Some plants in arid regions benefit from climate change, study finds

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Arid regions are sensitive to climate change. However, some plants seem to benefit from the extreme living conditions and even thrive. © Roberto Salguero-Gómez

(Phys.org)—Dryland ecosystems cover 41% of the Earth's land surface. These ecosystems are highly vulnerable to global environmental change and desertification. But climate change seems to have a positive impact

on some plants. A study involving the Max Planck Institute for Demographic Research in Rostock has come to this conclusion.

Using demographic methods, ecologist Roberto Salguero-Gómez investigates desert plants to find out how vulnerable they are to climate change. The results of his newest study are surprising: Climate change may have a positive impact on some plants.

Climate models used by scientists to forecast the effect of climate change on the various ecosystems predict a bleak future for these regions: temperatures will rise, there will be less rain, and it will rain more erratically – all conditions seemingly unfavorable to plants.

To measure the impact of climate change on the dynamics of plant populations, researchers to date have mostly worked with average values, such as average temperature or average rainfall. "This is a method commonly used, but it cannot be applied to desert plants", says researcher Roberto Salguero-Gómez of the Max Planck Institute for Demographic Research.

Dryland plants cannot really be compared to plant species growing in other latitudes, where weather conditions are fluctuate less. Dryland plants have adapted to the extreme climatic conditions of arid regions in the course of evolution, even under conditions of no climate change, and they benefit from it.

Scientists at the Max Planck Institute for Demographic Research investigating the desert vegetation with unusual methods. © Roberto Salguero-Gómez

Some plants produce dormant seeds in years of heavy rainfall. The seeds of other plant species have something like a sensor to detect the level of rainfall: not enough rain drops falling to secure their life until they reproduce and they will not germinate. A lot of rain after years of drought, and they start to grow. The advantage is that many other plant species - competitors for space - have a low drought tolerance and this has thinned out the total population, freeing up space where individuals, who have waited for the big rain, can spread.

"Using average precipitation values to predict plant population dynamics does not correspond to the physiology of these plants, a physiology that is unique", sums up Roberto Salguero-Gómez.

It is for this reason that he, together with his colleagues Wolfgang Siewert and Katja Tielbörger (University of Tübingen) and Brenda Casper (University of Pennsylvania) have looked anew at two long-term studies that documented the population size of two desert plant species, one each in the USA and Israel, over a number of years.

Based on the data of these studies, a climate model and a demographic calculation method, the researchers have developed a new model that provides insights into the future dynamics of plant populations. The results, recently published in the scientific journal Philosophical Transactions B of the Royal Society of London, are astounding: Changing weather conditions do not seem to harm the population of these plants; quite to the contrary, they seem to benefit from it. "The plants adapt quite well", says Roberto Salguero-Gómez. They seem to have a sizeable buffer to adapt to climate change."

It is of great important to continue to observe and investigate these dynamics, he stresses, for example to assess which measures are best suited to alleviate poverty in the long run and where to apply them. Most dryland areas are located in the poorest regions of the world, i.e. Africa, Central Asia, and South America. Many people living there have to make a living from the scarce resources these barren regions offer. And there will be more of them as, undoubtedly, the share of dryland will increase due to climate change, desertification and other human-driven activities. It is thus all the more important to assess what impact climate change will truly have on plants that serve as food for people and livestock in these areas.

More information: Fernando T. Maestre, Roberto Salguero-Gómez, Impacts of global environmental change on drylands: from ecosystem structure and functioning to poverty alleviation, *Philosophical Transactions of the Royal Society B: Biological Sciences*, rstb.royalsocietypublishing.or … /2012/drylands.xhtml

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