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CREATING YOUR OWN ENVIRONMENT: ECOSYSTEMS SUSTAINED BY CUSHION PLANTS

Gianalberto Losapio

Study description

A cardinal notion in ecology is that the environment influences biological populations. Yet, organisms have the power to create and modify their surrounding environment, in turn influencing other populations and ecosystem processes. Using mountain plant communities and flower visitor networks as a case study, we developed an empirical approach to quantify changes in ecosystem functioning due to ecosystem engineers and associated biodiversity. Our results show how facilitation and complementarity effects between plants increase ecosystem functioning across trophic level. We also reveal a novel mechanism underlying the consequences of biodiversity change and the constructive impact of biological populations on their environment.

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Photo 1: Mountains such as the Spanish Sierra Nevada are biodiversity hotspots teeming with endemic species. At high altitude (3200 m asl), these environments are sustained by cushion plants. Photo credit: Gianalberto Losapio.



Photo 2: Ecosystem engineers *Arenaria tetraquetra* (left) and *Hormathophylla spinosa* (right) can tolerate stress, ameliorate the environment and facilitate other plant species. Photo credit: Gianalberto Losapio.



Photo 3: The cushions of *Arenaria tetraquetra* hosts different blooming plants such as *Jasione amethistina, Lotus corniculatus* subsp. *glacialis, Galium pyrenaicum, Anthyllis vulneraria* subsp. *pseudoarundana*, *Leontodon boryi*, and *Nevadensia purpurea.* Photo credit: Gianalberto Losapio.



Photo 4: The flower visitor network is characterized by more than 50 species of insects. These include the cosmopolitan honeybees (*Apis mellifera*), which moved at high altitude for foraging on flowers of *Sideritis glacialis*. Photo credit: Gianalberto Losapio.



Photo 5: Not all the insects visiting flowers are actual pollinators, but they are also predators, parasitoids, or herbivores, like the weevils *Otiorhynchus* (Curculionidae). This way, cushion plants enrich also the functional diversity and complexity of insect communities. Photo credit: Gianalberto Losapio.

These photographs illustrate the article "An experimental approach to assessing the impact of ecosystem engineers on biodiversity and ecosystem functions" by Gianalberto Losapio, Bernhard Schmid, Jordi Bascompte, Richard Michalet, Pierfilippo Cerretti, Christoph Germann, Jean-Paul Haenni, Rainer Neumeyer, Francisco Javier Ortiz-Sánchez, Adrian C. Pont, Pascal Rousse, Jürg Schmid, Daniele Sommaggio, and Christian Schöb in *Ecology*. https://doi.org/10.1002/ecy.3243