or hydroxides are also present. The main mineralogical difference between the two studied sites are (1) the greater presence of fluorapatite in Mas de Clapises I, and (2) the presence of kaolinite in Mas de Clapises II. Histologically, the samples studied present a good preservation, as we were able to observe the lamellae of both primary and secondary osteons. Also, canaliculi and osteocyte lacunae were observed.

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

STABLE ISOTOPE DIETARY ASSESSMENT OF *SMILODON* (CARNIVORA, FELIDAE) FROM CENTRAL ARGENTINA DURING THE LATEST PLEISTOCENE

D. Sanz-Pérez[1,2*], M. Hernández Fernández[1,2], R.L. Tomassini[3], C.I. Montalvo[4], L. Domingo[1,2,5]

[1]Departmento de Geodinámica, Estratigrafía y Paleontología, Universidad Complutense de Madrid, C/ José Antonio Novais 12, 28040 Madrid, Spain.

[2]Departmento de Geología Sedimentaria y Cambio Medioambiental, Instituto de Geociencias (CSIC, UCM), C/ del Dr. Severo Ochoa 7, 28040 Madrid, Spain.

[3]Instituto Geológico del Sur, Departamento de Geología Universidad Nacional del Sur (UNS)-CONICET, Av. Alem 1253, 8000, Bahía Blanca, Argentina.

[4]Facultad de Ciencias Exactas y Naturales, Universidad Nacional de La Pampa, Av. Uruguay 151, 6300, Santa Rosa, Argentina.

[5]Earth and Planetary Sciences Department, University of California Santa Cruz, 1156 High Street, 95064, Santa Cruz, USA.

*presenting author, dasanz01@ucm.es

***Keywords**: carbon stable isotopes, predator-prey interactions, Bayesian mixing models, Last Glacial Maximum, South America*

The sabertooth *Smilodon* is a felid from the Pleistocene of the Americas, placed at the top of the food web, that participated in the Great American Biotic Interchange. The South American *Smilodon populator* was capable of hunting large prey weighting up to 2,000 kg. In this contribution, we evaluate the diet of *S. populator* from the tooth enamel carbon isotope composition ($\delta^{13}C$) analyzed on 65 bioapatite samples of this carnivore (n=10) and its prey (n=55). Two Late Pleistocene fossiliferous sites of central Argentina were studied: Santa Rosa (~28 ka) and Playa del Barco (~19 ka). Potential prey includes both South American endemic species of notoungulates, litopterns, and pilosans, and North American immigrant species of artiodactyls, perissodactyls, and proboscideans. The $\delta^{13}C$ range (–8.6 to –6.6‰) suggest an open environment as the preferred prey habitat. The $\delta^{13}C$ range of this hypercarnivore in both sites is narrow compared to the dispersion of values of the different herbivores. We used the MixSIAR Bayesian mixing model to evaluate the contribution of potential prey to its diet. This model showed that all herbivores could have been potential prey for this predator in Santa Rosa and Playa del Barco, although at the latter locality it showed a preference for *Megatherium* and *Stegomastodon*. Similar results were obtained from samples from other localities of Argentina. Therefore, at a moment close to the extinction of the megafauna in the Pleistocene–Holocene boundary, *Smilodon* inhabited open environments where it was a generalist felid that preyed on a wide suite of taxa.

Acknowledgements: This work has been funded by project PGC2018-094955-A-I00 (Spanish Ministry of Science and Innovation) and is a contribution of the research group UCM 910607, Project

G13 UNLPam and project PGI 24 H/154 of the UNS. D.S.P. has been funded by a predoctoral contract PRE2019-089848 from the Spanish Government.

THE CRITICAL INCLUSION OF POSTCRANIAL ANATOMY IN AQUATIC CROCODYLIFORM PHYLOGENETICS

I. Scavezzoni[1], V. Fischer[2*], M. Johnson[3]

[1]Evolution and Diversity Dynamics Lab, ULiège, Allée du Six Aout 14, 4000, Liege, Belgium.
[2]Evolution and Diversity Dynamics Lab, ULiège, Allée du Six Aout 14, 4000, Liege, Belgium.
[3]Department of Palaeontology, Staatliches Museum für Naturkunde Stuttgart, Museum am Löwentor, Rosenstein 1, 70191 Stuttgart, Germany.

*presenting author, v.fischer@uliege.be

***Keywords**: Archosauria, phylogeny, postcranium, girdles, characters*

The postcranial anatomy of extinct crocodyliforms remains globally undervalued and often overlooked in anatomical descriptions, diagnoses, and phylogenetic analyses. Indeed, ever expanding datasets for phylogenetic analyses on this group have long been more focused on skull shape variation and include a plethora of craniodental characters. However, craniodental morphology often presents malleability and convergence, which have previously obscured the global positioning and interrelations of extinct crocodyliform clades. A possible solution resides in the disregarded—yet rich—postcranial anatomy of extinct crocodyliforms, which has generally been treated as conservative between many crocodyliform clades. Recent studies on the morphological variation of aquatic crocodyliform clades (namely Thalattosuchia and Dyrosauroidea) suggest the existence of a strong phylogenetic signal in the postcranium. Hence, we aim to test the phylogenetic informative strength of postcranial anatomy. We have critically reassessed one of the most complete and recent phylogenetic Crocodyliformes dataset to address our phylogenetic question and avoid falling into a 'repurposed matrix' dead-end. We present our preliminary results on the phylogeny of Crocodyliformes and offer a series of new postcranial characters based on the pelvic and thoracic girdles of extinct crocodyliforms, such as the position of the glenoid facet of the scapula, the extension of the pubic diaphysis, and the inclination of the coracoidal shaft. Through Bayesian inference, we also assess the differences of topologies between our results and published works/phylogenies. We stress that postcranial anatomy constitutes an important supply to better understand the relations of extinct crocodyliforms, but also offers insights on their development, ecology, and biomechanics.

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

SOME LIKE IT HOT—CLIMATE NICHE OCCUPATION OF JURASSIC DINOSAURS

L. Schnetz[1*], E.M. Dunne[2], A. Farnsworth[3], P.L. Godoy[4], R.J. Butler[1]

[1]School of Geography, Earth & Environmental Sciences, University of Birmingham, Edgbaston, Birmingham, B15 2TT, UK.

[2]GeoZentrum Nordbayern, Friedrich-Alexander University Erlangen-Nürnberg (FAU), 91054 Erlangen, Germany.

[3]School of Geographical Sciences, University of Bristol, University Rd, Bristol, BS8 1SS, UK.

[4]Department of Biology, Universidade de São Paulo, Ribeirão Preto, São Paulo 14040-901, Brazil.

*presenting author, L.Schnetz@bham.ac.uk

Keywords: *Dinosauria, palaeoclimate models, macroevolution, temperature, phylogeny*

Non-avian dinosaurs were a diverse, widely distributed, and successful group that dominated Mesozoic terrestrial ecosystems for over 150 Myr. Across this interval, the climate changed considerably, impacting dinosaur diversity and biogeography. During the Jurassic, as dinosaurs rose to ecological dominance, global temperatures and humidity increased as Pangaea started to break apart. Towards the latter half of the Jurassic, strikingly different dinosaur lineages diversified. Earlier Jurassic assemblages consisted mainly of early-branching sauropodomorphs, early-diverging ornithischians and some theropods, whereas later assemblages included a broader range of major dinosaur clades. A possible explanation for this change in diversity is changing climate conditions. However, previous examinations of the links between Jurassic dinosaur diversity and climate have focussed on broad-scale patterns, specific geographic regions or used coarse global approximations of variables. Here, we quantify and explore the climatic niche spaces occupied by Jurassic dinosaurs at a global scale by combining fossil occurrence data from the Paleobiology Database with a general circulation climate model (HadCM3L). Our results indicate that climate niche spaces of major dinosaur groups started to shift from a more generalised occupation in the Early Jurassic to more restricted spaces later on. Temperature ranges of dinosaurs drop from the Early to the Middle Jurassic. Using evolutionary model-fitting analyses, we also find evidence for an evolutionary shift from wetter and cooler niche spaces to drier and warmer niche spaces in key dinosaur clades across the Middle–Late Jurassic boundary. Our findings provide further support for the influence of climate on the evolutionary success of dinosaurs.

Acknowledgements: This research was funded by a Leverhulme Research Project grant (RPG-2019-365). We also want to sincerely thank all the contributors who entered Jurassic dinosaur occurrence data to the Paleobiology Database.

SAUROPOD FOOT CARE: AN UNUSUAL DIGIT AND UNGUAL TRACE FROM THE *POLYONYX GOMESI* HOLOTYPE, GALINHA TRACKSITE (PORTUGAL)

L. Sciscio[1,2*], M. Belvedere[3], C.A. Meyer[4], V.F. dos Santos[5]

[1]Jurassica Museum, Rte de Fontenais 21, 2900, Porrentruy, Switzerland.

[2]Department of Geosciences, University Fribourg, Chemin du Musée 6, 1700, Fribourg, Switzerland.

[3]Dipartimento di Scienze della Terra, Università di Firenze, Via G. La Pira 4, 50121 Firenze, Italy.

[4]Department of Environmental Sciences, University of Basel, Bernoullistrasse 32, CH-4056, Basel, Switzerland.

[5]Departamento de Geologia, Faculdade de Ciências da Universidade de Lisboa, (IDL - Instituto Dom Luiz), Campo Grande, P-1749 016 Lisboa, Portugal.

*presenting author, lara.sciscio@jurassica.ch

Keywords: *sauropod, ichnopathology, trackway, Middle Jurassic, holotype*

Unique anatomical pathologies of the pes and manus are not typically observed in the track record. Exceptional instances where ichnopathologies are present act as a record for disease/injury of the trackmakers' autopods and their effect on locomotion. Frequently 'irregular gaits' have been cited as possible evidence of pathologically influenced behaviour. Recent fieldwork at the Middle Jurassic Galinha track site (Serra de Aire Formation, Portugal) has examined the G5 holotype trackway for *Polyonyx gomesi*. G5 consists of ~94 manus–pes sets and the right pes bears a repeated and unique feature associated with the digit IV. This digit has a slightly more anterior placement relative to that of the left pes and is associated with a sharply impressed, narrow, rectangular furrow that projects laterally. Herein, we consider this an ichnopathology of the digit and ungual of this pes. This assumption is based on the repeated nature of this structure, the digits' uncommon orientation relative to other tracks, and the lack of such a feature in the left pes tracks of G5. No other sauropod trackway on the Galinha surface or within the ichnogenus *Polyonyx* bears this abnormality associated with digit IV. Given the length of the trackway and the consistency of the substrate over said length, we also discount preservational modification as a means to create the structure. The reason for this anomaly in the track morphology is currently unknown. Analysis of the trackway gait does not indicate any irregularities in stride or paces associated with the abnormality.

Acknowledgements: Financial support provided by the Swiss National Science Foundation (SNF 200021_192036). Field assistance was kindly given by Remmert Schouten. Site access/permitting by Ildegardo Granjo (Monumento Natural das Pegadas de Dinossáurios da Serras de Aire) and Lia Mergulhão (Institute for the Conservation of Nature and Forests).

