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Conservation narratives and bibliogrammatic networks in the conservation landscape

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Summary

The analysis of conservation narratives primarily resides in the methods and techniques of social sciences, focusing mainly on uncovering advocacy versus critical lines of thought in the complex mosaic of arguments around institutional actors and the public. Researchers have previously proposed an archetypal scheme in which the core conservation narratives and their conceptual interrelations are classified. This report explores the feasibility of coupling such a traditional method with techniques emanating from quantitative linguistics, network analysis and bibliometry. The neologic metaphor of the Anthropause is purposely added to long-established narratives to examine its potential effects on the conservation narratives landscape. The results show that this metaphor reorganizes the mentally constructed connections between flag narratives and symbolic lexical units.

Introduction

Scientific and value-led arguments provide scaffolding for the human and institutional understanding of and engagement with conservation efforts, policymaking and eventually support for policy implementation on the ground (e.g., Jepson & Canney 2003, Maas et al. 2019). Subtle conceptual nuances differentiate terminologies adopted in the various conservation disciplines to characterize structured messages conveyed to and between people. Narratives, stories, conceptual frames or discourses are language tools devised to communicate ideas, advocating nature worldviews or criticizing mechanisms driving harmful human–nature relationships (e.g., Dahlstrom 2014, Díaz et al. 2018, Veland et al. 2018). Social science conservation scholars distinguish narratives from other communication tools, emphasizing their bringing of multiple ways of knowing, generating what they call, eloquently but accurately, a conservation landscape or arena (Louder & Wyborn 2020). Keeping in mind this distinction, we consider here, for reasons of simplicity, narratives as ‘stories’ with architectures and elements aspiring to institutional conservation change (Jepson et al. 2018).

Abundant literature highlights actors’ networking, more than participation per se, into environmental governance orientated towards nature, ecosystem or biodiversity stewardship as the prerequisite for progress (Armitage et al. 2012). For networking to operate, cognitive and language connections or edges should assemble conservation actors’ nodes. It is then interesting to analyse quantitatively, beyond verbal narrative analysis, the public mosaic of conservation arguments (i.e., the conservation narratives landscape). The challenge is not merely to test the potency of the methods and techniques emanating from network analysis, quantitative linguistics or bibliometry functionalities to unfold the skein of conservation arguments and rhetoric using words, terms or lexical units (i.e., a form–meaning composite chain of words or catena) as elementary entities. The challenge is to further explain the common thread that biodiversity continues to decline despite many advocacies seeking institutional and citizen pro-conservation mobilization and action (Williams et al. 2021).

This report addresses these two aspects of quantitative linguistic analysis of the conservation narrative landscape. We use as reference material the thought-stimulating paper by Louder and Wyborn (2020) introducing the narrative analysis of this landscape. We apply quantitative methods to the foundational papers of each central conservation advocacy narrative and critical counternarrative, identified and classified by these authors, to convert them into a network of concepts. Finally, we introduce to this network the recently and conjecturally emerged conservation metaphor of the Anthropause (Rutz et al. 2020) to understand if and how new argument constructs may alter the ‘old’ and ‘unsuccessful’ narrative landscape.

Methods

Louder and Wyborn (2020, table 1) presented a 2×7 matrix-like scheme of classifying 14 archetypic biodiversity narratives. We proceed in two ways. First, we transform and reconfigure Louder and Wyborn's (2020) matrix-like narratives classification scheme into a network of conceptual constructions, a concept being approximated by the core vocabulary at the nucleus of a 'narrative'. Second, we calculate and visualize bibliogrammatic networks of the 14 narratives and insert into the current conservation landscape an additional discourse constructed and developed after the COVID-19 pandemic, namely the Anthropause (Rutz et al. 2020), which refers specifically to 'a considerable global slowing of modern human activities, notably travel' resulting from global lockdown. Empirical evidence amassed during that period, from noise abatement to population recovery, species territory expansion or even lowering of wildlife road mortality, is considered an argument in favour of de-growth policies to address biodiversity erosion.

