

Osteology, fossil record and palaeodiversity of the European lizards

Andrea Villa¹, Emanuel Tschopp^{1, 2, 3}, Georgios L. Georgalis^{4, 1}, Massimo Delfino^{1, 5}

¹ Dipartimento di Scienze della Terra, Università degli Studi di Torino, via Valperga Caluso 35, 10125 Torino, Italy

² GeoBioTec, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Caparica, Portugal

³ Museu da Lourinhã, Rua João Luís de Moura, 2530-157 Lourinhã, Portugal

⁴ Department of Geosciences, University of Fribourg/Freiburg, Chemin du Musée 6, 1700 Fribourg, Switzerland

⁵ Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICTA-ICP, Carrer de les Columnes s/n, Campus de la UAB, 08193 Cerdanyola del Vallès, Barcelona, Spain

Supplementary material

Supplement S1. List of studied specimens

The specimens marked with an asterisk were included in the phylogenetic analysis. Abbreviations: CIPA - Laboratorio Arqueociencias Lisboa, Portugal; HUJ.OST - Osteological collection of the Hebrew University of Jerusalem, Israel; MCCI - Museo Civico di storia naturale di Carmagnola, Italy; MDHC - Massimo Delfino Herpetological Collection, Departement of Earth Sciences, University of Torino, Italy; MNCN - Museo Nacional de Ciencias Naturales, Madrid, Spain; MNHN - Muséum national d'Histoire naturelle, Paris, France; NHMW - Naturhistorisches Museum Wien, Austria; PIMUZ - Paläontologisches Institut und Museum der Universität Zürich, Switzerland; UAM.R - Universidad Autonoma de Madrid (Reptiles), Spain; ZMS - Zoologische Staatssammlung München, Germany.

Laudakia stellio: MDHC 245; HUJ.OST-Z-5, 423, 424.

Chamaeleo chamaeleon: MNHN 241, 1942-103, 2002-24, 1887-875; HUJ.OST-Z-380, 425.

Euleptes europaea: MDHC 384, 388, 389.

Hemidactylus turcicus: MDHC 26, 238

Mediodactylus kotschyi: MDHC 201, 285.

Tarentola mauritanica: MDHC 97, 98, 119, 194, 302.

Acanthodactylus erythrurus: UAM.R.ACVII; EBD 1266 (specimen from the collection of Salvador Bailon).

Algyroides fitzingeri: MDHC 351.

Algyroides moreoticus: MDHC 174.

Algyroides nigropunctatus: MDHC 171, 242, 243; NHMW 797*.

Archaeolacerta bedriagae: MDHC 167*; unnumbered specimen from the collection of Salvador Bailon.

Eremias arguta: MNHN 1944-168.

Iberolacerta bonnali: UAM.R.Lm28A.

Iberolacerta cyreni: UAM.R.Lm4.

Iberolacerta monticola: UAM.R.Lm77, Lm92.

Lacerta agilis: CIPA 1550*; MDHC 176*, 177*, 178*, 230*, 231*; MNCN 15979*; NHMW 802*; PIMUZ A/III 0902*.

Lacerta bilineata: MDHC 15*, 48*, 73*, 77*, 84*, 381*; MNCN 16505*; PIMUZ A/III 1276*; UAM.R.Q21*.

Lacerta schreiberi: CIPA 778*, 1256*, 1511*, 1517*; UAM.R.S-6*.

Lacerta trilineata: MDHC 240*, 241*, 295*, 356*.

Lacerta viridis: MNCN 16504*; NHMW 778*, 906*, 32879-3*.

Ophisops elegans: MDHC 281, 282; unnumbered specimen from the collection of Salvador Bailon.

Podarcis bocagei: UAM.R.PB48.

Podarcis filfolensis: MDHC 385.

Podarcis hispanicus: UAM.R.H30; two unnumbered specimens from the collection of Salvador Bailon.

Podarcis lilfordi: two unnumbered specimens from the collection of Salvador Bailon.

Podarcis melisellensis: MDHC 217, 218.

Podarcis muralis: MDHC 6, 65, 66, 72, 81, 89, 90, 222, 267, 311*, 312*, 313, 395, 413; MNHN 1992.192.

