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# Naturally low biodiversity is getting a raw deal in the media

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While media usage has helped biodiversity gain a central spot in the contemporary conservation landscape, it is acknowledged that high biodiversity in itself is not always the best indication of conservation value. There are multiple reasons why low-biodiversity systems have to be valued. Such systems are easier to appreciate by the general public in their entirety, and also easier to study, with most model systems referring to low numbers of species. In remote and environmentally harsh settings, biodiversity can increase *via* biological invasion, which is usually perceived as a negative anthropogenic impact. Island systems, typically lower in biodiversity compared to continental settings, are, specifically thanks to the available niche space, laboratories of speciation and potentially macroevolutionary innovation. Although biodiversity hotspots are at the centre of global conservation efforts, coldspots have their own dynamics and conservation needs, generally poorly understood at this stage due to the high-biodiversity focus. Here, I discuss the media relevance and, where applicable, distortion, of these aspects. I conclude by recommending a local rather than global focus in the marketing of conservation, which could encourage an appreciation of naturally low biodiversity.

## KEYWORDS

**biodiversity coldspots, biodiversity hotspots, biological invasions, island biogeography, polar ecosystems, terraformation**

## Introduction

Biodiversity is not a particularly old word. It was coined as recently as 1986, for the specific purpose of making the older phrase “biological diversity” more marketable – primarily in the mass media (Collins and Kephart, 1995). Since, it has seen rapid growth in usage, both in scientific publications and in the media itself (Wilson et al., 2007; Legagneux et al., 2018), and has become the primary bridging term between conservation research and public perception (Norton, 2008). There is little doubt that the ways in which the term has been used in these two spheres are interdependent. This interdependence has not been limited to science promotion, also involving related but distinct aspects such as dialogue and science legitimation (Hellsten, 2002).

The undeniable appeal of the idea of biodiversity to the general public has to do with the hope for preserving nature in all its complexity, whether we perceive ourselves as intrinsic or extrinsic to it. This appeal is likely to have obscured some of the technical details, as is often the case in science communication (Weber and Word, 2001). The extrinsic view of humans' place may have the upper hand in numerous contexts, with human-related actions being generally perceived as negative, often in the form of reducing biodiversity (Hellsten, 2002). In this respect, confusing situations whereby humans artificially inflate biodiversity are generally omitted.

## The cold and the alien

Recently, two distinct yet interconnected aspects involving pristine systems with low or no biodiversity have emerged that are filtering into the media. The first of these has to do with biological invasions, and before reaching the point where we can explore how these affect low-biodiversity systems, it is worth mentioning the narratives attached to this phenomenon in general. The naturalisation of plant and animal species from other world regions has been a hot topic in ecology since Elton (1958), and increasingly so as the process itself is becoming more pervasive across diverse ecosystems (Bradley et al., 2012). The growth of the scientific literature on biological invasions has been accompanied by a whole range of popular treatments, reflecting both the overwhelming research angle that highlights primarily the negative impacts of alien species on an ecological and economic level (Anthonry, 2017; Wilcox, 2021), and alternate views (Thompson, 2014; Pearce, 2015), largely dismissed in scientific circles (Ricciardi et al., 2017). While the scientific community, primarily quantitative in its approach, claims the methodological upper hand, the scarcity of qualitative approaches in invasion biology creates a gap between itself and public perception (Kapitza et al., 2019), which opens the latter to alternative views.

The impact of biological invasions on biodiversity is mainly portrayed in both the media and scientific literature in the form of the resulting species extinctions; however, the most immediate and obvious aspect of an alien species becoming naturalised is that one species has been added to the recipient region/ecosystem. That regions which are naturally more diverse are likely to receive more alien newcomers has been long known (Stohlgren et al., 2003). However, an increase that is proportionally more substantial is seen in regions that are naturally species-poor. Highly relevant to popular perceptions, and well reflected in both popular and scientific writings, this lies at the intersection of two anthropogenic processes: global warming and the increased transport of species, and is best illustrated by invasions in polar ecosystems (Miller and Ruiz, 2014; McGeoch et al., 2015; Ricciardi et al., 2017). Such ecosystems were naturally unable to sustain a great diversity of

life in their characteristic conditions, but are starting to do so as the ice melts, creating conditions for a variety of biotas.