Louder and Wyborn's (2020) method accepts a form of 'dichotomy' in the column entries, namely discourses or stories vectoring advocative approaches of conservation and sustainability versus critical analyses of persisting destructive, ineffective or unjust human–nature relationships. In the row entries, Louder and Wyborn's (2020) classes can be arranged along a gradient of arguments that grade from ethical to technological. Furthermore, Louder and Wyborn's (2020) examination of the affinities between contemporary narratives and their deficiencies regarding the quest for a 'new narrative' that would engage social and institutional actors in conservation policy, action and practice can be distinguished. As clearly developed in their analysis, although some narratives are entrenched in minds and public discourse, they are not impervious to inter-insemination by others (methods, partial arguments, hypotheses and, of course, predictions), even by some that might be placed on the opposite side of the 'dichotomy'. This observation is the foundation for potentially addressing the conservation narratives landscape as a network of concepts.

The basic idea is to exploit the linguistic substance of narratives considered communication devices, based on language and even vocabulary, as a complex system aimed at influencing or figuring out the collective buy-in and valuation of conservation messages and efforts by people (Ladle et al. 2016). The bibliogrammatic network is based on the concept of the bibliogram proposed initially by White (2005). The kernel concept that sets the context of a bibliogram is usually constructed after some cohesive lexical units (single nouns or nouns arranged syntactically together), such as the Anthropocene (Crutzen 2002) or Nature's Contributions to People (IPBES 2019). The kernel lexical unit(s) co-occurs with complementary lexical units within some stretch of text or across a collection of other concepts in a network form, with quantifiable topology, structural properties and geometrical dimensions.

Our procedure consists of four steps. First, we considered one scholar-published stretch of text per narrative, composed of its abstract, title and keywords, as a principled recitation of the narrative. We used, in most cases, the same indicative publications proposed by Louder and Wyborn (2020, references in table 1, p. 253). When the proposed documents did not fit our protocol because of the format of the publication (e.g. through lack of abstract or extensive summaries), we selected alternatives of early, highly cited and debated papers referring to the same narrative.

The item count of each stretch of text varied between 92 and 187. Overall, the set of records amounts to 15 stretches of text corresponding to the original 14 narratives plus the additional one of the Anthropause discourse.

The second step of our procedure borrowed the classic Zipfian analysis of a text (Zipf 1949), namely the construction of a power-law of word frequency–decreasing rank distribution $f(r) \sim s_r^{-\gamma}$, where s is the word's rank in terms of its frequency, r is rank monotonically decreasing and γ is a scaling exponent. Terms irrelevant to the narrative (e.g., articles, verbs or adjectives, usually positioned at the upper limit of the decreasing ranking of words) were retracted from the vocabulary record, deleting much of the $1/f$ noise of the text as a complex system. The vocabulary record per stretch of text was further pruned, using the word relevance (and occurrence) functionality of the *VOSviewer* bibliometry/visualization software (<https://www.vosviewer.com/>; van Eck & Waltman 2010 and following), selecting thus the most relevant noun phrases. We obtained a neutral deconstruction of composite narratives into their constitutive vocabulary, namely terms or lexical units.

The third step involved applying a 'small-world' network model (Watts & Strogatz 1998) to the network of concepts arranged randomly on a regular ring lattice. This exercise attempted to implement a rewiring procedure for interpolating between the regular ring lattice and a random network without altering the number of vertices or edges in the undirected graph. This procedure was substituted for or paralleled the mental narrative analysis, which resides in social science methods, eventually mitigating subjectivities or syndicate agendas. Two rings were created and compared, one with 14 vertices and another with 15 when the Anthropause discourse was added. In 10 000 Monte Carlo (uniform distribution) simulations, the number of edges (i.e., nearest neighbours) was 3–4, and increased randomness in the rewiring procedure was in the range $p = 0.30$ – 0.99 .

