***Poster***

Mosasaurids from the Maastrichtian phosphates of Morocco:

an extraordinary ecological diversity prior to the K/Pg crisis

**Nathalie Bardet1, Valentin Fischer2, Nour-Eddine Jalil1, Fatima Khaldoune3, Oussama Khadiri Yazami3, Xabier Pereda Suberbiola4 & Nicholas Longrich5**

1CR2P Centre de Recherche en Paléontologie - Paris, CNRS / MNHN / SU, CP 38, 57 rue Cuvier, 75005, Paris, France, email: [nathalie.bardet@mnhn.fr](mailto:nathalie.bardet@mnhn.fr), nour-eddine.jalil@mnhn.fr; 2Evolution & Diversity Dynamics Lab, UR Geology, Université de Liège, Quartier Agora, Allée du 6 Août, 14000, Liège, Belgium, email: v.Fischer@uliege.be; 3Office Chérifien des Phosphates, Khouribga, Morocco, email: [KHALDOUNE.Fatima@ocpgroup.ma](mailto:KHALDOUNE.Fatima@ocpgroup.ma), O.KHADIRIYAZAMI@ocpgroup.ma; 4Departamento de Geología, Facultad de Ciencia y Tecnología, Universidad Del País Vasco/Euskal Herriko Unibertsitatea, Apartado 644, Bilbao, Spain, email: xabier.pereda@ehu.eus; 5Department of Biology and Biochemistry, University of Bath, Claverton Down, BA2 7AY, Bath, United Kingdom, email: nrl22@bath.ac.uk

In the fossil record, mosasaurid teeth are both very abundant and usually species-specific, allowing the documentation of both taxonomic diversity and ecological disparity of this group with fewer uncertainties than in other marine reptiles.

With sixteen mosasaurid species described so far, representing a wide range of sizes and morphologies,the upper Maastrichtian phosphates of Morocco undoubtedly represent the richest deposits in the world for this emblematic clade of Mesozoic predators (e.g., Bardet *et al*., 2015; Longrich *et al*., 2022; MacLaren *et al*., 2022).

Up to now, methods used to link tooth morphology to diets of marine amniotes, such as the one employed by Massare (1987), were essentially **qualitative**. Here, using dental morphologies of most of the Moroccan species, we combine two complementary approaches, namely a thorough comparative anatomy and high-density 3D geometric morphometry (Fischer *et al*., 2022), so as to determine **quantitatively** the dietary preferences, shape diversity and niche partitioning of these apex predators in the local marine ecosystem, just prior to the Cretaceous-Paleogene (K/Pg) extinction event.

Similar to elsewhere in other regions across the globe, our results show that the Mosasaurinae constitutes the dominant clade in the local assemblage, exhibiting both the greatest systematic diversity (i.e., two-thirds of all taxa represented), the widest range of morphology and size (two to 15 m in overall length) and ecological disparity, reflected by an occupation of all ecological guilds as defined by Fischer *et al*. (2022): durophages, generalists, flesh cutters and flesh piercers*.* Plioplatecarpines were less diverse, medium-sized predators. The two local halisaurines exhibit the same dental shape, but vary greatly in tooth size (ratio 1:2) and cranial morphology, confirming the hypothesis put forward by Fischer *et al*. (2022) that tooth size is of importance in assessing diet. Noteworthy, durophagous taxa remain unknown within these two non-mosasaurine clades. Tylosaurinae are known only by a very large, generalist taxon. As observed elsewhere, tylosaurines were probably replaced by mosasaurines as apex predators during the Maastrichtian (e.g., MacLaren *et al.*, 2022).

As a whole, mosasaurids were both systematically highly diverse – and still diversifying during the latest Maastrichtian – and ecologically disparate, through niche-partitioning in the shallow-marine environment represented by the uppermost Cretaceous phosphates of Morocco. This high diversity and disparity just prior to the K/Pg biological crisis suggest that their extinction was rather sudden.

**REFERENCES**

**Bardet, N., Houssaye, A., Vincent, P., Pereda-Suberbiola, X., Amaghzaz, M., Jourani E. & Meslouh, S., 2015.** Mosasaurids (Squamata) from the Maastrichtian phosphates of Morocco: biodiversity, palaeobiogeography and palaeoecology based on tooth morphoguilds. *Gondwana Research*, 27: 1068-1078. <https://doi.org/10.1016/j.gr.2014.08.014>

**Fischer, V., Bennion, R.F., Foffa, D., MacLaren, J.A., McCurry, M.R., Melstrom, K.M. & Bardet, N., 2022.** Ecological signal in the size and shape of marine amniote teeth. *Proceedings of the Royal Society,* B289: 20221214. <https://doi.org/10.1098/rspb.2022.1214>

**Longrich, N.R., Jalil, N.-E., Khaldoune, F., Yazami, O.K., Pereda-Suberbiola, X. & Bardet, N., 2022.** *Thalassotitan atrox*, a giant predatory mosasaurid (Squamata) from the Upper Maastrichtian Phosphates of Morocco. *Cretacecous Research*, 140: 105315. <https://doi.org/10.1016/j.cretres.2022.105315>

**MacLaren, J.A., Bennion, R.F., Bardet, N. & Fischer, V., 2022.** Global ecomorphological restructuring of dominant marine reptiles prior to the Cretaceous-Palaeogene mass extinction. *Proceedings of the Royal Society* B289: 20220585. <https://doi.org/10.1098/rspb.2022.0585>

**Massare, J.A., 1987.** Tooth morphology and prey preference of Mesozoic marine reptiles. *Journal of Vertebrate Paleontology*, 7: 121-137. <https://doi.org/10.1080/02724634.1987.10011647>