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Lessons from the WBF2020: extrinsic and intrinsic value of soil organisms

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Abstract

Following our participation in the first World Biodiversity Forum in Davos, Switzerland, we provide a summary of the main themes of the conference, as well as an overview of the session that was focused on soil biodiversity. One of the main themes of the conference was the valuation of biodiversity and what contributes to the value of biodiversity. In this article we explore whether we should move away from the notion that we can only 'sell' soil biodiversity based on the function and services it provides, and rather shift towards valuing soil biodiversity based on its intrinsic value and our relationship with it.

Keywords World Biodiversity Forum | ecosystem functions and services | intrinsic value | valuing soil biodiversity

The World Biodiversity Forum

In late February 2020, over five hundred people gathered in Davos, Switzerland, for the first ever World Biodiversity Forum (Figure 1A). The naming and location of the conference intentionally invokes reference to the World Economic Forum held a few weeks earlier in the same place, with the forward-thinking intention that the two meetings would be more closely dovetailed in the future. The goal of the World Biodiversity Forum was to evaluate the agenda for biodiversity as a focal topic for the next ten years, whilst providing space and opportunity for participants from different disciplines to meet and exchange ideas.

The idea for the conference stemmed from an initiative formulated by scientists of the Future Earth Global Research Programme bioDISCOVERY (https://futureearth.org/networks/global-research-projects/biodiscovery/) and the University of Zurich Research Priority Program 'Global Change and Biodiversity' (https://www.gcb.uzh.ch/en.html), who believed that progress toward positive change could be propelled by bringing together people from divergent sectors of knowledge (societal actors, academic disciplines, biogeographic regions) to present research and discuss progress around four major themes: 1) changing biodiversity, 2) values and concepts of biodiversity, 3) future of biodiversity, and 4) impact and implementation of biodiversity concepts. The program included a series of keynote lectures, shorter presentations, interactive panels, a House of Commons style debate (Figure 1B), and several workshop style discussion groups. Collectively, participants evaluated what kind of future they foresee, and what kind of future they want for the diverse lifeforms that share our planet. Here we evaluate the content of the World Biodiversity Forum as it relates

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to the themes of the conference, as well as our expertise in soil organisms.

The valuation of biodiversity

The perception and valuation of biodiversity was a theme that particularly caught our attention, and was touched upon by many of the plenary talks. Scientists often justify their studies by appealing to pragmatism: Sandra Díaz spoke in the opening plenary about the necessity of conserving biodiversity to maintain the vital ecosystem services it provides us, a message reiterated by Barend Eramus in his talk on the necessity of restructuring current financial motivations for sustainability. But by valuing biodiversity based solely on what humans gain from it, with the knowledge that we are losing biodiversity, we risk goals being set for how much biodiversity can be lost, a situation which Andy Purvis strongly advised against.

Even though valuing biodiversity may be a crucial mechanism to leverage political biodiversity protection, such a valuation does not and cannot fully encompass the value inherent to living beings. Unai Pascual opined that such an incomplete valuation cannot lead to complete, effective protection of biodiversity; the purely pragmatic approach limits conservation by entrenching us in the perception of nature as something to be used. Fabio Scarano applied this philosophical view to the currently accepted model of biodiversity protection within the Western economic system, asking if 'sustainable growth' was a reasonable long-term goal and emphasizing the need for 'degrowth' instead. Other calls to rethink Western conceptualizations of biodiversity and how we protect it came from Workineh Kelbessa and Pragati Sahni. Both spoke about the effect that cultural and religious background has upon how we value nature; in Buddhism, Jainism, and traditional African religions, nature is seen as valuable in and of itself, regardless of its possible use. Markku Oksanen presented a similar idea in the structure of Western philosophy, putting forward the idea that biodiversity has an inherent right to exist, a concept that was also discussed by Anna Zemp in the public event hosted by the WBF and the organization 'Biodiversity Means Life'. Odette Curtis-Scott gave a concrete example of these alternate values, speaking about the Renosterveld system she and her organization protect. Despite the system being degraded beyond any possibility of economic value, she has won local farmers over to her point of view through easements. Virtually all plenary talks emphasized the need for a fundamental change in how we view nature and our need or responsibility to protect it; only through a combination of more effective economic valuation and a reevaluation of our reasons for protecting biodiversity can conservation succeed. This reevaluation is important in all fields of biodiversity research; we believe it to be particularly overdue in our field of soil biodiversity research, where research is often justified based wholly on the services, such as water filtration and nutrient cycling, which the study organisms offer.

