**Lichen functional diversity as early-warning indicators of global change in Mediterranean drylands**

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As a result of global change, dryland ecosystems may change non-linearly, meaning that beyond a certain pressure the ecosystem may undergo a sudden change towards another alternative state. These abrupt and potentially irreversible transitions are expected to increase in Mediterranean ecosystems, so current research is now focusing on detecting the early signs that could indicate if a critical threshold is approaching. Despite the progress in research during the last decade, no early warning indicators were yet developed, mostly, because forecasting the early-signs of critical transitions is extremely difficult as it implies traditionally large amounts of data and long-time data series. The solution to overcome this problem could be the use of pattern of change over space as a surrogate of the temporal changing patterns in ecotones (transition areas between adjacent biomes), as these are also the ones most likely to show the first early signs of change.

It is currently accepted that these early-warning indicators should be based on the overall response of ecosystems as indicators. Functional diversity has been given promising results in this field; however most of these works focus on plants while those of other organisms remain unknown. Lichens are amongst the ecosystem components more sensitive to changes, and could fulfil that role. They have been used as ecological indicators, early-warning systems and recent works suggest that they respond to global warming.

Our research concept is that lichen functional diversity can be used as a universal early-warning indicator of global change in Mediterranean drylands. This work will allow us to early detect the signs of climate change and to map risk areas. Our work has been focusing on a desertification gradient within the transition between dry-subhumid and semi-arid, but because this is a functional approach, this tool has the potential to be universal. Thus, additional work is being done in other ecotonal transitions in other parts of the world so it can be validated to other regions and used worldwide in a comparable way. This tool will be highly important to the identification of areas in risk of global change to timely predict and develop strategies to avoid these critical transitions.

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