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# On the global relationships between vertebrate evolutionary history and productivity

Wilfried Thuiller\*<sup>1</sup>, Florent Mazel , Tamara Münkemüller , Laura Pollock , and Dominique Gravel

<sup>1</sup>Laboratoire d'écologie alpine (LECA) – CNRS : UMR5553, Université Joseph Fourier - Grenoble I, Université de Savoie – bat. D - Biologie 2233 Rue de la piscine - BP 53 38041 GRENOBLE CEDEX 9, France

## Abstract

Despite a broad consensus that biodiversity increases towards the equator, with temperature and precipitation, there is no consensus on the underlying mechanisms. While species richness tells about the contemporary mechanisms of coexistence, it is still unknown to what extent local species richness is constrained by regional species richness. The challenge arises from multiple hypotheses making the same predictions. It is possible however that the investigation of multiple aspects of the distribution of evolutionary history solves this issue. Importantly, at biogeographical scale, phylogenetic diversity tells us a lot about the diversification processes responsible for the regional species pool. Here, we analyse how phylogenetic diversity and species-level diversification rates of all mammals, birds and amphibians relate to primary productivity at global scale. We show that the evolutionary history of the three groups is strongly influenced by primary productivity but they differ in their response. For amphibians, highly productive sites do contain close relatives, while the most distinct and diversifying species are mostly in North America, Europe and Australia. For birds and mammals, there is a lower than expected species-level diversification rate in high productivity sites. We hypothesize that regional density-dependence diversification with early filling of ecological space by ancient radiations in their regions of species origin might have produced this relationship. Low productivity areas with high diversification rates are instead characterised by strong climatic fluctuations from the Pliocene to the present suggesting that past climate dynamics has had a major role for today's diversity patterns.

**Keywords:** Macroecology, diversification rates, phylogenetic diversity, mammals, birds, amphibians, global scale

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\*Speaker