LATE JURASSIC SAUROPOD TRACKWAY COMPARISONS—EXAMPLES FROM THE PURGATOIRE VALLEY (USA) AND JURA (SWITZERLAND) TRACKSITES

L. Sciscio[1,2*], C.A. Meyer[3], M. Belvedere[4], M. Lockley[5], B. Schumacher[6]

[1]Jurassica Museum, Rte de Fontenais 21, 2900, Porrentruy, Switzerland.

[2]Department of Geosciences, University Fribourg, Chemin du Musée 6, 1700, Fribourg, Switzerland.

[3]Department of Environmental Sciences, University of Basel, Bernoullistrasse 32, CH-4056, Basel, Switzerland.

[4]Dipartimento di Scienze della Terra, Università di Firenze, Via G. La Pira 4, 50121 Firenze, Italy.

[5]Dinosaur Trackers Research Group, University of Colorado Denver, Denver, CO, USA.

[6]Minerals and Geology Management, United State Forest Service, Lakewood, CO, USA.

*presenting author, lara.sciscio@jurassica.ch

Keywords: Parabrontopodus*, Morrison Formation, Reuchenette Formation, Jurassic, paratype*

Late Jurassic tracksites often share similar ichnofaunas dominated by sauropod and theropod trackmakers. Our study assesses two Late Jurassic tracksites that are geographically separated but bare comparable ichnofauna and proposed ichnotaxa. Sauropod tracks and trackways from the Late Jurassic sites at Purgatoire Valley (Lower Morrison Formation; Colorado, USA) and the Jura Mountains (Reuchenette Formation; NW Switzerland) are used for a comprehensive review and analysis between the tracksites. Particularly, recent fieldwork at the Purgatoire tracksite, including photogrammetric and sedimentological analyses, has allowed the re-evaluation of the *Parabrontopodus mcintoshi* holotype track surface in addition to a comprehensive in situ study of the paratype/topotypes of *Parabrontopodus*. Descriptive and quantitative trackway data were collected from each site and analysed with statistical methods to test differences between the ichnotaxa reported at the sites. Other factors such as trackmaker movement and substrate rheology were also studied to inform any morphological differences. Focus has been placed on the ichnogenus *Parabrontopodus* given its importance in Late Jurassic sauropod ichnotaxonomy. In this vein, trackways from the Jura are often described as cf. *Parabrontopodus*, but few have been rigorously tested. Our work describes morphological similarities between cf. *Parabrontopodus* tracks and trackways, while illustrating statistical differences between the ichnofauna at these different sites. The provisional results illustrate the complexity in sauropod ichnotaxonomy when pes morphology is similar despite differences in overall trackway parameters. The latter may be controlled by the trackmaker's age, locomotive abilities, and behaviour, but also abiotic factors such as substrate and environment.

Acknowledgements: Financial support provided by the Swiss National Science Foundation (SNF 200021_192036). Research permitting was kindly provided by the United States Department of

Agriculture Forest Service and facilitated through John Linn (District Ranger, Comanche National Grassland) and the Comanche National Grassland rangers.

SABERTOOTHED FELIDS FRONTAL SINUSES: INSIGHTS ON THE FEEDING BEHAVIOR AND PREDATORY STRATEGIES OF *SMILODON FATALIS*

P. Segurado[1*], E. Melnik[1], S. Bartolini-Lucenti[2,3], J. Madurell-Malaperia[2,1]

[1]Department of Geology, Autonomous University of Barcelona, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Earth Science Department, University of Florence, Via la Pira 4, 50121, Florence, Italy.

[3]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, pau.seguradp@gmail.com

Keywords: *Pleistocene, Carnivora, computered tomography, Felidae*

In the Quaternary fossil record, neuroanatomy and frontal sinuses of fossil taxa have been largely overlooked by paleontological research and only a few studies have focused on extant species. Published radiographic studies on extant felids argued that most of them lack caudally elongated sinuses. Indeed, pantherines display the most reduced ones. On the contrary, lynx and other small felines display a slightly caudally elongated sinuses and *Panthera uncia, Otocolobus manul*, and *Acinonyx jubatus* are the only extant species with caudally elongated frontal sinuses. With the aid of computerized tomography, we analyzed two Late Pleistocene *Smilodon fatalis* crania from Rancho La Brea (California, USA). We then compared them to a dataset of extant felids including the genera *Panthera, Acinonyx, Neofelis, Puma, Lynx*, and *Felis.* Our preliminary results point out that *S. fatalis* possessed elongated and enlarged frontal sinuses, overhanging the postorbital constriction, on one side, and expanded laterally. A comparable condition is only documented in *A. jubatus* and *P. uncia* and has been traditionally related to the cooling of the brain during high-speed hunts, in the former species, or to the adaptation to high-altitude environments, in the latter. The documented enlarged sinuses in *S. fatalis* are also probably related to their locomotor behavior in open landscapes during the Late Pleistocene.

Acknowledgments: We would like to thank several persons and institutions for provide to us CT scans, information and/or suggestions, including: Jessie Maisano (Texas University), Aisling Farrel (Los Angeles Natural History Museum), Patricia Wils (Muséum national d'Histoire naturelle, Paris), Anjali Goswami (Natural History Museum London), and John Hutchinson (Royal College London).

NOT THAT SMALL: A HISTOLOGICAL REASSESMENT OF THE IBERO-ARMORICAN HADROSAURS

A. Sellés[1,2*], B. Vila[1,2], J. Serrano[2], O. Chiri[1], A. Porcel[1]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, c/ Escola Industrial 23, 08201 Sabadell, Barcelona, Spain.

[2]Museu de la Conca Dellà, c/ Museu 4, 25650 Isona, Lleida, Spain.

*presenting author, albert.selles@icp.cat

***Keywords**: Hadrosauria, histology, insularity, Late Cretaceous*

At the beginning of the 20th century, paleontologist Franz Nopcsa postulated that most of the Late Cretaceous ornithopods from Romania could be considered insular dwarfs because they were significantly smaller than their continental relatives. Despite several small-sized hadrosaurid specimens having been unearthed from the ancient Ibero-Armorican Island, the generalized occurrence of truly miniaturized species is a matter of debate. However, recent histological evidence from the Pyrenean hadrosaurids has provided new insights into this question, showing that some small-sized specimens belong to, indeed, immature individuals. Here, we evaluate the histological features of several Maastrichtian hadrosaurs from the Pyrenees on the base of more than 20 individuals, represented by small and large-size femora, tibiae, and fibulae. The histological observations, made with a cross and polarized light microscope, revealed that almost all specimens are characterized by growth cycles, consisting of woven-parallel complex tissue with alternations of subplexiform and longitudinal arrangement of primary osteons. Each cycle is bounded by rest lines rather than lines of arrested growth, albeit observed in a few specimens. No external fundamental system is observed, suggesting that most individuals were probably subadults at the time of death. By assuming the subadult stage of *Pararhabdodon* and *Adynomosaurus*, the largest European hadrosauroids recovered so far, their sizes fit well within the range of subadults of several North American and Asian hadrosaurids. Therefore, except for the small-sized hadrosaurid from the uppermost Maastrichtian of Serraduy, along with recent discoveries in the Tremp Basin, it seems that insular ecological pressures did not significantly impact on hadrosaurid body size.

Acknowledgements: This research is funded by R+D+I project PID2020-119811GB-I00 funded by MCIN/AEI/10.13039/501100011033/ and project PLEC2021-007903 funded by MCIN/AEI/10.13039/501100011033 and "NextGenerationEU"/PRTR. Additional funding was provided by the CERCA Programme/Generalitat de Catalunya, and project CLT0009_22_000021 funded by the Departament de Cultura of the Generalitat de Catalunya.

A STUDY IN SCARLET: TAPHONOMY AND DEADFALL ECOLOGY OF MESOZOIC MARINE REPTILES FROM PELAGIC "RED" FORMATIONS OF NORTHERN ITALY

G. Serafini[1*], S. Danise[2], E.E Maxwell[3], L. Giusberti[4]

[1]Department of Chemical and Geological Sciences, University of Modena and Reggio Emilia, Via Campi 103, 41125, Modena, Italy.

[2]Dipartimento di Scienze della Terra, Università degli Studi di Firenze, Via La Pira 4, 50121, Firenze, Italy.

[3]Department of Palaeontology, Staatliches Museum für Naturkunde, Rosenstein 1, 70191, Stuttgart, Germany.

[4]Department of Geosciences, University of Padova, Via Gradenigo 6, I-35131, Padova, Italy.

*Presenting author, giovanni.serafini@unimore.it

Keywords: *taphonomy, deadfalls, Rosso Ammonitico Veronese, Middle–Upper Jurassic, marine reptiles*

Although poor and rather fragmentary, the Italian marine reptile record offers a precious window into mesopelagic settings, a paleoenvironment often neglected from taphonomic and deadfall stage studies on Mesozoic material. To address how mesopelagic deadfall stages compare to those observed in modern oceans, we conducted a taphonomic survey on Mesozoic marine reptiles from deposits of northern Italy, focusing on the Middle–Upper Jurassic Rosso Ammonitico Veronese (Bajocian–Tithonian). These beds offer novel data on the taphonomy of ophthalmosaurid ichthyosaurs, metriorhynchoid thalattosuchians, and pliosaurid plesiosaurs. All specimens from this setting are badly preserved; skeletons are highly incomplete and eroded to the cancellous bone. Preserved elements are found articulated, suggesting limited disturbance of the carcasses at the seabed. Associated fossil fauna is frequently found: shark teeth and rhyncholites (Nautiloidea) are confidently assigned to the mobile scavenger stage, while bioeroders and belemnites are believed to be opportunistic exploiters during the enrichment stage of carcasses decomposition. Crinoids and rare encrusting traces are interpreted as equivocal evidence of an underrepresented reef stage. All gathered observations (geology and taphonomy) suggest a slow sedimentation rate setting with well-oxygenated waters that ensure the development of an ecological succession around carcasses followed by water dissolution of the skeletal tissues. Cephalopods were never described as a predominant component in Mesozoic reptile-falls, but are instead consistent with modern whale-falls in deep-water settings. Similar results can be traced in other reddish pelagic limestone formations from central and northern Italy, such as the Upper Jurassic Calcari Diasprigni and the Upper Cretaceous Scaglia Rossa.

Acknowledgments: The Paleontological Society supported part of this research with a Student Research Grant, and The Palaeontological Association supported it with a Small Grant Scheme. The

Lauer Foundation for Paleontology, Science and Education supported this research by providing professional UV-light equipment. All of these aids are heartily thanked.

NEW DATA ON THE NEUROANATOMY OF *DIPLOCYNODON TORMIS* (CROCODYLIA) FROM THE DUERO BASIN (IBERIAN PENINSULA, SPAIN)

A. Serrano-Martínez[1,2*], À.H. Luján[1,3], A. García-Pérez[1], J. Fortuny[1]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Facultad de Ciencias, Universidad Nacional de Educación a Distancia, Paseo Senda del Rey 9, 28009 Madrid, Spain.

