Perspectives in Ecology and Conservation 15 (2017) 245–247

ABECO ASSOCIAÇÃO BRASILEIRA DE CIÊNCIA ECOLÓGICA E CONSERVAÇÃO

Perspectives in ecology and conservation

Supported by Boticário Group Foundation for Nature Protection

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Editorial – Rewilding South American Landscapes

Challenges and opportunities for rewilding South American landscapes

The rampant extinction of many animal species caused by human interventions has led many conservation biologists to propose the creation of large protected parks, and the listing and protection of rare and threatened species. The setting aside of spaces and species are the two main classical approaches of biological conservation. Each serves a compositionalist view, such that some components (species) are protected everywhere, and all components (species) are protected in some places (Jepson, 2016). Species protection focuses on population levels, and space protection focuses on species composition maintained within that space. Although these strategies have been important for deterring species extinction, there is an increasing necessity to restore not only the components, but the functional interactions between the components of those ecosystems (Valiente-Banuet et al., 2015).

Most of the world's ecosystems are impoverished, missing globally or locally extinct species, particularly large bodied vertebrates (Dirzo et al., 2014; Faurby and Svenning, 2015; Ceballos et al., 2017). We still know little about the ecological and evolutionary consequences of megafauna extinction (Galetti et al., 2017).

One strategy to revert the loss of functionality of natural ecosystems is to re-introduce former extinct species (*reintroduction* or *refaunation*), to introduce ecological analogues (*rewilding*) or even try to revive extinct species (*de-extinction*) (Table 1). The term rewilding has faced much controversy primarily because of an early focus on the goal of recovering Pleistocene ecosystems (Galetti, 2004; Donlan, 2005; Zimov, 2005; Donlan, 2005). Rewilding, however, goes beyond restoring ecosystems to how they were in the Pleistocene. The science of rewilding today has much broader implications. There has been a call to focus research on understanding top-down trophic interaction dynamics of reintroducing species ("trophic rewilding") to fulfil lost ecological processes (Svenning et al., 2016; Galetti et al., 2017). Top-down trophic and associated bottom-up trophic as well as non-trophic impacts, such as disturbance, nutrient cycling, or seed dispersal, have become lost or reduced due to historic and prehistoric defaunation and constitute important impacts of many keystone and ecosystem engineering species (Doughty et al., 2016a,b).

In Europe, rewilding projects have increased enormously in recent years, especially in the United Kingdom, the Netherlands, and Denmark, but also Eastern and Southern Europe, focusing mainly on the reintroduction of large and medium sized herbivores such as beavers, wild boar, bison, moose, and primitive horse and cattle breeds (e.g., Jepson, 2016). South America, one of the continent most strongly hit by the prehistoric end-Pleistocene-early Holocene megafauna extinctions (Fariña et al., 2013), is still facing rapid Anthropocene defaunation (Jorge et al., 2013). In addition, large parts of South America are experiencing land change and abandonment. These conditions suggest that rewilding has much scope as an approach to biodiversity conservation and land management in South America. Despite the big scope, rewilding projects and debate are still in their infancy in South American contexts.

In this Special Issue, a series of papers, both theoretical and practical, present new information and experiences for the debate of rewilding. Svenning and Faurby (2017) provide historically-informed base-lines for trophic rewilding in the Central and South America and discuss the implications, highlighting the need for a more nuanced view on non-native megafauna species as they may sometimes represent taxon substitutes for missing species, while emphasizing that rewilding should be implemented flexibly and in dialogue with society, e.g., handling human-wildlife conflicts and ensuring benefits for local livelihoods. Following this theoretical discussion, Pires (2017) presented a novel approach on how ecological network model can help in rewilding projects. Another important discussion on rewilding theory is that rewilding is the consideration of particular models of conceiving, implementing and managing rewilding projects that fit the social and cultural realities of the different regions within South America (Root-Bernstein et al., 2017). The various cosmologies, land use practices, traditional resource uses, etc. of indigenous peoples of South America should also be considered in the development of ideas about what rewilding is for, what it aims to achieve, and how it can do this (Root-Bernstein et al., 2017). For the practical point of view, rewilding information has proven to be an effective strategy to restore important ecological processes, particularly in highly fragmented landscapes (Fernandez et al., 2017; Sobral-Souza et al., 2017; Root-Bernstein and Svenning, 2017; Zamboni et al., 2017) and can be important to recover some declining populations (Campos-Silva et al., 2017).

https://doi.org/10.1016/j.pecon.2017.10.002

Table 1
Definitions and a time sequence of terms used in animal restoration.

Year	Concept	Author
1832 (1987)	Reintroduction is the intentional release a species into part of its native range from which it has become extirpated in historic times as a result of human activities or natural catastrophe	Wilson (1832)
1987	Reinforcement is addition of new individuals to a small population	IUCN (1998)
1991	Defaunation is the functional, local or global extinction of species or populations of animals	Dirzo and Miranda (1991)
1992	Empty forest is a state of a natural community (forest) with no or few large mammals and large birds	Redford (1992)
1998	Rewilding is the restoration of large areas based on regulatory roles of large predators	Soulé and Noss (1998)
2004/2005	Pleistocene Parks is management strategy to introduce extant herbivores (domestic or wild) that could function as ecological analogue of extinct Pleistocene megafauna in fenced zones.	Zimov (2005)
2005	Pleistocene rewilding is the similar of Pleistocene parks in non-fenced zones.	Donlan (2005)
2010	Refaunation is the restoration of populations of extant species to their original distributions.	Oliveira-Santos and Fernandez (2010)
2013	De-extinction is the technique to bring back extinct species, such as mammoth, passenger pigeon. It is more focused on species than on ecological processes.	Sherkow and Greely (2013)
2016	Trophic rewilding is the use of species introductions to restore top-down trophic interactions and associated trophic cascades to promote self-regulating biodiverse ecosystems.	Svenning et al. (2016)

We believe that the information presented in this special issue will bring attention and opportunities for rewilding South American landscapes, from horses that were an integral part of South American ecosystems for several millions of years and are back again to the Americas (Naundrup and Svenning, 2015; Lundgren et al., 2017) to more easily accepted rewilding projects, such as agouti reintroduction (Fernandez et al., 2017), or even top predators (Zamboni et al., 2017), to more audacious rewilding projects with megafauna in fenced parks (Galetti, 2004). Trophic rewilding has the potential to become important strategy for biodiversity conservation and ecological restoration in South America. The research and the experiences from the papers presented here bring important contributions to developing the practice and science of trophic rewilding in this region as well as more generally.

Acknowledgements

We want to thank all reviewers and authors that could make this special issue possible. M.G. and J.-C.S. thank the Aarhus University Research Foundation for a guest researcher grant to sponsor M.G. at Aarhus University. J.-C.S. considers this work a contribution to his Carlsberg Foundation Semper Ardens project MegaPast2Future (CF16-0005) and to his VILLUM Investigator project 'Biodiversity Dynamics in a Changing World' funded by VILLUM FONDEN. MG is also funded by CNPq and FAPESP.

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19 October 2017
Available online 1 November 2017