Podarcis siculus: MDHC 25, 91, 125, 229.

Podarcis tauricus: MDHC 244.

Podarcis tiliguerta: MDHC 153, 154.

Podarcis waglerianus: MDHC 390; MNHN 1992.189, 1992.190.

Psammodromus algirus: MNHN 1992.41; NHMW 788*; UAM.R.Ps9.

Timon lepidus: MDHC 216*; MNHN 1988.6629, 1991.4010, 1991.4242; unnumbered specimen stored in the Institut Català de Paleontologia Miquel Crusafont.

Zootoca vivipara: MDHC 179; UAM.R.Lv24.

Ablepharus kitaibelii: MDHC 239.

Chalcides bedriagai: unnumbered specimen from the collection of Salvador Bailon.

Chalcides chalcides: MDHC 94, 329, 398, 408.

Chalcides ocellatus: MDHC 193, 250; MNHN 1992.193; specimen number 28 from the collection of Salvador Bailon.

Chalcides striatus: MDHC 404; MNCN 16508; unnumbered specimen from the collection of Salvador Bailon.

Trachylepis aurata: MDHC 280; MNHN 1887-863.

Anguis gr. A. fragilis: MDHC 45, 49, 67, 102, 213, 221, 236, 237, 310, 367, 402.

Pseudopus apodus: MDHC 214, 215; MNHN 1918.95, 1992.199; PIMUZ A/III0975.

Blanus cinereus: MDHC 156; ZSM 175-1993-1, 175-1993-2, 227-1975, 548-2003, 652-0-1, 652-0-2, 653-0-1, 653-0-2.

Blanus mariae: ZSM 27-1988-1, 27-1988-2.

Blanus strauchi: MCCI R-1635, 1668; MDHC 93, 286, 287, 288.

Supplement S2. List of published works dealing with the osteology of extant European lizards and worm lizards

The references marked with an asterisk provided useful information for the creation of the phylogenetic matrix.

Anderson, S.C., Leviton, A.E. (1966): A review of the genus *Ophiomorus* (Sauria: Scincidae), with descriptions of three new forms. Proceedings of the California Academy of Sciences, Fourth series **XXXIII**: 499-534.

*Arnold, E.N. (1973): Relationships of the Palaearctic lizards assigned to the genera *Lacerta*, *Algyroides* and *Psammodromus* (Reptilia: Lacertidae). Bulletin of the British Museum of Natural History, Zoology **25**: 291-366.

Arnold, E.N. (1983): Osteology, genitalia and relationship of *Acanthodactylus* (Reptilia: Lacertidae). Bulletin of the British Museum of Natural History, Zoology **44**: 291-339.

Arnold, E.N. (1984): Evolutionary aspects of tail shedding in lizards and their relatives. J. Nat. Hist. **18**: 127-169.

*Arnold, E.N. (1989): Towards a phylogeny and biogeography of the Lacertidae: relationships within an Old-World family of lizards derived from morphology. Bulletin of the British Museum of Natural History, Zoology **55**: 209-257.

*Arnold, E.N. (1997): Interrelationships and evolution of the east Asian grass lizards, *Takydromus* (Squamata: Lacertidae). Zool. J. Linn. Soc.-Lond. **119**: 267-296.

*Arnold, E.N. (1998): Structural niche, limb morphology and locomotion in lacertid lizards (Squamata, Lacertidae); a preliminary survey. Bulletin of the Natural History Museum Zoology Series **64**: 63-90.

*Arnold, E.N., Arribas, O., Carranza, S. (2007): Systematics of the Palaearctic and Oriental lizard tribe Lacertini (Squamata: Lacertidae: Lacertinae), with descriptions of eight new genera. Zootaxa **1430**: 1-86.

*Arribas, O.J. (1998): Osteology of the Pyrenean Mountain Lizard and comparison with other species of the collective genus *Archaeolacerta* MERTENS, 1921 s.l. from Europe and Asia Minor (Squamata: Sauria: Lacertidae). Herpetozoa **11**: 47-70.

Arribas, O.J., Odierna, G. (2004): Karyological and osteological data supporting the specific status of *Iberolacerta (cyreni) martinezricai*. Amphibia-Reptilia **25**: 359-367.