[3]Department of Geological Sciences, Faculty of Sciences, Masaryk University, Kotlářská 267/2, 611 37 Brno, Czech Republic.

*presenting author, alejandro.serrano@icp.cat

Keywords: Diplocynodon*, Crocodylia, neuroanatomy, inner skull cavities*

Inner skull cavities have been overlooked in the descriptions of most fossil crocodylians until recent years. *Diplocynodon*, an extinct small alligatoroid that lived in Europe from the Paleocene to the Middle Miocene, is no exception to this. In order to partially fill this gap, we studied the inner cavities of the holotype of *Diplocynodon tormis*, recovered from Teso de la Flecha site (middle Eocene, Salamanca, Spain). The specimen is an undeformed, almost complete skull with the attached jaw. Only some bones of the posterior area of the skull are missing. The fossil was scanned using a medical CT scanner. The derived 3D model includes the paranasal air sinuses, in association with the nasal cavity, the maxillary and mandibular branches of the trigeminal nerve, the dorsal area of the forebrain and the intertympanic diverticula. These 3D reconstructions can be morphologically compared with those of members from both extant and extinct Alligatoridae and Crocodyloidea available in the literature. Our results concur with the previously-observed conservativeness of the inner cavities of crocodylians and therefore only minor morphological differences can be ascertained. The inner skull cavities of *D. tormis* are more similar in shape and sensorial capabilities to alligatoroids than to crocodyloids. Further studies including other basal Alligatoroidea will be required to better understand the morphological patterns that have been relevant during the evolution of the inner skull cavities.

Acknowledgements: We acknowledge the CERCA Programme/Generalitat de Catalunya, AGAUR's consolidated research group 2021 SGR 01184, and R+D+I project PID2020-117118GB-I00 (MCIN/AEI/10.13039/501100011033/).

FIRST RECORD OF *ACINONYX PARDINENSIS* (FELIDAE, CARNIVORA) FROM THE MIDDLE VILLAFRANCHIAN SITE OF EL RINCÓN-1 (MN16b; MOTILLEJA, ALBACETE, SPAIN)

G. Siliceo[1,2], J. Gamarra[1*], M. Antón[1], I. Martínez[1], M.D. Pesquero[1], M.J. Salesa[1]

[1]Departamento de Paleobiología, Museo Nacional de Ciencias Naturales-CSIC, C/ José Gutiérrez Abascal, 2, 28006 Madrid, Spain.

[2]Faculty of Natural Science, Department of Geology and Paleontology, Comenius University, Mlynská dolina, Ilkovičova ulica č. 6, 842 15 Bratislava 4, Slovak Republic.

*presenting author, jesus.gamarra@mncn.csic.es

***Keywords**: Felinae, Early Pleistocene, Iberian Peninsula, faunas*

The extant cheetah (*Acinonyx jubatus*) is the fastest mammal on terrestrial ecosystems, showing several physiological and skeletal adaptations to high-speed running such as the elongation of the limbs, skeleton slenderness, and flexible vertebral column. During the Pliocene and Pleistocene, a larger species of the genus, *A. pardinensis,* exhibited a set of similar adaptations, and might have occupied the niche of high-speed predator, hunting small to medium sized herbivores. The site of El Rincón-1 (Motilleja, Albacete) has provided one of the richest samples of fossil mammals from the middle Villafranchian (2.6–2.5 Ma, MN 16b, Early Pleistocene) of the Iberian Peninsula. During the fieldwork of 2021, a sample of fossils of *A. pardinensis*, a species previously unknown in the site, were found, consisting of a left P4, a calcaneus, and a metatarsal V. These fossils fit well in size and morphology with those of *A. pardinensis* from other Villafranchian sites. The P4 shows the typical highly reduced and distally placed protocone, similar to that of the extant cheetah, and lacks the ectoparastyle, a variable feature in the known specimens of *A. pardinensis*. The calcaneus and metatarsal V are both slender and markedly proximodistally lengthened. The calcaneus also has a proximodistally elongated and mediolaterally narrow articular surface and a dorsoplantarly narrow tuber calcis, similar to that of the extant cheetah. The presence of this cursorial felid at El Rincón-1, besides de abundance of *Gazella borbonica* and *Equus livenzovensis*, suggests the existence of a low-structured habitat dominated by grasslands or open woodlands.

Acknowledgements: This study is part of the projects EVOFEL (PID2020-112642 GB-I00 funded by MCIN/AEI/10.13019/501100011033), SBPLY/18/180801/00049, SBPLY/19/180801/000033, SBPLY/21/180801/000017 and SBPLY/22/180801/000070 (funded by Gobierno de Castilla-La Mancha and MNCN-CSIC). M.J.S. is member of Group CSIC 641538 (MNCN-CSIC); M.J.S. and M.D.P. are members of Group E04_20R FOCONTUR funded by Gobierno de Aragón and MCIN.

DISENTANGLING PHYLOGENY AND ECOLOGY IN ARCHOSAUR SKULL SHAPE

R.B. Sookias[1*], N.D.S. Grunstra[2,3], A. Le Maître[3,4], E. Ascarrunz[5], C. Foth[5]

[1]Department of Geology, University of Liège, Bât. B18 Quartier Agora, Allée du Six Août 14, 4000 Liège, Belgium.

[2]Natural History Museum Vienna, Burgring 7, 1010 Vienna, Austria.

[3]Department of Evolutionary Biology, University of Vienna, Vienna, Austria.

[4]Université de Poitiers, Poitiers, France.

[5]Department of Geosciences, University of Fribourg, Chemin du Musée 6, 1700 Fribourg, Switzerland.

*presenting author, r.sookias@gmail.com

Keywords: *phylogenetics, geometric morphometrics, shape evolution, Archosauria, ecomorphology*

Many factors dictate form, with selection, phylogeny, and structural constraints exerting strong influences. Separating these signals has long been a topic of investigation—with phylogenetic signal being of particular interest because of its importance in phylogenetic inference in fossil taxa—but remains challenging. A recently developed method using 2D geometric morphometrics aims to distinguish phylogenetic from ecomorphological signal via separation of "local" structural (=residual) shape from overall "global" (=outline) shape—with residual shape (e.g., relative contribution of elements to the snout) hypothesized to hold more phylogenetic signal and outline shape (e.g., snout shape) more ecological/selective signal. The expected separation of signals was demonstrated in some extant clades, and phylogenetic reconstruction from residual shape has met with some success when contrasted with molecular trees. We apply this method to 2D fossil archosaur cranial reconstructions, covering their Triassic/Jurassic radiation (including dinosaur, pterosaur, and pseudosuchian diversification). We use a dataset of discrete craniodental and mandibular characters as ecological proxies. Using an informal supertree, we find little difference in phylogenetic and ecomorphological signals between outline and residual shape, contra previous work. Trees inferred using phylogenetic morphometrics from outline and residual shape were not close to traditional trees, but outline-shape only trees were slightly closer, and several major clades were recovered. This indicates that phylogenetic information is present in cranial shape but that this method separating residual and outline shape may not be applicable at larger phylogenetic scales. Further testing with extant taxa and postcranial data is needed, the latter potentially distinguishing larger clades.

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

A DESCRIPTION OF A *DENAZINEMYS NODOSA* SPECIMEN (TESTUDINATA: BAENIDAE) FROM THE LATE CRETACEOUS KAIPAROWITS FORMATION OF SOUTHERN UTAH

G.E. Spicher[1,2*], J.J.W. Sertich[3,4], L.C. Girard[1], W.G. Joyce[1], T.R. Lyson[5], Y. Rollot[1]

[1]Department of Geosciences, University of Fribourg, Chemin du Musée 4, 1700 Fribourg, Switzerland.

[2]Institute of Geosciences, Section Paleontology, Rheinische Friedrich-Wilhelms-Universität Bonn, Nussallee 8, 53115 Bonn, Germany.

[3]Department of Geosciences, Warner College of Natural Resources, Colorado State University, 400 University Avenue, Fort Collins, Colorado, USA.

[4]Smithsonian Tropical Research Institute, Luis Clement Avenue, Building 401 Tupper, Panama City, Panama.

[5]Department of Earth Sciences, Denver Museum of Nature & Science, 2001 Colorado Boulevard, Denver, Colorado, USA.

*presenting author, spicher.gael@gmail.com

***Keywords**: Late Cretaceous, Kaiparowits Formation, Utah, Testudinata, Baenidae*

Denazinemys nodosa is a Late Cretaceous member of Baenidae, a clade of freshwater aquatic paracryptodiran turtles from North America. The species is diagnosed, inter alia, by the presence of raised welts on the shell surface. Our study describes a partially preserved skeleton from the late Campanian Kaiparowits Formation of Utah, USA. The description includes a detailed bone-by-bone analysis of the cranium through computed tomography imaging. Through a revised phylogenetic analysis, the placement of *D. nodosa* is reaffirmed as being close to *Eubaena cephalica* and *Boremys* spp. within the clade Eubaeninae. Comparison with a second skull from the Kaiparowits Formation previously assigned to *D. nodosa* reveals uncertainties regarding its attribution to this species. Several fragmentary specimens from Mexico and the USA, dating from the early to the late Campanian, had formerly been assigned to *D. nodosa* based on the texture of the shell surface. However, this typical texture is also known to be present in other taxa from the same clade. Based on our assessment of all accessible material, *D. nodosa* is therefore restricted to the late Campanian of Utah and New Mexico.

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

A PRELIMINARY COMPARISON OF BIOGEOGRAPHIC AND COMMUNITY STRUCTURE SIMILARITIES BETWEEN CHINA AND AFRICA DURING THE PLIO-PLEISTOCENE

J. Sun[1,2*], F. Bibi[1], I. de la Torre[3]

[1]Museum für Naturkunde, Leibniz Institute for Evolution and Biodiversity Science, Invalidenstraße 42, 10115, Berlin, Germany.

[2]Institute for Biology, Faculty of Life Sciences, Humboldt-Universität zu Berlin, Invalidenstraße 43, 10115, Berlin, Germany.

[3]Instituto de Historia, CSIC-National Research Council, C/ Albasanz 26-28, 28037, Madrid, Spain.

*presenting author, Jijia.Sun@mfn.berlin

Keywords: *Paleobiogeography, community structure, Pliocene, Pleistocene, large mammals*

Hominins first appeared in Africa over 6 Ma and, since then, they have coevolved with the African continental fauna. In contrast, hominins only arrived in Asia at ~2 Ma. While climate certainly played a significant role in community change during the Plio-Pleistocene, it is possible that the arrival of hominins also precipitated changes in community structure. Here, we conducted taxonomic and functional biogeographic comparisons of extant and fossil large mammal communities from Eurasia and Africa to determine: (1) whether hominins left Africa as part of a larger wave of faunal dispersal; and (2) whether their arrival in Asia caused fundamental changes in the existing large mammal community structure. Body mass, diet, and locomotion were used as functional traits and taxonomic analysis used both genus and species level data. Our results indicate that hominin dispersal from Africa to Eurasia during the Plio-Pleistocene was not part of a significant faunal dispersal and that African faunas remained distinct from Eurasian faunas. The distribution of extant Chinese large mammal functional communities (based on traits) correlates well with climate, especially mean annual precipitation. A north–south differentiation of Chinese large mammal communities (both taxonomically and functionally) was already present during the Pleistocene.