In the fourth step, the collections of 14 (and 15) lexically cleared stretches of text were accreted to bibliogrammatic network configurations through computer programs for exploring bibliometric maps of science. A bibliogrammatic network was then constructed as a graph of lexical unit co-occurrences based on text data. The ultimate goals of this final step were: (1) to establish the feasibility of the method; (2) to spot words or lexical units that act as bridges between edges (betweenness centralities) and those that are eccentric to the master network; (3) to uncover new lexical conglomerates, if any, that might indicate different or alternative narrative construction mechanisms, other than those analysed initially by Louder and Wyborn (2020); and (4) to establish the relative position, inclusion or integration of the Anthropause discourse in the conservation landscape.

Results

Figure 1 shows a synoptic version of Louder and Wyborn's (2020) matrix-like narrative classification scheme. Besides our proposal of a succinct title for each narrative, the exciting part is the visualization of the relativeness of the classification. For instance, the Anthropocene narrative is summarized as 'there is no nature besides the one humanity makes' and is listed in the advocacy subgroup by the authors; in parallel, they identify as a counternarrative of the eco-centric argument of the implicit value of nature, the classic deconstructionist view that "'Nature" is a particular social construct' (Soulé & Lease 1995). One would find remarkable similarities between these arguments of anti-diametrical rationale

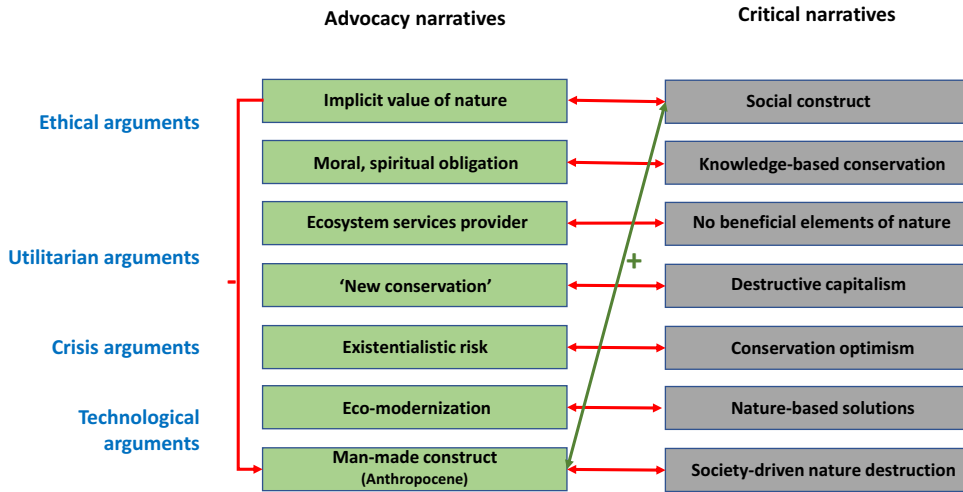


Fig. 1. A depiction of the procedure of transformation and reconfiguration of Louder and Wyborn's (2020) matrix-like classification scheme of conservation narratives. The original scheme is redrafted, succinct titles adopted and pairwise correspondence between advocacy and critical narratives established. The green arrow indicates an exemplary case of the interchangeable positioning of narratives.