Baig, K.J., Wagner, P., Ananjeva, N.B., Böhme, W. (2012): A morphology-based taxonomic revision of *Laudakia* Gray, 1845 (Squamata: Agamidae). Vertebrate Zoology **62**: 213-260.

Bailon, S. (1991): Amphibiens et reptiles du Pliocène et du Quaternaire de France et d'Espagne: mise en place et evolution des faunes. PhD thesis, Université Paris VII.

*Barahona, F.F. (1996): Osteología craneal de lacértidos de la Península Ibérica e Islas Canarias: análisis sistemático filogenético. Unpublished PhD thesis, Universidad Autónoma de Madrid.

*Barahona, F., Barbadillo, L.J. (1997): Identification of some Iberian lacertids using skull characters. R. Esp. Herp. **11**: 47-62.

Barahona, F., Barbadillo, L.J. (1998): Inter- and intraspecific variation in the post-natal skull of some lacertid lizards. J. Zool. **245**: 393-405.

Barbadillo, L.J. (1989): Los Reptilia (Sauria y Amphisbaenia) de los yacimientos Plio-pleistocénicos de la cuenca Guadix-Baza (sudeste español). Trabajos sobre el Neogeno-Cuaternario **11**: 151-165.

Barbadillo, L.J., Barahona, F. (1994): The number of cervical vertebrae in lacertid lizards: some unusual cases. Herpetol. J. **4**: 166.

*Barbadillo, L.J., Sanz, J.L. (1983): Análisis osteométrico de las regiones sacra y presacra de la columna vertebral en los Lagartos Ibéricos *Lacerta viridis* Laurenti, *Lacerta lepida* Daudin y *Lacerta schreiberi* Bedriaga. Amphibia-Reptilia **4**: 215-239.

Bauer, A.M., Good, D.A., Branch, W.R. (1997): The taxonomy of the southern african leaf-toed geckos (Squamata: Gekkonidae), with a review of old world “*Phyllodactylus*” and the description of five new genera. Proceedings of the California Academy of Science **49**: 447-497.

Blain, H.-A. (2009): Contribution de la paléoherpétofaune (Amphibia & Squamata) à la connaissance de l'évolution du climat et du paysage du Pliocène supérieur au Pléistocène moyen d'Espagne. Treballs del Museu de Geologia de Barcelona **16**: 39-170.

Blain, H.-A. (2012-2014): Anfibios y escamosos de Cueva Victoria. - Amphibians and squamate reptiles from Cueva Victoria. Mastia **11-12-13**: 175-197.

Blain, H.-A., Bailon, S., Agustí, J. (2007): Anurans and squamate reptiles from the latest early Pleistocene of Almenara-Casablanca-3 (Castellón, East of Spain). Systematic, climatic and environmental considerations. Geodiversitas **29**: 269-295.

Bochaton, C., Buffrénil, V. de, Lemoine, M., Bailon, S., Ineich, I. (2015): Body Location and Tail Regeneration Effects on Osteoderms Morphology. Are They Useful Tools for Systematic, Paleontology, and Skeletochronology in Diploglossine Lizards (Squamata, Anguidae)? J. Morphol. **276**: 1333-1344.

Bochaton, C., Boistel, R., Casagrande, F., Grouard, S., Bailon, S. (2016): A fossil *Diploglossus* (Squamata, Anguidae) lizard from Basse-Terre and Grande-Terre Islands (Guadeloupe, French West Indies). Scientific Reports **6**: 28475.

*Böhme, M. (2010): Ectothermic vertebrates (Actinopterygii, Allocaudata, Urodela, Anura, Crocodylia, Squamata) from the Miocene of Sandelzhausen (Germany, Bavaria) and their implications for environment reconstruction and palaeoclimate. *Paläont. Z.* **84**: 3-41.

Bolet, A., Delfino, M., Fortuny, J., Almécija, S., Robles, J.M., Alba, D.M. (2014): An Amphisbaenian Skull from the European Miocene and the Evolution of Mediterranean Worm Lizards. *PLoS ONE* **9**: e98082.