Acknowledgements: ERC Advanced Grant (to I.d.l.T.) project BICAEHFID, the Amniota Lab at the Museum für Naturkunde, and the financial help from FB 1-Leitung from Museum für Naturkunde.

PRELIMINARY REPORT ON THE THEROPOD FAUNA OF A LOWER CRETACEOUS UPLAND ECOSYSTEM FROM BALVE, NW GERMANY

D. Theda[1*], D. Nau[1], R. Dederichs[1], A.H. Schwermann[2]

[1]Institute of Geoscience, University of Bonn, Nussallee 8, 53115, Bonn, Germany.
[2]LWL-Museum of Natural History Münster, Sentruper Straße 285, 48161, Münster, Germany.

*presenting author, theda-paleo@gmx.de

Keywords: *Theropoda, Cretaceous, fissure fill, systematics, morphometrics*

The Lower Cretaceous (Barremian to Aptian) karstic fissure fill near Balve in Northwestern Germany has recently been found to represent the remnants of a former upland ecosystem and as such provides a rare window into an environment up to a few hundred meters above sea level during the Mesozoic. Aside from numerous other vertebrate groups, including amphibians and mammals, dinosaur taxa, such as iguanodontids, thyreophorans, sauropods, and theropods, are represented at the site by fairly abundant material. However, the large vertebrate remains are generally isolated and heavily eroded, making reliable taxonomic identifications difficult. Here we describe and analyze the theropod material from Balve, using a combined qualitative and quantitative approach. We use phylogenetic analysis and morphometric methods in an attempt to constrain systematic affinities of these isolated elements, including teeth and other cranial material, long bone fragments, and phalanges, including unguals. Our preliminary results support the presence of several theropod taxa also known from other roughly contemporaneous localities in Europe, including cf. Allosauroidea and Tyrannosauroidea. Additionally, we present the potentially first known remains of Ornithomimosauria from Germany. The latter group is likely represented by a few isolated unguals, as well as a distal metatarsal. The systematic affinities of these ungual phalanges are tested using elliptical Fourier and linear discriminant analysis to isolate taxonomic signals from outline shapes. This research further adds to the documented diversity of the dinosaur fauna of Balve and highlights the importance of the site for future research on macrovertebrates from the Cretaceous of Europe.

Acknowledgements: We would like to thank Christopher Barker, Elena Cuesta Fidalgo and Ronan Allain for their input, as well as Steve Brusatte and Roger Benson for sharing photographs of Wealden material. We would like to thank the Lhoist company for permission to excavate and technical support over the past 20 years.

THE EVOLUTION OF LEAF-EATING ADAPTATIONS IN COLOBINE MONKEYS OF EURASIA: NEW INSIGHTS FROM DENTAL TOPOGRAPHY OF FOSSILS

G. Thiery[1*], M. Takai[1]

[1]Center for Evolutionary Origins of Human Behavior EHUB, Kyoto University Museum, 606-8501 Yoshida-honmachi, Sakyo-ku, Kyoto, Japan.

*presenting author, ghislain.thiery@ntymail.com

***Keywords**: 3D analysis, diet, morphology, Neogene, primates*

Digesting leaves often requires dedicated adaptations, as the nutrients contained in leaves are protected both chemically (toxic compounds, tannins) and mechanically (impermeable cell walls, fibrous tissues). It has been suggested that leaf-eating adaptations could derive from seed-eating adaptations, notably in primates. Here we present the preliminary results of a project investigating this hypothesis in Eurasian colobine monkeys (Primates) from 8 Ma to present day. This work includes *Semnopithecus gwebinensis*, *Parapresbytis eohanuman* as well as an extinct species from the Pleistocene of South China, and compares them to 12 extant species from Asia. In order to include the highest number of specimens, we pooled together upper and lower molars using position, wear stage, and taxonomy as factors. Dental casts were scanned using microtomography and prepared for analysis using open-source software (Meshlab). To detect changes in dental morphology related to their leaf- and seed-processing efficiency, we investigated dental topography using the R package 'doolkit'. During the Miocene, the dental topography of colobine monkeys was diverse, with some species likely being able to process seeds based on their low dental relief and sharpness, while other species showed a combination of high relief, high sharpness, or both. Then, from the Pleistocene onward, the dental topography of colobine monkeys was similar to their extant counterparts, with a high relief, high sharpness, and a clear trend towards an enhanced leaf-eating ability. Based on the current sample, however, it is not clear if this trend started before, during or after the Pliocene.

Acknowledgements: We thank the Japan Society for the Promotion of Science (JSPS-P22383 & 22KF0222) for funding this project, and the French National Center of Scientific Research (CNRS), the University of Poitiers, and the French National Agency for Research (ANR-17-CE02-0010 DieT-PrimE) for funding the development of 'doolkit'.

MORPHOMETRIC STUDY OF THE FORELIMB AND FEMUR OF *ICTITHERIUM EBU* (MAMMALIA: HYAENIDAE) FROM THE LATE MIOCENE OF LOTHAGAM, TURKANA BASIN, KENYA

J. van der Hoek[1*], L. Werdelin[2]

[1]Department of Earth and Environmental Sciences, University of Manchester, M13 9PL, Manchester, United Kingdom.

[2]Department of Palaeobiology, Swedish Museum of Natural History, P.O. Box 50007, SE-10405, Stockholm, Sweden.

*presenting author, julien.vanderhoek@postgrad.manchester.ac.uk

***Keywords**: Carnivora,* Ictitherium ebu*, cursoriality, multivariate statistics, functional morphology*

Hyaenidae are of considerable palaeontological interest, due to their widespread occurrence in Miocene–Pleistocene sites in Europe and the important roles of the three large extant hyaenids in their respective ecosystems. Their evolutionary pattern in Europe is clear, but it is poorly understood in the Late Miocene of Africa. The hyaenid material from the Late Miocene of Lothagam (Kenya) may be used to improve our knowledge of the ecological roles of these animals. Four species were identified in Lothagam, among which the nearly complete skeleton of *Ictitherium ebu* is the most informative. The long, gracile morphology of the limb bones of *I. ebu* has led to the hypothesis that this animal was cursorial. However, cursoriality in *I. ebu* has never properly been researched. Here the forearm and femur of *I. ebu* were compared to extant Hyaenidae and Canidae. Linear measurements were used to calculate indices of morphological characters. Landmarks were captured on the anterior side of the distal humerus, from which truss distances were calculated. These distances represent a schematic interpretation of elbow joint shape. We show that *I. ebu* has an overall morphology resembling that of *Chrysocyon brachyurus* (Canidae) and an elbow joint reminiscent of *Proteles cristatus* (Hyaenidae). Multivariate statistics primarily separated the data based on taxonomy, yet locomotor and habitat categories were also relevant. The elongated, slender limb bones of *I. ebu* are likely to be adaptations for locomotor efficiency, pouncing on prey and looking over tall grass in the open environments it inhabited, similar to *C. brachyurus*.

Acknowledgements: Thanks to the Otterborg stipend committee for providing us with the funds needed for this project. Thank you to the curators and collection managers of the Museum för Naturkunde, Senckenberg Naturmuseum, Alexander Koenig Zoological Research Museum, Royal Museum for Central Africa, Naturalis Biodiversity Center, La Specola, and Naturhistoriska Riksmuseet.

A FRESH NEW BEGINNING: NEW PLIOCENE LOCALITIES AND SMALL VERTEBRATE MATERIAL FROM THE CONTINENTAL DEPOSITS OF SE ROMANIA

Ș. Vasile[1,2,*], B.-S. Haiduc[1], V.D. Crespo[3,4], B.-G. Rățoi[1,5], E.-I. Păun[1,5], O. Kovalchuk[6,7], M. Venczel[8]

[1]Lythos Research Center, University of Bucharest, 1 Nicolae Bălcescu Avenue, 010041 Bucharest, Romania.

[2]'Emil Racoviță' Institute of Speleology, 13 Calea 13 Septembrie, 050711 Bucharest, Romania.

[3]Departamento de Ciências da Terra, GeoBioTec, Universidade Nova de Lisboa, Quinta da Torre, 2829-516, Caparica, Portugal.

[4]Museu da Lourinhã, 9 Rua João Luis de Moura, 2530-158 Lourinhã, Portugal.

[5]Department of Geology, 'Alexandru Ioan Cuza' University of Iași, 20B Carol I Avenue, 700505 Iași, Romania.

[6]Department of Palaeontology, National Museum of Natural History NASU, 15 Bohdan Khmelnytskyi Street, 01054, Kyiv, Ukraine.

[7]Department of Palaeozoology, University of Wrocław, 21 Sienkiewicza Street, 50-335, Wrocław, Poland.

[8]Department of Natural Sciences, Țării Crișurilor Museum, 1/A Calea Armatei Române, 410987 Oradea, Romania.

*presenting author, yokozuna_uz@yahoo.com

***Keywords**: Early Pliocene, small mammals, herpetofauna, Eastern Carpathian Foreland*

Known from the beginning of the 20th century, and boasting the most diverse Pliocene continental vertebrate assemblages from Romania, the classical sites of Berești and Mălușteni have been largely abandoned for several decades. Recent fieldwork in the same area of the Eastern Carpathian Foreland, in SE Romania led to the discovery of several new outcrops yielding vertebrate fossil material, both by surface picking, but, most importantly, by introduction of screen washing, previously not used in the area. The most abundant fossil samples were found at Schineni and Țuțcani, both villages from the immediate vicinity of Mălușteni (Vaslui County). The fluvial sands of Schineni yielded a fairly diverse small mammal assemblage (*Ochotona* sp., *Trischizolagus* sp., Soricidae indet., *Talpa* sp., cf. *Miopetaurista* sp., Gerbilidae? indet., *Sylvaemus*/*Apodemus* sp., *Rhagapodemus* sp., *Pliospalax* sp., *Allocricetus* sp., *Mimomys* vel *Promimomys* sp.), as well as several fish taxa (Leuciscinae indet., *Leuciscus* sp., *Scardinius* cf. *erythrophthalamus*, *Barbus* sp., *Carassius* sp., *Tinca* sp., Salmonidae indet., *Esox* sp., and Sparidae indet.), rare squamates (Lacertidae indet., *Pseudopus* sp., *Natrix* sp.), and fragmentary indeterminate anuran material. Similar assemblages, albeit less diverse, were identified from Țuțcani, including small mammals (*Ochotona* sp., *Trischizolagus* sp., *Castor fiber*, Sciuridae indet., *Talpa* sp., and *Amblycoptus* sp.), freshwater fishes (Leuciscinae indet., *Rutilus* sp., *Tinca* sp., *Scardinius ponticus*), squamates

(*Pseudopus* sp., *Natrix* sp.), and rare indeterminate anurans. The list of small mammalian taxa, including several new occurrences for the area, suggests an Early Pliocene (Ruscinian, MN14–MN15) age for the above-mentioned assemblages.