'Illuminating the black box'

The soil-focused session 'Illuminating the black box' aimed at covering the most recent advances in soil biodiversity research related to methods to assess the drivers and distribution of biodiversity, anthropogenic impacts on soil biodiversity, and the consequences of changes in distribution and diversity of soil organisms for human wellbeing. Accordingly, the contributions spanned a gradient from local-scale mechanistic studies to regional biodiversity assessments in understudied habitats to global meta-analyses, syntheses on the distribution and drivers of soil biodiversity, and databases of soil animal traits. With eleven talks across a full day (with two sub-sessions), the session was one of the largest of the conference and attracted attention of scholars from several disciplines beyond soil ecologists.

Within the topic of global distribution and drivers of soil biodiversity, results of recent macro-ecological studies were presented that focused on soil microorganisms (presented by Mohammad Bahram: Bahram et al. 2018), nematodes (presented by Johan van den Hoogen: van den Hoogen et al. 2019), and earthworms (Phillips et al. 2019a). They highlighted climatic and land-use drivers as significant predictors of soil biodiversity, and provided support for the finding that soil biodiversity may show a different global distribution from aboveground taxa (Cameron et al. 2019). These recent success stories of large synthesis efforts will be followed up by a number of other projects: the Global Collembola Initiative, a global assessment of collembola diversity and abundance, presented and led by Anton Potapov; BETSI, a database presented by Pierre Ganault, which holds functional traits of soil invertebrates (Pey et al. 2014) (https://portail.betsi.cnrs.fr/); in the framework of the LUCAS soil analysis, a pan-European assessment of soil microbial biomass and respiration (Ballabio et al. 2019) presented by Linnea Smith; a microbial biogeography project across alpine soils presented by Lucie Anne Malard; and updating global predictions of earthworm diversity (led by Thibaud Decaens and colleagues, but presented by Helen Phillips), which is building upon and combining recent data compilation and synthesis efforts

Figure 1. (**A**) The World Biodiversity Forum was held high up in the snowy Alps in Davos. Credit: Marianne Darbi. (**B**) Participants of the House of Commons style debate. Participants discussed whether they thought biodiversity was declining. Credit: Marten Winter

(Phillips et al. 2019a) as well as online soil biodiversity databases (e.g. Drilobase; http://drilobase.org/). Taken together, these presentations highlighted the vibrant field of large soil biodiversity syntheses and provided an overview of exciting avenues where this research field might move in the next years.

In the context of anthropogenic impacts on soil biodiversity and feedback effects, Léa Beaumelle reported on a global review of and roadmap for future research on the effects of chemical stressors on soil biodiversity (Phillips et al. 2019b). Victoria Burton presented her success in increasing the proportion of soil biodiversity data in the PREDICTS database (Hudson et al. 2017) and provided some first projections of global trends of soil biodiversity, indicating a predicted decrease with land-use change. Nico Eisenhauer reported on soil biodiversity and activity responses to interactive effects of climate and land-use change in the Global Change Experimental Facility, Germany (Schädler et al. 2019), and highlighted the limited capacity of less intensively used ecosystem types to buffer detrimental short-term climate-change effects on soil communities and processes (Siebert et al. 2019, Yin et al. 2019) as well as the need to study temporal dynamics of climate effects (Eisenhauer et al. 2018). Raúl Ochoa-Hueso extended the feedback effects of changing soil communities by presenting work on the linkages between soil microbial communities and plant community nutrition and functioning under altered rainfall in Australian grassland. Moreover, he provided an outlook of how the connections between various ecosystem components can be informative for soil ecosystem effects of a changing world (Ochoa-Hueso et al. 2020).