A second, even more radical angle on species introduction by humans is the potential terraformation of other heavenly bodies. Unlike biological invasions on Earth, this aspect is still very thinly represented in the scientific literature (e.g. Beech et al., 2021), and far more so in the media. The long-term human survival angle, in the event of catastrophe on Earth, should certainly help with enlisting a large proportion of the readership in favour of terraformation (Harmsen, 2021), even though this represents a flagrant case of altering the natural state of affairs. In 2018, Zahaan Bharmal of *The Guardian* went as far as placing biotic contamination at the top of the list of reasons against colonizing Mars (Bharmal, 2018). Nevertheless, opinions to the contrary abound, to the point where the majority of American adults are now in favour, at the very least, of a human mission to the Red Planet (McCarthy, 2019). Practically all countries that could attempt the terraformation of Mars or any other planet have in fact signed and ratified the Outer Space Treaty, regulating (amongst others) aspects relevant to planetary protection. These include forward protection, that is, preventing biological contamination of other planets with Earth life forms (US National Research Council 2006), and back protection, in the idea that life may exist elsewhere and present risks of contaminating the Earth itself.

Polar and extra-terrestrial settings are in fact in some respects similar enough to refer to one when studying the other (Cassaro et al., 2021). Media reports for biodiversity impacts in both of these settings are likely to elicit mixed responses, by contradicting the prevailing biodiversity paradigm [many species = good; few species/no species = bad]. The oversimplification that such a paradigm involves has been highlighted before. For example, in his 2007 book "The Revenge of Gaia", James Lovelock pointed out, as part of a medical allegory aimed at our planet's health, that a "rich biodiversity is not necessarily highly desirable and to be preserved at all costs" (Lovelock, 2007). However, the multiple problems with over-marketing the term 'biodiversity' have not, to date, been unpacked in any great detail.

Here, I point out the fact that other metrics of conservation relevance are often conflated under the term 'biodiversity', I list a few reasons why low biodiversity should in fact be appreciated, and conclude by assessing what could be done to make these points more available and relevant to broad audiences.

## There are other measures employed in conservation

To the general public, conserving nature is essentially conserving biodiversity (Norton, 2008). To the conservation community, biodiversity in itself is far from being the only way of prioritising action, albeit many of the other metrics used to achieve this do, in fact, take biodiversity into account. From the early days when ecosystem function and services (Slocombe,

1998), biological integrity (Angermeier and Karr, 1994) and naturalness (Angermeier, 2000) came onto the scene, the conservation landscape has evolved along multiple lines, and has incorporated numerous metrics. While some of these should conceptually be as marketable as biodiversity, they are perhaps not as easily quantified, or the quantification process is not as easy to explain to the broader public – at least when compared to biodiversity in its classical species richness form. Other measures of biodiversity, such as trait/functional and phylogenetic diversity, are increasingly being employed in conservation. Each of these measures has its own global and regional patterns (Jetz et al., 2014; Freitas et al., 2021; Hughes et al., 2022), and conserving high biodiversity according to one is conserving low biodiversity according to another, but such differences may be too subtle, or the metrics too hard to explain to make for a good media story.

But even species numbers are not portrayed fairly in the media. The prevailing approach in e.g. wildlife documentaries remains one of labelling any form of life as ‘amazing biodiversity’, even in environments where the number of species is remarkably close to zero. In contrast, global biodiversity maps (Barthlott et al., 1996) have shown for a long time that both cold and dry environments tend to have lower species diversity compared to warm humid ones. More recently, the advent of global biodiversity hotspots – regions where high biodiversity meets high levels of threat (Myers et al., 2000) – has been countered by the observation that coldspots too, may be of some value (Kareiva and Marvier, 2003), and that places that are coldspots in some regards are hotspots in other ways. Recent studies show that coldspots have their own extinction dynamics, and so their own conservation needs (Le Roux et al., 2019). However, marketing low biodiversity as high biodiversity is well rooted in psychology.