Acknowledgements: This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS - UEFISCDI, project number PN-III-P1-1.1-TE-2021-0664, within PNCDI III (Ș.V., B.-G.R., B.-S.H., E.-I.P.).

A NEW TITANOSAURIAN TOOTH MORPHOTYPE FROM THE UPPERMOST CRETACEOUS OF THE SOUTH-CENTRAL PYRENEES (CATALONIA, SPAIN)

B.J. Vázquez[1,2*], D. Castanera[3], B. Vila[1,2]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, c/ Escola Industrial 23, 08201 Sabadell, Barcelona, Spain.

[2]Museu de la Conca Dellà, c/ Museu 4, Isona i Conca Dellà, Lleida, Spain.

[3]Fundación Conjunto Paleontológico de Teruel-Dinópolis/Museo Aragonés de Paleontología, Avenida de Sagunto s/n, 44002 Teruel, Spain.

*presenting author, bernat.vazquez@icp.cat

Keywords: *Cretaceous, Tremp, Sauropoda, titanosaurs, dentition*

In Europe, the titanosaurian record concentrates in the uppermost Cretaceous (Campanian–Maastrichtian) of Spain, France, and Romania with up to eight species described. While the tooth record is very scarce in Romania, up to eight tooth morphotypes have been discovered in Spain and France. Recent discoveries in the southern Pyrenees have yielded the largest tooth sample for a Late Cretaceous titanosaur in Europe. Thus, in the Lower Maastrichtian locality of Els Nerets (Tremp Basin, Catalonia), several teeth associated to a partial and disarticulated skull have been collected. The comprehensive description of the 18 specimens, which were found disarticulated but assigned to a single individual, shows that the teeth have conical and slender crowns, pronounced development of mesial and distal carinae, a lingually tilted subtriangular cusp, a characteristic lemon-shaped cross-section, a pair of protruding labial ridges, and a coarse enamel wrinkling defined by closely packed longitudinal crenulations. The teeth show wear facets developed along both the mesial and the distal sides of the crown, which suggests that there was tooth-to-tooth contact. They are among the largest, most slender, and most labiolingually compressed titanosaurian teeth from Europe, and resemble other contemporary titanosaur species described in other localities from SW Europe. However, despite several morphological similarities, the dental material from Els Nerets is different enough to be referred to a distinct, yet to be described taxon. Finally, a rationale based on tooth shape, measurements, and wear facet distribution is proposed to infer tooth topology along the dental series.

Acknowledgements: This research is supported by the FPI grant of the Ministerio de Ciencia e Innovación (reference PRE2021-097744) and it is part of the R+D+I project PID2020-119811GB-I00 funded by MCIN/AEI/10.13039/501100011033/, the project CLT0009_22_000021 funded by the Departament de Cultura of the Generalitat de Catalunya, and the CERCA Programme/Generalitat de Catalunya.

EXTREME CRANIOFACIAL TRANSFORMATION DURING GROWTH IN THE REBBACHISAURID SAUROPOD *NIGERSAURUS TAQUETI*

D. Vidal[1,2*], M. Ciudad Real[2], P.C. Sereno[1]

[1]Department of Organismal Biology, University of Chicago, 1027 E 57th St, Chicago, Illinois 60637, USA.

[2]Grupo de Biología Evolutiva, Facultad de Ciencias, Universidad Nacional de Educación a Distancia (UNED), Avda. Esparta s/n, 28232 Las Rozas de Madrid, Madrid, Spain.

*presenting author, eoalulavis@gmail.com

***Keywords**: ontogeny, sauropoda, Niger, Cretaceous, skull*

The skull of *Nigersaurus taqueti* is the most specialized among all known sauropodomorph dinosaurs. Despite cranial bones of extremely lightweight construction, *Nigersaurus* has widened jaws that extend beyond the side of the snout and that house tooth batteries rather than teeth in around a hundred individual sockets. New cranial specimens from the Elrhaz Formation in Niger include individuals both less and more mature than the subadult holotypic skull. A juvenile dentary has a similar number of tooth positions as in later growth stages but differs markedly in tooth crown structure and jaw shape. The pencil-shaped crowns have symmetrical, rather than asymmetrical, enamel distribution, and the jaw lacks the lateral excursion of the tooth row: unlike the distally-located transverse tooth rows in subadult and adult stages, the distal half of the tooth row in the juvenile faces laterally, and the lateral extension of the tooth row has yet to develop. The jaws continue to change their form in later development. In a new adult individual, the tooth-bearing portion of the jaws are both broader transversely and thicker anteroposteriorly than in the subadult holotype with a similar-sized braincase. *Nigersaurus* thus altered both crown structure and jaw form markedly from juvenile to adult growth stages even more drastically than other known diplodocoid ontogenetic sequences, suggesting that it had a specialized feeding strategy that likely changed considerably during growth.

Acknowledgements: We thank Tyler Keillor for extraordinary specimen preparation and advice and Lauren Conroy for high-resolution scans of the fossils.

ON THE TAXONOMY AND DIVERSITY OF THE UPPER CRETACEOUS TITANOSAURIAN BONEBED OF BELLEVUE (FRANCE)

B. Vila[1,2*], V. Díez Díaz[3], A. Sellés[1,2], J. Le Loeuff[4]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, c/ Escola Industrial 23, 08201 Sabadell, Barcelona, Spain.
[2]Museu de la Conca Dellà, c/ Museu 4, 25650 Isona, Lleida, Spain.
[3]Dynamics of Nature, Museum für Naturkunde - Leibniz Institute for Evolution and Biodiversity Science, Invalidenstraße 43, 10115 Berlin, Germany.
[4]Musée des Dinosaures, Avenue de la gare, 11260 Espéraza, France.

*presenting author, bernat.vila@icp.cat

***Keywords**: Titanosauria,* Ampelosaurus*, Bellevue, Late Cretaceous, multitaxic bonebed*

Since its first excavation in 1989, the vertebrate bonebed of Bellevue (early Maastrichtian, Campagne-sur-Aude, France) has yielded more than 1,400 dinosaur remains, mainly titanosaur bones. In 1995, the description of *Ampelosaurus atacis* based on axial (three holotypic dorsal vertebrae) and abundant girdle and other appendicular material from Bellevue pointed to the idea that the site was a monotaxic titanosaur bonebed. However, more recent research has suggested the possibility of a multispecific titanosaur assemblage or the occurrence of sexual dimorphism at the Bellevue site. Here we present preliminary results of a comprehensive study on most of the titanosaur material recovered in the last forty years from Bellevue. Osteological and histological analyses, coupled with 3D modeling of more than 75 specimens of axial and appendicular material (including an associated partial skeleton), indicate the presence of at least two distinct morphotypes. We found significant differences in discrete characters, robustness, and size in the studied sample, thus supporting the hypothesis that the Bellevue bonebed includes at least two titanosaur species. In addition, our study integrates former stratigraphic data from the site, which reveals the nature and taphonomic history of the fossil accumulation. Finally, our results, which involve an emended diagnosis of *Ampelosaurus* and the erection of a new species, will have important implications for the phylogeny of the latest Cretaceous titanosaurs from Europe.

Acknowledgements: This research is part of R+D+I project PID2020-119811GB-I00 funded by MCIN/AEI/10.13039/501100011033/ and has been supported by the CERCA Programme/Generalitat de Catalunya.

THE HISTORICAL DINOSAUR MATERIAL COLLECTED BY JOAQUÍN MENDIZÁBAL IN THE TREMP BASIN (SOUTHERN PYRENEES)

B. Vila[1,2*], R. Gaete[2]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, c/ Escola Industrial 23, 08201 Sabadell, Barcelona, Spain.

[2]Museu de la Conca Dellà, c/ Museu 4, 25650 Isona i Conca Dellà, Lleida, Spain.

*presenting author, bernat.vila@icp.cat

Keywords: *Dinosauria, Tremp Formation, Late Cretaceous, early finds*

The history of dinosaur finds in the southern Pyrenees begins in the Tremp Basin around 1916, with the discovery of bones during the construction of the Sant Antoni reservoir in Talarn and continues in 1927 in the nearby area of Els Nerets. In the mid 1950s, the works of W.G. Kühne in Orcau were famous for yielding abundant sauropod bones. However, the references to the finds made in 1940 by Joaquín Mendizábal, the so-called “Conde de Peñaflorida”, near Suterranya were vaguely reported. Bataller (1958) narrated that Mendizábal collected indetermined dinosaur material during oil exploration at the Suterranya drilling and that it was delivered to the Instituto Geológico y Minero de España in Madrid. A recent bibliographic and repository reassesment of the whereabouts of the Mendizábal material confirms that it has been exhibited for more than eighty years in the display cabinets of above-mentioned museum. The specimens, labeled as coming from the Tremp Basin, correspond to axial (four caudal centra) and appendicular (left partial femur) material assignable to Hadrosauroidea indet. Although it has not been possible to specify the exact stratigraphic provenance of the material, some indications suggest that it might come from the continental levels of the lower red unit of the Tremp Formation, which in that region dates to the late Maastrichtian.

Acknowledgements: This research is part of R+D+I project PID2020-119811GB-I00 (funded by MCIN/ AEI/10.13039/501100011033/) and CLT0009_22_000021 (funded by the Departament de Cultura of the Generalitat de Catalunya) and is also supported by the CERCA Programme/Generalitat de Catalunya.

BONE HISTOLOGY OF *AMPELOMERYX* (MAMMALIA, RUMINANTIA) FROM ELS CASOTS FOSSIL SITE SHEDS LIGHT ON ITS GROWTH PATTERN

A. Viladot[1*], I.M. Sánchez[1], S. Moyà-Solà[1,2,3], C. Nacarino-Meneses[1]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Institució Catalana de Recerca i Estudis Avançats, Pg. Lluís Companys 23, 08010 Barcelona, Spain.

[3]Unitat d'Antropologia (Dept. BABVE), Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, alexandra.viladot@gmail.com

***Keywords**: bone histology,* Ampelomeryx*, paleomerycid, growth rate, Miocene.*

Bone histology is a powerful tool when it comes to understanding the patterns and rates of growth of extinct animals. For this reason, the histological examination of mammals has received special attention during the last decades, although there are many taxa for which this kind of studies are still lacking. This is the case of *Ampelomeryx*, a paleomerycid giraffomorph found at the Middle Miocene fossil site of els Casots (Catalonia). Here, we analyzed histological thin sections from four *Ampelomeryx* tibiae to provide a first insight into its life history. We found that the predominant type of primary bone tissue in the cross sections studied is fibrolamellar bone. Variation in the orientation of the vascular canals creates distinguishable areas of plexiform, laminar, and reticular fibrolamellar bone. Generally, these bone tissue types are similar to those described in extant giraffomorphs (i.e., giraffes), suggesting that both *Giraffa* and *Ampelomeryx* likely present comparable rates of growth. However, we observed that some *Ampelomeryx* tibiae show a specific pattern of alternating bands of reticular bone among the otherwise plexiform tissue. This reveals that this animal experienced a particular cyclical variation in its growth rate, which may be due to both external (e.g., environmental) and internal (e.g., biological) factors. Future research will focus on the analysis of growth marks, as well as on the comparison with more ruminant species, both extant and extinct, to obtain further information about the pace of growth and the main life history traits of the paleomerycid from els Casots.