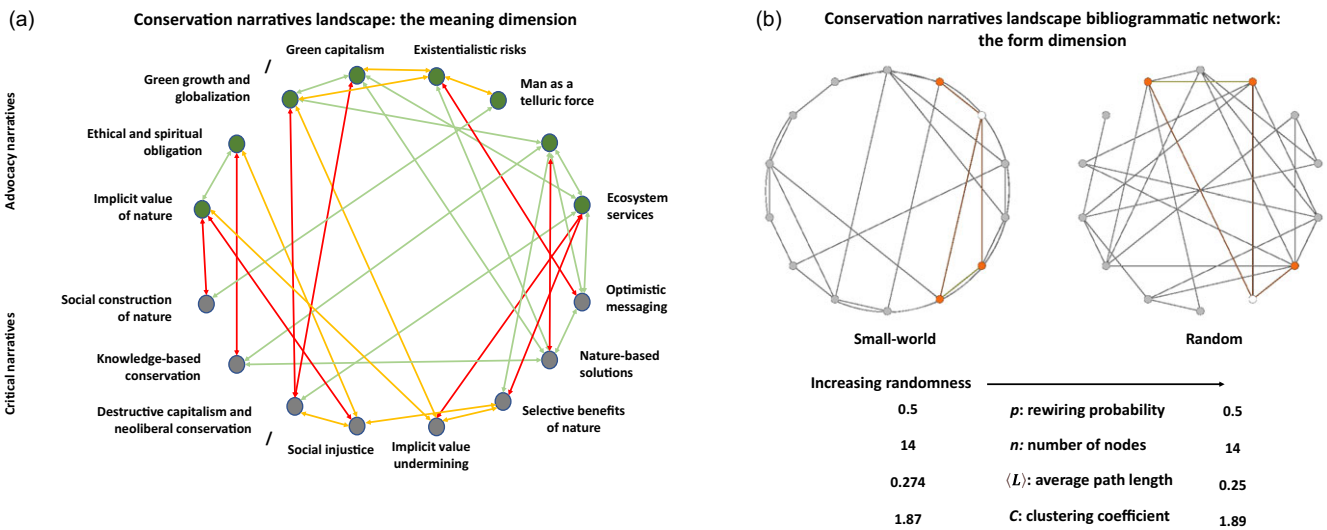


Fig. 2. (a) Transformation of the original matrix scheme of the conservation narratives landscape into a network of concepts and their potential relationships. Green arrows: positively related interchangeable concepts; red arrows: negatively related interchangeable concepts; yellow arrows: ambivalent relationships. (b) Reconfiguring the network of concepts as a regular ring lattice with 14 nodes and three edges. The network metrics are explained in detail in the text.

and scientific method that form a triangular loop in the network space.

Figure 2a presents the proposed transformation of the 2×7 matrix to a ring lattice and the potential relationships and interchangeability of narratives; it depicts the conceptual flows within the conservation landscape. Figure 2b shows an example of the 'small-world' network reconfiguration and correspondence with the transformed matrix. The added value of this procedure stems from the information gained after coupling narrative analysis with quantitative linguistics and network theory statistics. Besides the persisting characteristic of conservation rhetoric revealed by Louder and Wyborn (2020), namely its neo-catastrophic repertoire and vocabulary (Marriner & Morhange 2013), the conservation narrative landscape presents a remarkable conceptual fluidity that might confuse or estrange the public. Randomness in rewiring probability as low as $p \cong 0.35$ leads to network configurations that approach a random connection status between narratives. The simulations of small-world network rewiring, starting from an ordered arrangement with $p = 0$ and evolving towards increasing randomness (Fig. 2b), show that steady network metrics and properties are reached rapidly. A network of 14 narrative nodes and

four edge connections presents an average path length $\langle L \rangle \approx 0.9$ and a clustering coefficient $C \approx 0.6$ for $p \geq 0.4$. Since the average clustering coefficient is a relative measure of the number of triangles in a graph varying from $0 \leq C \leq 1$, the observed C and $\langle L \rangle$ suggest that more than half of the narratives form conceptual triangular loops and are closely connected, distanced by one step between them. The conservation narratives landscape does contain groups of concepts that are densely connected verbally.

