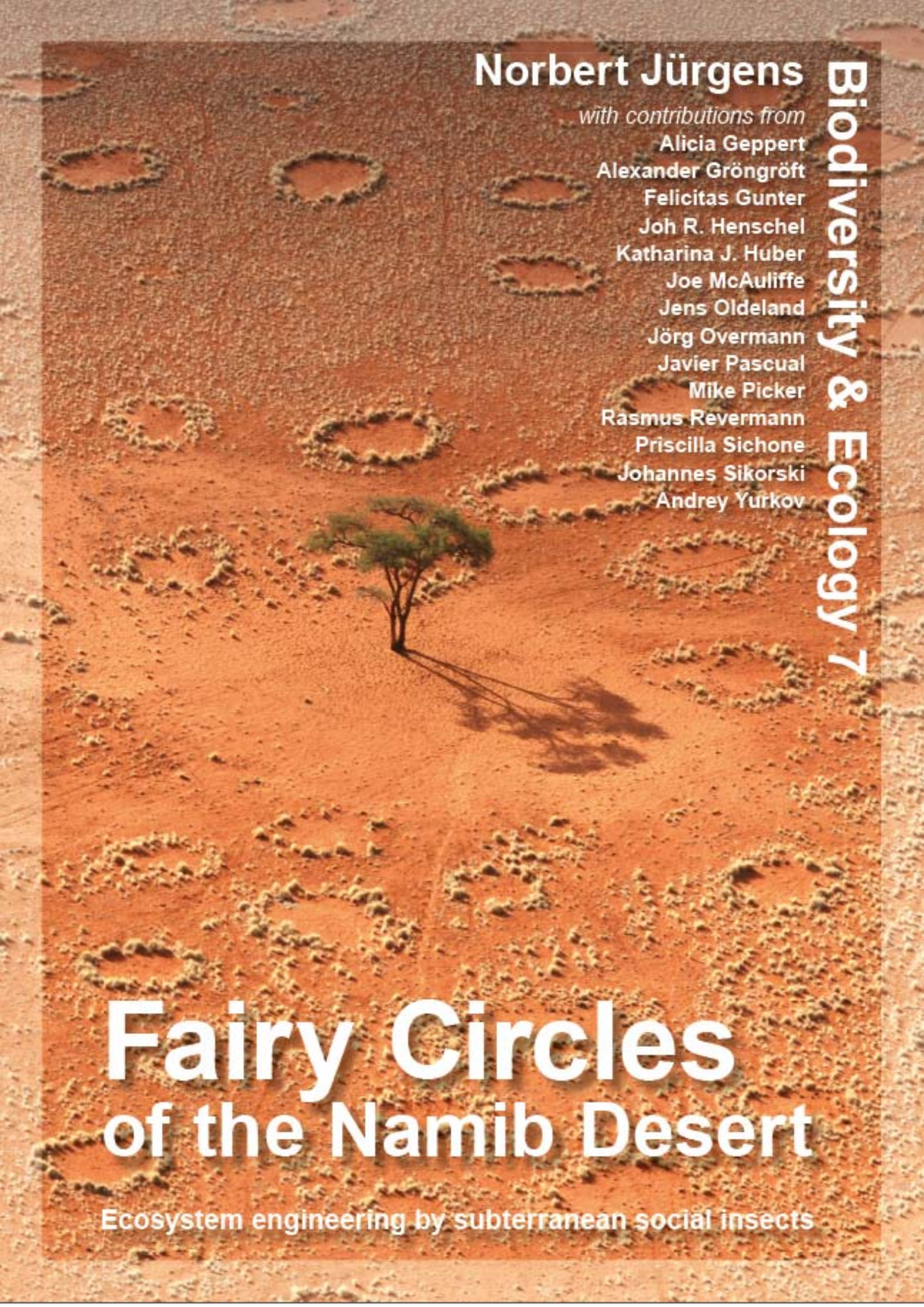

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Biodiversity & Ecology 7

Fairy Circles of the Namib Desert

Ecosystem engineering by subterranean social insects

Abstract

On the eastern edge of the Namib Desert—probably the oldest continuous desert in the world—millions of ochre-coloured bare patches in the grass have created landscapes of unique beauty that are often regarded as one of the greatest mysteries in ecology: the fairy circles of the Namib Desert.

Building on more than four decades of ecological research in all parts of the Namib in Angola, Namibia, and South Africa, the authors here present the natural history of the phenomenon, with all the facts understood so far, and also describe the remaining open questions.

In the Namib Desert, sand termites from soil-dwelling termite families have been found to cause the fairy circles. These termites must be understood as ecosystem engineers that—comparable to the beavers in rivers of the northern hemisphere—profoundly alter the landscape and make permanent life in the desert possible.

The termites create the bare spots in the vegetation through localized herbivory, with the ecological effect that subsequent rainfall is not immediately absorbed and transpired by plants. Instead, the sandy soils in the open spots allow rapid percolation of the rainwater to soil depths below 50 cm, where water remains stored even during prolonged periods of drought. This water storage enables the termites to live permanently even in dry climatic zones with less than 100 mm of annual precipitation. At the same time, numerous other animals and plants benefit from these underground water resources.

Although water and fresh plant biomass are the main attraction, several animals also use the termites as a source of food. The most notable predator is the aardvark, but the list also includes several carnivorous and omnivorous ants, which are eaten in turn by spiders, ant lions, reptiles, birds, and many other members of a diverse food web.

The termite nest within the fairy circles contains a special microbiome on its own, which involves various bacteria and fungi some of which produce organic and inorganic gases such as methane.

A comparative look beyond the Namib Fairy Circles shows that also other social insects are important and often underrated ecosystem engineers and produce similar phenomena within the Namib Desert and in other climates.

However, the fairy circles of the Namib Desert are probably the most astounding and efficient product of adaptation to extreme aridity. The sand termites manipulate the local topsoil hydrology and thereby turn an ephemeral desert into a permanently habitable grassland.