Acknowledgements: This research has received support from the projects PID2020-117118GB-I00, PID2020-117289GB-I00, and PID2020-116220GB-I00 (MCIN/AEI/10.13039/501100011033), AGAUR's consolidated research groups 2021 SGR 01184 and 2021 SGR 01188, the Beatriu de Pinós program funded by the Ministry of Research and Universities/Generalitat de Catalunya (2021 BP 00078 to C.N.M.), and CERCA Programme/Generalitat de Catalunya.

PLEISTOCENE ASIAN BLACK BEAR (*URSUS THIBETANUS*) IN THE IBERIAN PENINSULA: NEW EVIDENCE AND A COMPLETE REVIEW

M. Villalba de Alvarado[1,2,3*], E. Crégut-Bonnoure[4], J.L. Arsuaga[3,5], H. Collado[6], J. van der Made[7], A. Gómez-Olivencia[8,9]

[1]Dept. de Prehistoria, Historia Antigua y Arqueología, Universidad Complutense de Madrid, C/ Prof. Aranguren s/n, 28040 Madrid, Spain.
[2]Centro UCM-ISCIII de Evolución y Comportamiento Humanos, Av. Monforte de Lemos 5, Pabellón 14, 28029 Madrid, Spain.
[3]Musée de l'Homme, Pl. du Trocadéro et du 11 Novembre, 17, 75116 Paris, France.
[4]TRACES, UMR 5608 (CNRS – Université Toulouse Jean-Jaurès), 5 allées Antonio Machado, 31058 Toulouse Cedex 9, France.
[5]Dept. de Geodinámica, Estratigrafía y Paleontología, Universidad Complutense de Madrid, C/ José Antonio Novais 12, 28040 Madrid, Spain.
[6]Consejería de Cultura, Turismo y Deporte-Sección de Arqueología, Junta de Extremadura, Av. Valhondo s/n, Complejo Administrativo Mérida III Milenio, 06800 Mérida, Badajoz, Spain.
[7]Consejo Superior de Investigaciones Científicas, Museo Nacional de Ciencias Naturales, C/ José Gutiérrez Abascal 2, 28006 Madrid, Spain.
[8]Dept. Geología, Facultad de Ciencia y Tecnología, Universidad del País Vasco-Euskal Herriko Unibertsitatea (UPV-EHU), Barrio Sarriena, s/n, 48940 Leioa, Bizkaia, Spain.
[9]Sociedad de Ciencias Aranzadi, Zorroagagaina Kalea, 11, 20014 Donostia, Gipuzkoa, Spain.

*presenting author, movillal@ucm.es

***Keywords**: Middle Pleistocene, Late Pleistocene, Europe, fossil record, dental morphology*

The Asian black bear *(Ursus thibetanus*) is a medium-sized ursid that inhabits southern and eastern Asia. It is locally extinct in Europe, but during the Middle and early Late Pleistocene its distribution reached western Europe. In the Iberian Peninsula, its paleontological evidence is scarce and restricted to four sites (Bolomor, Koskobilo, Cau d'en Borràs, and Villavieja). Here, we provide a detailed description of the *U. thibetanus* remains from Iberia and present new dental and postcranial fossils from Cau d'en Borràs, Villavieja, and a new site: La Llanera. Fossils were compared to both European Pleistocene and recent *U. thibetanus*. They are morphologically and metrically similar to European fossils and similar in size or even larger than the largest extant bears. Based on the study of the second upper molar, we describe similarities with *U. thibetanus* European fossil subspecies: Bolomor is similar to *U. t. mediterraneus* and Koskobilo to *U. t. kurteni*. The recent identification of *U. thibetanus* remains in Koskobilo (Navarre) and La Llanera (Oviedo) has resulted in a wider distribution of this species, not restricted to the Eastern region of Iberia. Except for the remains from Bolomor (MIS 7), the rest of the Iberian *U. thibetanus* fossils are difficult to ascribe chronologically. Based on biochronological proxies, Cau d'en Borràs, Koskobilo, and Villavieja can be tentatively assigned to MIS 5–7 range, whereas La Llanera has yielded the oldest record of *U. thibetanus* (MIS 15–13). However, until new absolute datings are performed, the proposed chronologies should be regarded with caution.

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

Acknowledgements: We would like to thank the curators and researchers that helped us and provided access to the fossils that allowed us to do this research. This work was funded by FPU (MICIU), project PID2021-122355NB-C31 (MCIN/AEI), Research Group IT1485-22 (Gobierno Vasco), RYC-2017-22558, project P d d eGC2018 093925 B C31 (MICIU) and Synthesys (MICIU).

THE IMPACT OF SEASONALITY ON THE RELATIVE BRAIN SIZE OF MAMMALS: A TEST STUDY USING EXTANT BLACK RAT (*RATTUS RATTUS*) POPULATIONS FROM THE LESSER ANTILLES

F. Vincent[1*], A. Souron[1], O.C. Bertrand[2]

[1]UMR PACEA 5199, Université de Bordeaux, Bât. B2, Allée Geoffroy Saint-Hilaire, 33615 Pessac, Cedex, France.

[2]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, flavienvincent85@gmail.com

***Keywords**: endocast, ecology, rodents, energy consumption, food availability*

Seasonality, defined as intra-annual climatic fluctuations in temperature and precipitation, translates into variations in food availability for mammals. Prolonged food scarcity can be detrimental, and it is crucial to maintain energy intake and expenditure equals. Two ways exist to avoid negative energy balance: decreasing the energetic needs by reducing the energy consumption from costly organs such as the brain (expensive tissue hypothesis, smaller relative brain sizes) or countering the effect of seasonality by keeping the energy intake level constant by behavioral adaptations (cognitive buffer hypothesis, larger relative brain sizes). We still do not know whether those patterns are also present at an intraspecific level. Here, we investigate the effect of seasonality in *Rattus rattus* using adult specimens trapped in five distinct habitats (dry forest, semievergreen, rainforest, swamp forest, crop fields) from Guadeloupe during the dry season. Based on microCT scans of 51 specimens, we generated virtual endocasts using the R package Arothron and compiled endocranial volumes. Using known body masses, we generated encephalization quotients (EQ) from an allometric regression equation based on our sample. Rats from the dry forest have relatively lower EQs with smaller body masses compared to other habitats and specifically the semievergreen and rainforests. This supports the expensive tissue hypothesis, for the first time at an intraspecific level, and if those differences proved to be inheritable, they could be translated to interspecific differences. Ultimately, these data could improve our understanding of the effect of seasonality on the brain evolution of extinct species of rodents and other mammals.

Acknowledgements: PACEA UMR 5199 laboratory, AAP ANCOR (Appel à projet: Actions Nouvelles et COllectives de Recherche; A.S. and O.C.B.); Beatriu de Pinós, 2021 BP 00042 (O.C.B.); ECSIT project (A. Lenoble) for collecting the specimens; N. Vanderesse for CT scanning; D. Neaux and A. Profico for help regarding the R package Arothron.

PALEOECOLOGY AND DIETARY HABITS OF CAVE BEAR LINEAGE THROUGH STABLE ISOTOPES ANALYSES ($\delta^{13}C$ AND $\delta^{18}O$) AND DENTAL MICROWEAR ON *URSUS DENINGERI* FROM VALLPARADÍS SECTION (TERRASSA, VALLÈS-PENEDÈS BASIN, NE IBERIAN PENINSULA)

V. Vizcaíno-Varo[1,2*], F. Rivals[1,2,3], I. Ramírez-Pedraza[1,2], C. Tornero[4,2], B. Martínez-Navarro[1,2,3], J. Madurell-Malapeira[5,6]

[1]Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avda. Catalunya 35, 43002 Tarragona, Spain.

[2]Institut Català de Paleoecologia Humana i Evolució Social (IPHES), Campus Sescelades URV (Edifici W3), 43007 Tarragona, Spain.

[3]ICREA, Pg. Lluís Companys 23, 08010 Barcelona, Spain.

[4]Department of Prehistory, Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Spain.

[5]Dipartimento di Scienze della Terra, Università di Firenze, I-50144 Firenze, Italy.

[6]Department of Geology, Faculty of Sciences, Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, victor6500@hotmail.com

Keywords: Ursus deningeri*, Vallparadís Section, microwear, Early Pleistocene, stable isotopes*

Dietary habits for the cave bear lineage have been previously studied for the Early Pleistocene ursids from Dmanisi (1.8 Ma) and Orce sites (1.6–1.2 Ma), and their diet was found to be omnivorous with a substantial consumption of meat and fish in both cases. The present study represents the chronological continuation of these previous published works. Here we present a multiproxy approach using two methods, namely tooth microwear and stable isotopes analyses ($\delta^{13}C$ and $\delta^{18}O$) on tooth enamel, both performed on *Ursus deningeri* from levels EVT7/CGR7 (0.86 Ma) and EVT12 (1.07–0.99 Ma) from the Vallparadís Section (NE Iberian Peninsula). For the isotopic analyses we used the former species and eight additional taxa of both carnivorans and ungulates from the same site, with a total of 112 samples. For dental microwear, we analyzed the scratches and pits in the occlusal surface of five lower first molars of *U. deningeri* and compared our results with the eight species of extant bears through data from previously published studies. The stable isotopes analyses indicate a diet based on C3 plants for *U. deningeri*, whereas dental microwear suggests an omnivorous diet for the species. Our study provides information about the paleoecology of ursids from the Early to Middle Pleistocene Transition in the Vallparadís Section, although further research with a larger sample will be necessary to obtain a more complete understanding and interpretation of the diet of this species.

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

A SUCCESSFUL EUROPEAN VERTEBRATE LINEAGE: THE "DOUBLE-CANINE" CROCODILE

J.D. Walter[1,2]*, M. Delfino[1,3], M. Rabi[2,4]

[1]Dipartimento di Scienze della Terra, Università di Torino, Via Valperga Caluso 35, I-10125 Torino, Italy.

[2]Department of Geosciences, Eberhard-Karls-Universität Tübingen, Hölderlinstrasse 12, D-72076 Tübingen, Germany.

[3]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA/ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[4]Central Natural Science Collections, Martin Luther University Halle-Wittenberg, Domplatz 4, D-06108 Halle (Saale), Germany.