Moving towards the intrinsic value of soil biodiversity

What was striking was that most speakers in the 'Illuminating the black box session' justified their focus on studying soil organisms by highlighting the importance of soil biodiversity for people. For example, most talks started with slides related to the key roles of soil microbes and invertebrates in the global carbon budget or food production. This is also very common in soil ecology papers (e.g. Crowther et al. 2019, Phillips et al. 2019a, van den Hoogen et al. 2019). Yet despite this 'nature for people' justification (Pereira et al. in press), many, if not all, of the speakers in the soil biodiversity session expressed high emotional attachment to their studied organisms, with statements such as they are 'great', 'beautiful' or 'amazing'. Given the strong focus of the plenary talks, we couldn't help but ask: Should soil ecologists shift from this 'provider-perspective' of soil biodiversity? Have we done enough to integrate the intrinsic value of soil biodiversity (valuing biodiversity because it has the right to exist)? Or the relational value of soil biodiversity (valuing the relationship that we, as humans, have with biodiversity)?

It is possible that soil ecologists focus on soil biodiversity as providers for people only because they expect the public to have a negative perception of soil organisms (fear, distaste: Leandro & Jay-Robert 2019). Yet, the high publicity in the media following two recent high-impact publications on soil invertebrates (Phillips et al. 2019a, van den Hoogen et al. 2019) would indicate otherwise. This positive feedback can also be seen through the success of a touring exhibition showcasing soil biodiversity (developed by Senckenberg Museum), which has been highly successful over the last 5 years (Xylander & Zumkowski-Xylander 2018). If the focus is based solely on 'selling' soil biodiversity to the wider ecological audience, particularly to policy-makers, then perhaps the acknowledgment of soil in the IPBES report (Appendix IV; IPBES 2019), and the soil biodiversity focused Plan of Action for the CBD (International Initiative For The Conservation And Sustainable Use Of Soil Biodiversity; https://www.cbd.int/sbstta24/review.shtml) is an indication that we are making progress towards that goal. Thus, maybe there is the possibility for our 'selling points' to begin to change.

What would be the shape of future research if soil ecologists were to start incorporating the intrinsic value of soil biodiversity in their science? It is possible that soil organisms currently understudied, such as rotifers, or soil organisms that are less prominent in providing crucial functional roles in ecosystem processes (Orgiazzi et al. 2016), would then begin attracting more academic attention, reducing knowledge gaps in soil biodiversity research (Guerra et al. 2020). Furthermore, focusing on the intrinsic value of soil biodiversity could also shape future biodiversity research more generally. Ecosystems, such as croplands or urban parks, usually perceived as lacking diversity from the perspective of plants and mammals, can actually host very diverse soil communities (Smith et al. 2006). It is therefore possible that such degraded, non-natural systems would be considered more valuable than they currently are based on the intrinsic value of the soil biodiversity, and might be studied much more.

In the concluding plenary, the World Biodiversity Forum attendees identified and approved a series of resolutions for the future that are posted online (https://www.worldbiodiversityforum.org/resources/WBF_Resolution_Davos_Final_20200228.pdf). Without specific mention of any particular taxonomic group or ecological realm (terrestrial, marine, freshwater), the

resolutions promote interdisciplinary and transdisciplinary research that holistically integrates all aspects of biodiversity. To specifically include soil organisms in this agenda requires appreciation of microbial diversity and diversity of taxa that are too small to see when viewing a landscape. We believe future research should highlight the extrinsic value that soil organisms hold for multiple stakeholders and ecosystem services such as production of food and clean water (as outlined in the IPBES framework), whilst also embracing and quantifying the intrinsic value of soil organisms as the diverse and charismatic life forms that they are.

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