**Changes in the taxonomic, phylogenetic, and functional diversity of gypsum lichen communities across an environmental gradient**

Key words: Biological Soil Crust; Iberian Peninsula; Trait; Climatic; Latitudinal gradient; Gypsiferous; Arid; Terricolous.

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Assessing how taxonomic (TD), functional (FD) and phylogenetic (PD) diversities change along environmental gradients may help us to understand the response of biological communities to environmental variation. These biodiversity facets do not necessarily relate to each other and may have contrasting effects on ecosystem functioning. Disentangling the variation of interplay among the 3 diversities (TD, PD, FD) along natural gradients may contribute to our understanding of community assembly processes. Despite the advances in the study of Biological Soil Crusts (BSC), little is known about the relation between the three biodiversity facets. Here we evaluate how biotic and abiotic variables shape taxonomic, functional and phylogenetic diversities in gypsum lichen communities along an environmental gradient in the Iberian Peninsula. We used species composition and cover, trait data and phylogenetic data to calculate taxonomic, functional and phylogenetic diversity indices at community level including 35 plots surveyed. In order to characterize TD, lichen species richness, Shannon and Inverse Simpson diversity indices were calculated. Regarding FD, several qualitative and quantitative functional traits were chosen (e.g. water holding capacity (WHC), specific thallus mass (STM), chlorophyll content, growth form, photobiont, thallus color, ) in order to calculate the community weighted mean (CWM) and Rao’s quadratic entropy index (Rao). We constructed a phylogenetic tree with all lichen species to calculate the CWM and Rao indexes for the PD. We evaluated the effect of different variables related to climate and local scale factors in order to assess the response of taxonomic, functional and phylogenetic community diversity to these variables.