*presenting author, julesdenis.walter@unito.it

***Keywords**: Crocodylia, taxonomy, paleobiogeography, Cenozoic,* Diplocynodon

The Cenozoic period witnessed numerous turnovers in European fauna and flora composition, by all of which entire clades went extinct on the continent. Among these groups, crocodylians maintained a continuous presence in Europe until the late Neogene. The genus *Diplocynodon*, particularly, survived for more than 40 Myr and left a very rich fossil record. This genus therefore has the potential to offer rare insights into speciation mechanisms in response to long-term changes in climatic and tectonic contexts. The complex ingroup taxonomy of *Diplocynodon*, arising from an often perplexingly extensive fossil record, discouraged researchers to work comprehensively on this genus albeit a complete systematic and taxonomic revision is long due. Among *Diplocynodon* species, *Diplocynodon darwini* (Ludwig, 1877) is represented by the largest record, made of tens of specimens, but yet critically lacks a detailed and complete osteological description. The species represents an exceptional opportunity to perform an in-depth study of intraspecific variation for an extinct crocodylian taxon. The abundance of excellently preserved specimens from emblematic European Lagerstätten enables the study of ontogenetic variation in temporally restricted populations. Moreover, the rich fossil record provides critical comparative data for a much-needed revision of the species-level taxonomy. The combination of these morphological, temporal and paleogeographical data may allow distinguishing between speciation mechanisms throughout the Cenozoic, as either: allopatry, due to geographical isolation in separate European basins; sympatry, within constrained biogeographical areas; or even anagenesis, if revised topologies reveal a continuous origination/extinction pattern of species.

Acknowledgements: This project was made possible thanks to the following people and institutions: SYNTHESYS+ Transnational access program; K. Smith, A. Vogel, and T. Lehmann from Senckenberg Museum Frankfurt (Germany); T. Wappler from Hessiches Landesmuseum Darmstadt (Germany); R. Rozzi from Zentralmagazin Naturwissenschaftlicher Sammlungen, Halle (Germany); and CERCA Programme/Generalitat de Catalunya to M.D.

CRANIAL MORPHOLOGY OF *KHIRTHARIA INFLATA* (RAOELLIDAE, ARTIODACTYLA)

M. Waqas[1,2*], T. Smith[3], R. Rana[2], M.J. Orliac[1]

[1]Institut des Sciences de l'Evolution de Montpellier, Université de Montpellier, Place Eugène Bataillon, 34095, Montpellier cedex, France.

[2]Department of Geology, HNB Garhwal University, Srinagar, Garhwal-246174, Uttarakhand, India.

[3]Directorate Earth and History of Life, Royal Belgian Institute of Natural Sciences, 29 rue Vautier, Brussels, Belgium.

*presenting author, waqasmirza786@gmail.com

***Keywords**: Eocene, India, Cetacea, endocast*

Raoellidae are extinct small-sized semiaquatic artiodactyls that are the closest relatives to crown clade Cetacea. They display morphological features showing the transition between terrestrial and aquatic lifestyles and therefore bring crucial information to understand the earliest steps of cetacean evolution. Raoellid cranial morphology, including the ear region and endocranial morphology, has been documented using cranial remains referred to *Indohyus indirae* from the Kalakot area, Jammu and Kashmir in India. The study of these specimens highlighted that several cetacean features are already present in raoellids. The previously available *Indohyus* material was very deformed, preventing access to quantitative data and leading to potential misinterpretations. We describe new undeformed cranial material from the Kalakot area, documenting another raoellid species, *Khirtharia inflata*. The new observations allow us to complete our knowledge of raoellid cranial morphology, including the original shape of the cranium and brain endocast and to confirm the specificities of raoellid morphology within Artiodactyla. We further provide the first quantitative data for the different brain components and show that Raoellidae had low encephalization and neocorticalization values, much lower than cetaceans and close to early diverging, primitive, dichobunoid artiodactyls. Reconstruction of the blood sinuses above the cerebellum supports the previous "intraosseous" hypothesis about the initial steps of the development of the caudal venous *rete mirabile* in cetaceans. The presence of several cetacean cranial features in Raoellidae, such as the peculiar shape of the frontal, the strong postorbital constriction, the periotic involucrum, or the elongation of the olfactory bulbs, questions the definition of the Cetacea clade.

Acknowledgements: We are grateful to N. Vallee-Gillette (RBINS, Brussels) for the material preparation and to R. Lebrun (ISEM, Montpellier) for his help with microCT-scanning of the specimens. We also thank the FYSSEN foundation for funding.

DRIVERS OF THE ARTIODACTYL TURNOVER IN INSULAR EUROPE AT THE EOCENE–OLIGOCENE TRANSITION

R. Weppe[1*], F.L. Condamine[1], G. Guinot[1], J. Maugoust[1], M.J. Orliac[1]

[1]Institut des Sciences de l'Évolution de Montpellier, Université de Montpellier, CNRS, IRD, EPHE, Place Eugène Bataillon, 34095 Montpellier Cedex 5, France.

*presenting author, weppe.romain@orange.fr

***Keywords**: biological crisis, biotic interactions, diversity dynamics, trait evolution, western Europe*

Simultaneous investigation of the effects of abiotic and biotic factors over diversity dynamics is now essential to understand the evolutionary history of clades. The Grande Coupure (GC) corresponds to a major faunal turnover during the severe biological and climatic crisis of the Eocene–Oligocene transition (EOT), and is defined in western Europe as a dramatic extinction of insular European mammals coupled with a massive arrival of modern Asian clades. Here, we focused on the species-rich group of endemic European artiodactyls (EEA) to determine the proximal drivers of the GC. Using Bayesian birth-death models, we analyzed an original high-resolution fossil dataset (90 species, >2,100 occurrences) from South-West France (Quercy area) and estimated the regional diversification and diversity dynamics of EEA and immigrant artiodactyls (IA). We show that the EEA radiation is mainly related to the favorable Eocene tropical conditions, and that the major climatic changes at the EOT are responsible for their spectacular extinction, with the disappearance of 77% of species. We further highlight that the concurrent increase in seasonality in Europe during the Oligocene is likely one of the main drivers of their decline. Surprisingly, we do not support the widely-held hypothesis of active competition between EEA and IA, but rather suggest a passive or opportunistic replacement by IA, which is further supported by morphological clustering of specific ecological traits across the EOT. Our work thus provides insights into the evolutionary and ecological processes driving the diversification and decline of mammalian clades during a major biological and climatic crisis.

Acknowledgements: We are grateful to T. Pélissié (PNR des Causses du Quercy), the Cloup d'Aural and the Quercy research team (ISEM, Montpellier; LEHNA, Lyon; MNHN, Paris; PALEVOPRIM, Poitiers) for their work in the field. We thank F. Escuillié for the availability of his Quercy fossil collections.

QUANTITATIVE ANALYSIS OF FLIGHT CAPACITY IN A PALEOCENE STEM PALAEOGNATH

K.E. Widrig[1*], D.J. Field[1,2]

[1]Department of Earth Sciences, University of Cambridge, Downing St, Cambridge CB2 3EQ, UK.

[2]Museum of Zoology, University of Cambridge, Downing St, Cambridge CB2 3EJ, UK.

*presenting author, kew66@cam.ac.uk

***Keywords**: geometric morphometrics, Palaeognathae, Lithornithidae, flight*

Lithornithids are presumably flying stem palaeognaths known from the Paleogene. Among extant palaeognaths, which include flightless ratites such as ostriches, only tinamous (Tinamidae) are capable of flight. These superficially partridge-like birds are reluctant fliers, utilizing anaerobic burst flight over short distances to escape predators. The flight capabilities of stem palaeognaths are important for making sense of palaeognath biogeography, because the phylogenetic relationships of extant palaeognaths imply that their stem group representatives were capable dispersers to explain their presence on isolated landmasses such as Australia and New Zealand. Here, we quantitatively investigate the flight capabilities and ecology of *Lithornis promiscuus* using two methods shown to effectively predict these traits in extant birds: the ratio of forelimb to hindlimb length, and geometric morphometric shape analysis of elements of the flight apparatus. Our calculated forelimb:hindlimb ratio of –0.0387 indicates a slightly higher investment in hindlimbs than forelimbs, consistent with a ground-feeding ecology but inconsistent with flightlessness. Our geometric morphometric analysis rejects tinamou-like burst flight and is consistent with aerobic flight styles such as continuous flapping. Among extant birds, the humerus is unlike that of tinamous, and is instead similar to phylogenetically divergent taxa such as psittacids and columbids; the sternum is highly unlike that of tinamous, and bears resemblance to some extant marine birds. Unlike tinamous, these groups are capable of long-distance flight. Additionally, the sternum also shows similarity with the near-crown Cretaceous ornithurine *Ichthyornis*, suggesting that the *Lithornis* sternum may exhibit aspects of its three-dimensional morphology that are plesiomorphic for crown birds.

Acknowledgements: This research was supported by a SIFP Graduate Student Fellowship to K.E.W. and a UK Research and Innovation Future Leaders Fellowship (MR/S032177/1) to D.J.F.

THE KONSERVAT-FOSSILLAGERSTÄTTE WATTENDORF (UPPER FRANCONIA, NORTHERN BAVARIA, GERMANY): THE OLDEST JURASSIC PLATTENKALK DEPOSIT IN CENTRAL EUROPE

O. Wings[1*]

[1]Natural History Museum Bamberg, Staatliche Naturwissenschaftliche Sammlungen Bayerns, Fleischstr. 2, 96047 Bamberg, Germany.

*presenting author, wings@snsb.de

***Keywords**: Late Jurassic, fish, reptiles, trace fossils, soft tissue preservation*

The limestone quarry at Wattendorf yields an astounding variety of exquisitely preserved laminated limestone fossils. Wattendorf is special for several reasons: (1) dated at 154 Ma (late Kimmeridgian), the plant, invertebrate, and vertebrate fossils commonly represent new taxa that predate all other Central European Jurassic plattenkalk fossils by up to 4 Myr; (2) situated about 130 km north of the Solnhofen-Eichstätt-Painten area, the site allows insights into a new region; (3) the total thickness of the Wattendorf plattenkalk is astonishing small: most fossils come from thin layers with 15 cm in total; (4) vertebrate fossils are much more abundant than in the Solnhofen area; (5) some vertebrate groups are found with a higher relative abundance. The more than 30 taxa of fish include Chondrichthyes (*Pseudorhina*, *Lissodus*, and *Ischyodus*); Actinopterygii (dominated by *Tharsis*, but also including *Anaethalion*, *Ascalabos*, *Leptolepides*, *Thrissops*, *Pholidophorus*, *Siemensichthys*, *Aspidorhynchus*, *Belonostromus*, *Pleuropholis*, *Caturus*, *Eurypoma*, *Ainia*, semionotiforms, and pachycormids); and Actinistia (*Coccoderma* and *Undina*). Turtles comprise *Thalassemys*, *Achelonia*, *Tropidemys*, *Eurysternum,* and new taxa. Metriorhynchid crocodylomorphs include *Dacosaurus* and *Cricosaurus*. Both rhynchocephalian groups inclined to an aquatic lifestyle, represented by *Pleurosaurus* and *Sapheosaurus*, are common and include juveniles. Pterosaurs are represented by the holotype of the ctenochasmatid pterodactyloid *Balaenognathus* and an undescribed skull of "*Rhamphodactylus*". Preservation of many vertebrates is spectacular: specimens are fully articulated with common soft tissue preservation. Vertebrate trace fossils include abundant coprolites, regurgitalites, and other feeding remains. Taphonomy suggests a depositional environment close to reefs and to terrestrial habitats. Many finds represent new taxa and still await description.