Bons, J., Geniez, P. (1995): Contribution to the systematic of the lizard *Acanthodactylus erythrurus* (Sauria, Lacertidae) in Marocco. *Herpetol. J.* **5**: 271-280.

Boulenger, G.A. (1885): Catalogue of the lizards in the british museum (Natural History). London, order of the Trustees.

*Boulenger, G.A. (1916): On the lizards allied to *Lacerta muralis*, with an account of *Lacerta agilis* and *L. parva*. *The Transactions of the Zoological Society of London* **21**: 1-104.

*Boulenger, G.A. (1920): Monograph of the Lacertidae., London, British Museum Natural History.

Bruner, E., Costantini, D., Fanfani, A., Dell’Omo, G. (2005): Morphological variation and sexual dimorphism of the cephalic scales in *Lacerta bilineata*. *Acta Zool.-Stockholm* **86**: 245-254.

Buffrénil, V. de, Bardet, N., Pereda-Suberbiola, X., Bouya, B. (2008): Specialization of bone structure in *Pachyvaranus crassispodus* Arambourg, 1952, an aquatic squamate from the Late Cretaceous of the southern Tethyan margin. *Lethaia* **41**: 59-69.

Buffrénil, V. de, Dauphin, Y., Rage, J.-C., Sire, J.-Y. (2011): An enamel-like tissue, osteodermine, on the osteoderms of a fossil anguid (Glyptosaurinae) lizard. *CR Palevol* **10**: 427-437.

Buffrénil, V. de, Sire, J.-Y., Rage, J.-C. (2010): The Histological Structure of Glyptosaurine Osteoderms (Squamata: Anguidae), and the Problem of Osteoderm Development in Squamates. *J. Morphol.* **271**: 729-737.

*Calori, L. (1858): Sullo scheletro della *Lacerta viridis* Linn., sulla riproduzione della coda nelle lucertole, e sulle ossa cutanee del teschio dei sauri. *Memorie Della Accademia Delle Scienze dell’Istituto Di Bologna* **9**: 345-382.

*Camp, C.L. (1923): Classification of the lizards. *B. Am. Mus. Nat. Hist.* **48**: 289-480.

Caputo, V. (2004): The cranial osteology and dentition in the scincid lizards of the genus *Chalcides* (Reptilia, Scincidae). *Ital. J. Zool.* **71**: 35-45.

Caputo, V., Lanza, B., Palmieri, R. (1995): Body elongation and limb reduction in the genus *Chalcides* Laurenti 1768 (Squamata Scincidae): a comparative study. *Trop. Zool.* **8**: 95-152.

Čerňanský, A. (2010a): A revision of chamaeleonids from the Lower Miocene of the Czech Republic with description of a new species of *Chamaeleo* (Squamata, Chamaeleonidae). *Geobios-Lyon* **43**: 605-613.