The use of Zipf's word frequency-rank power-law distribution is a neutral text deconstruction procedure. The preliminary results on each of the 14 (and 15) stretches of text, summarizing the narratives, show empirical regularities, namely excellent fit (very high R^2) and $\gamma \approx 1$, besides the distribution of 'items' in text corpora or speeches (e.g., Ferrer i Cancho 2005). However, the 'universality' of Zipf's law lies in its scale invariance rather than the theoretical value per se of the scaling exponent $\gamma \approx 1$ condition, as γ may vary significantly between writers and types of text (Moreno-Sánchez et al. 2016). This procedure, coupled with the relevance screening of VOSviewer functionality, led to collections of words per narrative almost dominated by single occurrences or *hapax legomena* in

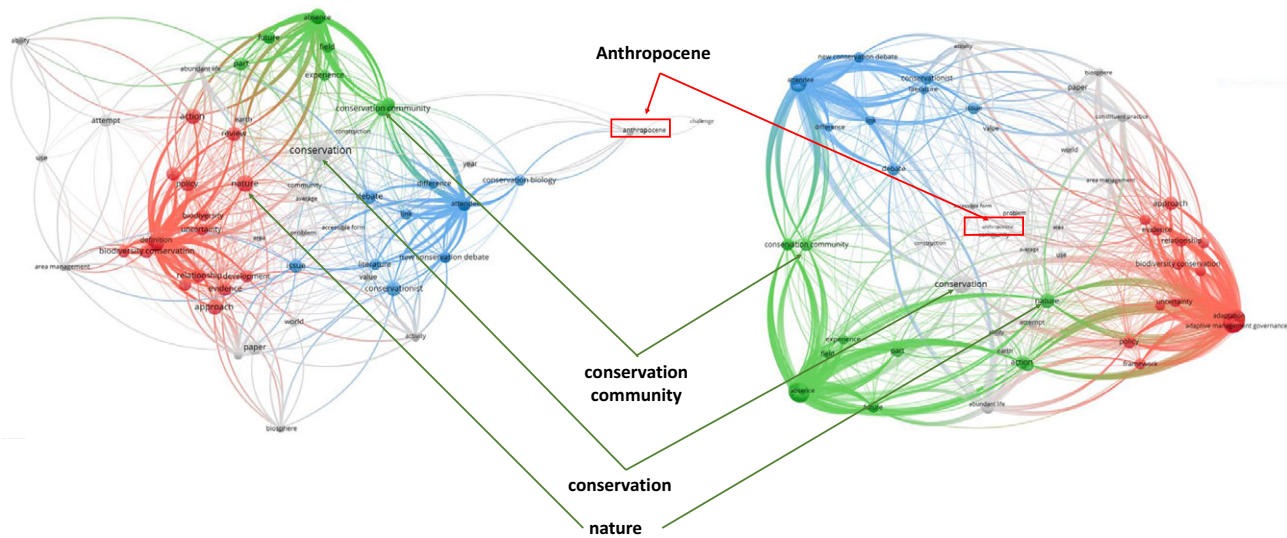
(a) Bibliogrammatic network after 14 narratives
(Louder & Wyborn 2020)(b) Bibliogrammatic network after 15 narratives:
addition of the Anthropause metaphor

Fig. 3. A comparison of bibliogrammatic networks of (a) 14 narratives identified by Louder and Wyborn (2020) and (b) 15 narratives, consisting of the previous plus the additional discourse on the Anthropause. Red arrows indicate the relative positioning of the kernel word 'Anthropocene' in the two configurations. Dark green arrows indicate the identity and positioning of the main word bridges (nature, conservation and conservation community) in the two bibliogrammatic networks. Conglomerates of words belonging to various narratives are aggregated into three major groups: red – biodiversity conservation science; green – method and research; blue – the 'egocentric' pole of the conservation community. See the main text for further details.

linguistic vocabulary. Generally, we value this trait highly since abstracts of scientific publications often: (1) are multi-authored; (2) are not necessarily authored by native English speakers; (3) use words and word combinations that are related to the authors' interests; (4) might be characterized by multiple topics and an absence of consistency – depending on the topic; (5) might use a restrictive, repetitive or protocolary lexicon; or (6) on the contrary, might be chaotic and varied.