## Numbers and perceptions

Even though biodiversity is commonly presented as being important to mental well-being, the human ability to intuitively estimate biodiversity is limited to small numbers, and one is actually more likely to perceive high tree cover, or other types of greenery, as biodiversity (Dallimer et al., 2012). While most studies illustrating this observation refer to city dwellers, it is in line with what has been termed the people-biodiversity paradox (Fuller and Irvine, 2010), and is probably a common human trait. Beyond a certain point, subjective estimates of biodiversity are influenced by attitudes towards specific regions or countries, often strongest towards one’s own country. For example, Fiebelkorn and Menzel (2019) found that both German and Costa Rican teachers overestimated their own countries’ biodiversity in global comparisons, while Chalmin-Pui and Perkins (2017) quote London Zoo visitors describing the UK

as a ‘desert of biodiversity’. Both of these studies also point out that respondents across countries would often (correctly, at least at species level) identify Brazil, or the Amazon specifically, as having the highest biodiversity globally. This potentially accurate stereotype of biodiversity associated with exotic settings is often reinforced visually in the media, *via* means that are in fact inaccurate.

Illustrations meant to portray biodiversity, from textbook covers sporting Rousseau Douanier canvasses or ethnic traditional illustrations (e.g. Rosenzweig, 1995) to screensavers of Alaskan pastures dotted with wildflowers, are in fact illustrations of low biodiversity, as the total number of species visible seldom exceeds a dozen. Most such visuals speak in fact of humans’ limited ability to perceive and process biodiversity beyond a certain point, except, that is, in numbers, which is an abstraction. It’s far easier to make a story out of peculiar examples of organisms with features unparalleled elsewhere.

## Absence makes the beak grow longer

Precisely because islands typically have lower biodiversity, island ecosystems are less niche-saturated than continental ones (Simberloff, 2000). They typically have fewer species, but these are often remarkable ones, with traits like no others. One example are the Hawaiian honeycreepers – essentially finches that took advantage of the absence of specialised nectar-sipping birds on those islands, and so became exactly that by growing their beaks to fit the purpose (Lerner et al., 2011). Similar things happened with overall body size (the so called ‘island rule’) – as animals reach islands, they evolve towards filling those niches that are both feasible and empty (Benítez-López et al., 2021). Flores Island in Indonesia was (and in some cases still is) the home of dragons, giant rats, pygmy elephants and hobbit-like humans (Meijer et al., 2010). Islands can in fact create new combinations of traits found nowhere else, with the potential of driving macroevolutionary change. Think flightless cormorants and marine iguanas, as in the Galapagos Islands. All this is possible because some entire groups of animals are in fact missing, which is one aspect of low biodiversity. At the regional scale, places such as Australia, New Zealand and Madagascar preserve unique sets of biotas, largely due to the absence of more competitive groups (Procheş and Ramdhani, 2013).

Islands have, both *via* the occurrence of such unusual innovations, and by their very low-biodiversity simplicity, been key to our contemporary understanding of ecological and evolutionary processes (Quiroga and Sevilla, 2017). In mainland settings, studies in these fields have initially had to limit themselves to studying a few species to gain critical insights (Gause, 1934), thus essentially replicating low-biodiversity systems.

## The way forward

To summarise, unlike what many nature documentaries tend to suggest, biodiversity is not remarkably high in all-natural systems. On the other hand, even in diverse systems like rainforests and mediterranean shrublands, one can focus on manageable groups, as relevant to the questions and initiatives at hand, and use them as flagships. But to showcase the lower end of the biodiversity spectrum, it may be a good idea to use a concept that can help us accept that a few species may just be all we can understand and love, and in many places, all there should really be. How would such a concept look? Is there an antonym to biodiversity? The term ‘bio-paucity’, has already been used in a handful of instances (e.g. Goulson, 2019), most often with a negative connotation. It may be hard to turn it into a positive, marketable concept. Perhaps the phrase ‘naturally low biodiversity’, abbreviated as NLB, could fare better. Some research into how this would be received on different social scenes would be more than welcome.

A second line of action would be to focus on marketing biodiversity locally more than globally. This would allow local communities to associate with the level of biodiversity naturally occurring in their setting, rather than having to either artificially inflate local values, or feel inferior in global comparisons. The transition from global to local may have to start with human geography research, but would ultimately have to end in the hand of educators and journalists, and increasingly so, of the social media. How influencers choose to address this matter will be critical, and providing them with a reliable set of facts is the place to start.

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## Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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## Conflict of interest

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