- Čerňanský, A. (2010b): Earliest world record of green lizards (Lacertilia, Lacertidae) from the Lower Miocene of Central Europe. *Biologia* **65**: 737-741.
- Čerňanský, A. (2011): A revision of the chameleon species *Chamaeleo pfeili* Schleich (Squamata; Chamaeleonidae) with description of a new material of chamaeleonids from the Miocene deposits of southern Germany. *B. Geosci.* **86**: 275-282.
- Čerňanský, A., Bauer, A.M. (2010): *Euleptes gallica* Müller (Squamata: Gekkota: Sphaerodactylidae) from the lower Miocene of North-West Bohemia, Czech Republic. *Folia Zool.* **59**: 323-328.
- Čerňanský, A., Klembara, J., Smith, K.T. (2016): Fossil lizard from central Europe resolves the origin of large body size and herbivory in giant Canary Island lacertids. *Zool. J. Linn. Soc.-Lond.* **176**: 861-877.
- Čerňanský, A., Rage, J.-C., Klembara, J. (2015): The Early Miocene squamates of Amöneburg (Germany): the first stages of modern squamates in Europe. *J. Syst. Palaeontol.* **13**: 97-128.
- Čerňanský, A., Smith, K.T., Klembara, J. (2014a): Variation in the position of the jugal medial ridge among lizards (Reptilia: Squamata): its functional and taxonomic significance. *Anat. Rec.* **297**: 2262-2272.
- Čerňanský, A., Boistel, R., Fernandez, V., Tafforeau, P., Le Noir, N., Herrel, A. (2014b): The atlas-axis complex in chamaeleonids (Squamata: Chamaeleonidae), with description of a new anatomical structure of the skull. *Anat. Rec.* **297**: 369-396.
- Conrad, J.L. (2004): Skull, mandible, and hyoid of *Shinisaurus crocodilurus* Ahl (Squamata, Anguimorpha). *Zool. J. Linn. Soc.-Lond.* **141**: 399-434.
- Conrad, J.L. (2008): Phylogeny and systematics of Squamata (Reptilia) based on morphology. *B. Am. Mus. Nat. Hist.* **310**: 1-182.
- Cope, E.D. (1892): The osteology of the Lacertilia. *P. Am. Philos. Soc.* **XXX**: 184-221.
- Cooper, J.S., Poole, D.F.G., Lawson, R. (1970): The dentition of agamid lizards with special reference to tooth replacement. *J. Zool.* **162**: 85-98.
- Daza, J.D., Bauer, A.M., Snively, E.D. (2014): On the Fossil Record of the Gekkota. *Anat. Rec.* **297**: 433-462.
- Delfino, M., Kotsakis, T., Arca, M., Tuveri, C., Pitruzzella, G., Rook, L. (2008): Agamid lizards from the Plio-Pleistocene of Sardinia (Italy) and an overview of the European fossil record of the family. *Geodiversitas* **30**: 641-656.
- *De Stefano, G. (1903): I sauri del Quercy appartenenti alla collezione Rossignol. *Atti Soc. Ital. sci. nat., Mus. civ. stor. nat. Milano* **42**: 382-418.

- Edmund, A.G. (1969): Dentition. In: Gans C. (Ed.), Biology of the Reptilia, Vol. I, Morphology A. Academic Press, London and New York: 117-200.
- El-Toubi, M.R. (1947): Sacral Ribs of Lacertilia. Nature **159**: 342.
- Estes, R. (1970): Die fauna der miozänen Spaltenfüllung von Neudorf an der March (CSSR). Reptilia (Lacertilia). Sitzungsberichte der Akademie der Wissenschaften mathematisch-naturwissenschaftliche Klasse **178**: 77-82.
- Estes, R., Williams, E.E. (1984): Ontogenetic variation in the molariform teeth of lizards. J. Vertebr. Paleont. **4**: 96-107.
- Etheridge, R. (1967): Lizard caudal vertebrae. Copeia **4**: 699-721.
- Evans, S.E. (2008): The skull of lizards and Tuatara. In: Gans C., Gaunt A. (Eds.), Biology of the Reptilia. Ithaca, New York.
- Gans, C., Montero, R. (2008): An atlas of amphisbaenian skull anatomy. In: Gans C., Gaunt A.S., Adler K. (Eds.), Biology of the Reptilia. Volume 21. Morphology I. The Skull and Appendicular Locomotor Apparatus of Lepidosauria. Society for the Study of Amphibians and Reptiles, Ithaca, New York. Pp. 621-738.
- Gasc, J.P. (1966): Les reptiles. In: Atlas de préhistoire, 3, Faunes et flores préhistoriques de l' Europe occidentale. R. Lavocat Eds., 470-474, Paris.
- Gaupp, E. (1900): Das Chondrocranium von *Lacerta agilis*, ein Beitrag zum Verständnis des Amniotenschadels. Anatomisebe Hefte. I. Abteilung.
- *Gauthier, J.A., Kearney, M., Maisano, J.A., Rieppel, O., Behlke, A.D.B. (2012): Assembling the squamate tree of life: perspectives from the phenotype and the fossil record. Bull. Peabody Mus. Nat. Hist. **53**: 3-308.
- Gleed-Owen, C. (1997): The prehistory of the slow-worm in Britain. KRAM News special edition, October **1997**: 11-15.
- Greer, A.E., Arnold, C., Arnold, E.N. (2000): The systematic significance of the number of presacral vertebrae in the scincid lizard genus *Mabuya*. Amphibia-Reptilia **11**: 121-126.
- Greer, A.E., Wilson, G.D.F. (2001): Comments on the scincid lizard genus *Ophiomorus*, with a cladistic analysis of the species. Hamadryad **26**: 261-271.
- Herrel, A., Aerts, P., Fret, J., De Vree, F. (1999): Morphology of the Feeding System in Agamid Lizards: Ecological Correlates. Anat. Rec. **254**: 496-507.
- Hoffstetter, R. (1944): Sur les Scincidae fossiles. 1. Formes européennes et nord-américaines. Bulletin du Muséum National d'Histoire Naturelle **XVI**: 547-553.