Figure 3a,b shows the bibliogrammatic networks based on lexical unit co-occurrences in the collection of stretches of text supposedly representing the landscape of conservation narratives. This exercise offers exciting information as to the above goals. First, it is technically feasible and extendable to the entire procedure for text data beyond the usual bibliometric approaches focusing primarily on citations, academic networks, authors' names and so on. However, it is important to remember that a bibliogram is one linguistics construct with the distinctive property that it is not the primary product of speaking or writing but a secondary or derivative product that emerges only through analysis (White 2005). This property, known to linguists as cohesion, is used here as a measure of the inclusion and – most likely – repetition of words and noun phrases, relating to the kernel concept of a narrative. The extreme narrowing of a single text that leads to the rise of the kernel concept, inferred by one analyst using specialized domain knowledge or common cultural literacy, is subjective, as the narrative itself is. Although the initial White (2005) bibliogram refers to the tandem 'one author – one text', cohesion becomes progressively more objective if inferences on kernel concept(s) are made on multiple texts of the same author or many authors. The property, then, analogously develops into inter-cohesion and inter-coherence (White 2005), respectively.

Second, comparing the two bibliogrammatic configurations helps with visualization of the bridging role and position of three central lexical units: conservation, nature and conservation

community. If the first two seem self-evident, conservation community might somehow reflect the egocentric centrality of social networks (Marsden 2002). This observation is further strengthened when lexical conglomerates are sought: three conglomerates are discernible in both configurations (Fig. 3). The first aggregates words around biodiversity conservation science (e.g., definitions, entities and development related). The second refers to issues of method and research requisites (e.g. uncertainty or field). The third incorporates self-referential words, such as conservationist, attendee, debate or activity of the conservation community and the ongoing vigorous but sometimes virulent 'New Conservation' debate (Minteer & Miller 2011) over the liberal compromise epitomized in the Convention on Biological Diversity, namely the designation of protected entities (species or sites), re-regulation of the environment and commodification of biological resources.

Although it is prudent not to promote it yet at the grade of an established narrative rooted in people's and scholars' minds, the inclusion of the Anthropause discourse in the incumbent bibliogrammatic network confers remarkable results. For instance, the Anthropause bibliogram incorporates the Anthropocene (and the narrative named after it) into the 15narrative network, leaving its eccentric and marginal position in the classic scheme. The same stands true for a series of lexical units (e.g. biosphere, use or area management) that, although crucial for conservation strategy implementation, were peripheral to the bulk of the 14narrative network.

Discussion

The procedure we propose and the findings complement and strengthen Louder and Wyborn's (2020) narrative analysis of the conservation landscape. We believe it might offer an exciting perspective on developing the 'New Conservation narrative' that



they claim is necessary because of the relative inability to accomplish the advocacy or critical roles that established narratives were meant to.

Three main conclusions might be retained in that path. The high transitivity of the network of concepts indicates that the conservation narratives landscape does contain groups of concepts that are densely connected verbally. Furthermore, whether a formal conservation language exists is still to be determined. The lexical conglomerates uncovered in the bibliogrammatic networks (i.e., biodiversity conservation science (definitions or entities), scientific method and self-reference issues (conservationist or debate)) might correspond to an academic or syndicate agenda rather than to a discourse that is accessible to people and institutions.

Finally, the Anthropause metaphor does present a restructuring capacity in the bibliogrammatic context. It is questionable whether its core but indirect message (i.e., humans as custodians of biodiversity) is a promising symbolism or a counterproductive strategy in the face of post-pandemic harmful rebound effects in several conservation issues (Young et al. 2021).

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Author contributions. AYT: conception, writing, editing. HS: data collection, statistical analysis. MG: data collection, statistical support, editing. GKV: programming, editing.

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