Acknowledgements: A big thank you to Thomas Bechmann for discovering this site, to the quarry company Andreas Schorr GmbH & Cr. KG for the permissions to excavate, and to former NKMB museum director Matthias Mäuser as well as all the numerous helpers during excavations since 2004.

A PIKA INTO LAGOMORPH EVOLUTION: A BIOMECHANICAL ANALYSIS OF *PALAEOLAGUS HAYDENI*

A.P. Wood-Bailey[1*], P.G. Cox[2], A.C. Sharp[1]

[1]Department of Musculoskeletal and Aging Science, University of Liverpool, 6 West Derby Street, 6 8TX, Liverpool, UK.

[2]Department of Cell and Developmental Biology, University College London, Gower Street, WC1E 6BT, London, UK.

*presenting author, a.p.wood-bailey@liverpool.ac.uk

***Keywords**: lagomorphs, finite element analysis, comparative anatomy*

Lagomorphs have a long and speciose evolutionary history with over 10 known extinct families and over 70 extinct genera. However, they remain remarkably conservative in their morphology throughout evolutionary time. The largest morphological distinction is between the two extant families: Ochotonidae (pikas) and Leporidae (rabbits and hares). While many fossils can be assigned to either family (or extinct families, such as Prolagidae), *Palaeolagus* has caused taxonomic difficulty: once thought to sit outside the extant families, it is now considered an early leporid. However, *P. haydeni* features a mosaic of cranial traits that are leporid-like or ochotonid-like. Essentially, *Palaeolagus* can be described as having a leporid-like anterior cranium and an *Ochotona*-like posterior cranium. Here, we use finite element analysis to model the forces of mastication to compare the cranial strains during feeding between a pika (*Ochotona princeps*), a rabbit (*Pronolagus rupestris*), and an undescribed *P. haydeni* specimen to ask: in terms of biomechanical function, does the *Palaeolagus* cranium more closely reflect a pika or a rabbit? The distribution of cranial strains in *Palaeolagus* suggests that the anterior portion of the cranium performs much like the anterior portion of the rabbit, with a longer rostrum and lateral fenestrations. The posterior portion, however, performs much like the posterior portion of the pika, with little to no ventral flexion and no intracranial joint. These results could suggest that the *Palaeolagus* cranium features early adaptations shifting towards that of modern leporid's locomotor form, which coevolved longer, more fenestrated and ventrally tilted crania with faster locomotion.

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

CHARTING 30,000 YEARS OF MORPHOLOGICAL EVOLUTION IN THE EIVISSA WALL LIZARD *PODARCIS PITYUSENSIS* LINEAGE

S. Woodgate[1*], J.A. Alcover[2], A. Pérez-Cembranos[3], V. Pérez-Mellado[3], J. Müller[1]

[1]Museum für Naturkunde, Leibniz Institute for Evolution and Biodiversity Science, Invalidenstraße 43, 10115 Berlin, Germany.

[2]Departament de Biodiversitat Animal i Microbiana, Institut Mediterrani d'Estudis Avançats (CSIC-UIB), Carrer de Miquel Marquès, 21, 07190 Esporles, Illes Balears, Spain.

[3]Department of Animal Biology, Universidad de Salamanca, Campus Miguel de Unamuno, 37071 Salamanca, Spain.

*presenting author, stephanie.woodgate@mfn.berlin

***Keywords**: morphodynamism, geometric morphometrics, conservation palaeobiology*

Elucidating how taxa respond to ecological changes across evolutionary scales is vital for informing effective conservation priorities to guard against future biodiversity loss. The famous cave site of Es Pouàs on Eivissa (Ibiza), Balearic Islands provides a high-resolution fossil record of the lineage of the endemic Eivissa wall lizard, *Podarcis pityusensis,* over the last 30 kyr. This record, along with the phenotypic diversity of modern populations, makes *P. pityusensis* a useful model to investigate drivers of shape change, particularly in response to human arrival and subsequent colonisation of islands. 3D geometric morphometric analysis of over 500 dentary fossils from 11 stratigraphic levels and 33 modern dentary bones reveals a pronounced contraction in disparity and increase in size over the last ~4 kyr. Morphospace occupation of modern dentaries is associated with shapes able to generate higher bite force, which can be linked to changes in population dynamics in response to unique pressures associated with urbanisation and introduced predators. Results gathered here are discordant with trends of decreasing body size observed in much of the literature of Holocene island reptile evolution and shed light on the importance of including a geological timeframe within analyses of modern biodiversity.

Acknowledgements: Thanks to Anna Díaz and Enric Torres-Roig (IMEDEA, CSIC-UIB) for access to collections. Thanks to Kristin Mahlow (MfN) for scanning specimens and Vincent Fantino (MfN) for help processing scans. Thanks to the DFG for funding this work.

EXTRACTION AND PREPARATION PROCESS OF A PARTIAL SKELETON IN ANATOMICAL CONNECTION OF *DIPLOCYODON RATELII* (CROCODYLIA: DIPLOCYNODONTIDAE) FROM ELS CASOTS SITE (CATALONIA)

A.S. Yagüe[1,2*], M. Rull[1], À.H. Luján[1,3], P. Logrosán Soriano[1], J. Abella[4,5,1], J. Madurell-Malapeira[6,7], I. Casanovas-Vilar[1]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona. Spain.

[2]Universitat de Barcelona, Facultat de Geografía i Història, c/ Montalegre 6, 08001 Barcelona, Spain.

[3]Department of Geological Sciences, Faculty of Sciences, Masaryk University, 611 37 Brno, Czech Republic.

[4]Grup d'Investigació en Paleontologia de Vertebrats del Cenozoic (PVC-GIUV), Departament de Botànica i Geologia, Universitat de València, C/ Doctor Moliner, 50, 46100 Burjassot, València, Spain.

[5]Instituto Nacional de Biodiversidad (INABIO), Pje. Rumipamba N. 341 y Av. de los Shyris (Parque La Carolina), Quito, Ecuador.

[6]Dipartimento di Scienze della Terra, Università di Firenze, Via G. La Pira 4, 50121 Firenze, Italy.

[7]Department of Geology, Faculty of Sciences, Universitat Autònoma de Barcelona, *c/* Til·lers s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

*presenting author, almudena.yague@icp.cat

***Keywords**: conservation, vertebrate fossils, crocodylians, extraction*

Els Casots (Subirats) is one of the major vertebrate sites from the Vallès-Penedès Basin (Catalonia, Spain) and has yielded thousands of remains dating to the earliest Middle Miocene. The site corresponds to an ancient lacustrine area and the stratigraphic succession consists of cyclically alternating lutite layers occasionally interbedded with carbonates and lignites. Vertebrate fossils occur in the lutites, which are finely laminated, thus complicating their extraction. Furthermore, intense lithostatic pressure extensively flattened most remains to just a few centimeters thick. In 2021, the first partial skeleton in anatomical connection of the small crocodylian *Diplocynodon ratelii* (IPS127899) was found at the site in a thin and laminated lutite layer above a thicker lacustrine limestone. This unique specimen was also affected by large cracks and plant roots, thus recommending careful extraction. This process comprised initial consolidation and the application of fiberglass to block the perimeter of the fossil and increase its stability. Then, an adapted first jacket was made to facilitate extracting the fossil, protect it from impacts, and preserve its anatomical connection. Preparation procedures were then executed in the lab: consolidation of the specimen, removal of the sedimentary matrix, reintegration of fossil fragments, and reinforcement of the most fragile areas. After this, a new definitive jacket was made considering current conservation criteria

that require for a light and relatively small package. The use of this acrylic resin jacket system in all the conservation process facilitates fossil extraction and preparation, guarantees its conservation during storage, and ensures safer manipulation during research tasks.

Acknowledgements: Funded by R+D+I project PID2020-117289GB-I00 (MCIN/AEI/10.13039/501100011033/), OSIC project CLT0009_22_000019 (Departament de Cultura, Generalitat de Catalunya), Generalitat de Catalunya/CERCA Programme, and AGAUR (2021 SGR 00620 and 2019 BP 00154). Preparation of IPS127899 was defrayed by the Ajuntament de Subirats.

DEMOUNTABLE RECONSTRUCTION OF AN AUROCH (*BOS PRIMIGENIUS*) SKULL AS AN ALTERNATIVE REINTEGRATION PROCESS OF ARCHAEOPALEONTOLOGICAL REMAINS (COVA DEL RINOCERONT, BARCELONA)

A.S. Yagüe[1,2*], F. Marcos-Fernández[3,4], J. Daura[2], M. Sanz[2]

[1]Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, c/ Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain.

[2]Grup de Recerca del Quaternari, Facultat de Geografía i Història, c/ Montalegre 6, 08001, Barcelona, Spain.

[3] Facultad de Bellas Artes, Universidad Complutense de Madrid, c/ Pintor el Greco 2, 28040 Madrid, Spain.

[4]Grupo de Biología Evolutiva de la Universidad Nacional de Educación a Distancia, c/ Senda del Rey 9, 28040 Madrid, Spain.

*presenting author: almudena.yague@icp.cat

***Keywords**: exhibition, conservation, preparation, removable, recover*

Volumetric reintegrations of paleontological remains always raise ethical questions regarding the choice of material, its visibility, and its reversibility. Here, we describe a demountable reintegration as an alternative method that can be discerned from the original fossil bone. It is completely reversible, light, and harmless, and achieves the goal of facilitating the understanding and interpretation of the fossil. The demountable volumetric reintegration was applied to a skull of an auroch (*Bos primigenius*) from the Pleistocene site of Cova del Rinoceront (Castelldefels, Barcelona) labeled as CR-VI-8657. This fossil is part of the permanent exhibition of the Ramón Fernández Jurado Library in Castelldefels. The cranium is well preserved, including the proximal portion of the left horn core. For the purposes of exhibition, it was decided to reproduce the missing proximal part of the right horn core. This volumetric reintegration contains a polyethylene foam structure (Ethafoam®), on which the simplified form is modeled with epoxy-based putty (Free Form™ AIR). For the chromatic reintegration we used a neutral ink technique with a lower tone than the matrix color. The innovative feature of this work is the union between the reconstruction and the specimen with high-resistance magnets glued with fast-drying transparent epoxy resin DEVCON 5 Minute® fast-drying. Seven magnets were placed on the matrix to avoid damage on the fossil and another seven were fixed to the reconstruction. This union can easily be removed without the need of any special procedures.

Acknowledgements: This research received financial support from Castelldefels city council, RYC2021-032999-I and from the Spanish Ministry of Science and Innovation and the European Union NextGeneration EU (M.S.); Departament de Cultura of the Generalitat de Catalunya (CLT/2022/ARQ001SOLC/128) and AGAUR (SGR2021-00337); R+D+I projects PID2020-

113960GB-100 and PID2020-117289GB-I00 (MCIN/AEI/10.13039/501100011033/); and CERCA Programme/Generalitat de Catalunya.