- Hoffstetter, R. (1962): Observations sur les ostéodermes et la classification des anguidés actuels et fossiles (Reptiles, Sauriens). Bulletin du Muséum National d'Histoire Naturelle - 2^o série **34**: 149-157.
- Hoffstetter, R., Gasc, J.-P. (1969): Vertebrae and ribs of modern reptiles. pp. 201-310. In: Gans C., Bellairs A.d'A., Parsons T.S. (Eds.), Biology of the Reptilia. Volume 1. Morphology A. Academic Press, London and New York.
- Holman, J.A. (1998): Pleistocene amphibians and reptiles in Britain and Europe. Oxford monographs on geology and geophysics, **38**.
- Jollie, M.T. (1960): The head skeleton of the lizard. Acta Zool.-Stockholm **41**: 1-64.
- Kazemi, S.M., Farhadi Qomi, M., Kami, H.G., Anderson, S.C. (2011): A new species of *Ophiomorus* (Squamata: Scincidae) from Maranjab Desert, Isfahan Province, Iran, with a revised key to the genus. Amphibian and Reptile Conservation **5**: 23-33.
- Klembara, J. (2012): A new species of *Pseudopus* (Squamata, Anguidae) from the early Miocene of Northwest Bohemia (Czech Republic). J. Vertebr. Paleontol. **32**: 854-866.
- Klembara, J., Hain, M., Dobiašová, K. (2014): Comparative Anatomy of the Lower Jaw and Dentition of *Pseudopus apodus* and the Interrelationships of Species of Subfamily Anguinae (Anguimorpha, Anguidae). Anat. Rec. **297**: 516-544.
- Klembara, J., Rummel, M. (2016): New material of *Ophisaurus*, *Anguis* and *Pseudopus* (Squamata, Anguidae, Anguinae) from the Miocene of the Czech Republic and Germany and systematic revision and palaeobiogeography of the Cenozoic Anguinae. Geol. Mag.: 1-25.
- Kosma, R. (2004): The dentitions of recent and fossil scincomorphan lizards (Lacertilia, Squamata) – Systematics, Functional Morphology, Palecology. Unpublished PhD Thesis, Universität Hannover.
- Kotsakis, T. (1981): Le lucertole (Lacertidae, Squamata) del Pliocene, Pleistocene e Olocene delle Baleari. Bolletí de la Societat d'Història Natural de les Balears **25**: 135-150.
- Lantz, L.A., Cyrén, O. (1919): On *Lacerta praticola*. The Annals and Magazine of Natural History **3**: 28-31.
- López-García, J.M., Blain, H.-A., Cuenca-Bescós, G., Alonso, C., Alonso, S., Vaquero, M. (2011): Small vertebrates (Amphibia, Squamata, Mammalia) from the late Pleistocene-Holocene of the Valdavara-1 cave (Galicia, northwestern Spain). Geobios-Lyon **44**: 253-169.
- Ljubisavljević, K., Urošević, A., Aleksić, I., Ivanović, A. (2010): Sexual dimorphism of skull shape in a lacertid lizard species (*Podarcis* spp., *Dalmatolacerta* sp., *Dinarolacerta* sp.) revealed by geometric morphometrics. Zoology **113**: 168-174.

- Malashichev, Y.B. (2001): Sacrum and pelvic girdle development in Lacertidae. Russian Journal of Herpetology **8**: 1-16.
- Mateo, J.A., López-Jurado, L.F. (1997): Dental Ontogeny in *Lacerta lepida* (Sauria, Lacertidae) and Its Relationship to Diet. Copeia **1997**: 461-465.
- Metzger, K. (2002): Cranial Kinesis in Lepidosauers: Skulls in Motion. pp. 15-46. In: Aerts P., D'Août K., Herrel A., Van Damme R. (Eds.), Topics in Functional and Ecological Vertebrate Morphology. Shaker Publishing.
- Mezzasalma, M., Maio, N., Guarino, F.M. (2014): To Move or Not to Move: Cranial Joints in European Gekkotans and Lacertids, an Osteological and Histological Perspective. Anat. Rec. **297**: 463-472.
- Moody, S., Roček, Z. (1980): *Chamaeleo caroliquarti* (Chamaeleonidae, Sauria): a new species from the Lower Miocene of Central Europe. Vestnik Ústředního Ústavu Geologického **55**: 85-92.
- *Müller, J. (1996) Eine neue art der echten eidechsen (Reptilia: Lacertilia: Lacertidae) aus dem Unteren Miozän von Poncenat, Frankreich. Mainzer Geowissenschaftliche Mitteilungen **25**: 79-88.
- Müller, J. (2001): A new fossil species of *Euleptes* from the early Miocene of Montaigu, France (Reptilia, Gekkonidae). Amphibia-Reptilia **22**: 341-348.
- Parker, K.W. (1879): The Croonian Lecture: On the Structure and Development of the Skull in the Lacertilia. Part I. On the Skull of the Common Lizards (*Lacerta agilis*, *L. viridis*, and *Zootoca vivipara*). Phil. Trans. R. Soc. Lond. **170**: 595-640.
- *Rauscher, K.L. (1992): Die echsen (Lacertilia, Reptilia) aus dem Plio-Pleistozän von Bad Deutsch-Altenburg, Niederösterreich. Beiträge zur paläontologie von Österreich **17**: 81-177.
- Roček, Z. (1980a): The dentition of the European glass lizard *Ophisaurus apodus* (Pallas, 1775) (Reptilia, Sauria: Anguidae), with notes on the pattern of tooth replacement. Amphibia-Reptilia **1**: 19-27.
- Roček, Z. (1980b): Intraspecific and ontogenetic variation of the dentition in the green lizard *Lacerta viridis* (Reptilia, Squamata). Věstník Československé společnosti zoologické **44**: 272-277.
- *Siebenrock, F. (1894). Das Skelet der *Lacerta simonyi* Steind. und der Lacertidenfamilie überhaupt. Sitzungsberichte Der Kaiserlichen Akademie Der Wissenschaften **103**: 205-292.
- Siebenrock, F. (1895): Das skelet der Agamidae. Sitzungsberichten der kaiserl. Akademie der Wissenschaften in Wien. Mathem.-Naturw. Classe **CIV**: 1-108.
- Stokely, P.S. (1947): Limblessness and Correlated Changes in the Girdles of a Comparative Morphological Series of Lizards. Am. Midl. Nat. **38**: 725-754.

- Sumida, S.S., Murphy, R.W. (1987): Form and function of the tooth crown structure in gekkonid lizards (Reptilia, Squamata, Gekkonidae). *Can. J. Zoolog.* **65**: 2886-2892.
- Van Damme, R., Vanhooydonck, B. (2002): Speed versus manoeuvrability: association between vertebral number and habitat structure in lacertid lizards. *J. Zool.* **258**: 327-334.
- Wellborn, V. (1933): Comparative osteological examinations of geckonids, eublepharids and uroplatids. Translated by Russel A.P., Bauer A.M., Deufel A. Herpetological Translations, 1. Breck Bartholomew, Bibliomania!
- Yaryhin, O., Klembara, J. (2015): Different embryonic origin of the basipterygoid process in two species of *Lacerta* (Squamata: Lacertidae). *Biologia* **70**: 530-534.
- Young, L.R., Caputo, V., Giovannotti, M., Kohlsdorf, T., Vargas, A.O., May, G.E., Wagner, G.P. (2009): Evolution of digit identity in the three-toed Italian skink *Chalcides chalcides*: a new case of digit identity frame shift. *Evol. Dev.* **11**: 647-658.