The courage of hopelessness: a transformative change for conservation sciences

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Abstract

As the twenty-first century unfolds, the human-driven decline of life on Earth is of greater concern and, despite tremendous growth in the volume of conservation science and many local successes, shows no clear signs of improvement. As a matter of fact, the reversal of nature's ongoing decline is only possible with urgent "transformative change"

However, no transformative changes are viable without first accepting that, as many other species, we may be bound for extinction and that no time or solutions may be left to reverse nature's decline. In light of this, I aim at provokingly inspiring the "courage of hopelessness", while paradoxically providing the leverage to think differently.

To this end I will remind that: 1) the main reports and projections about nature's decline paint a gloomy picture for the future of contemporary societies; 2) the destructive fingerprint of modern human societies (i.e., capitalist enterprise), although being just one of the many expressions in the evolution of human cultures, is now dominant and necessarily finds its root in the human biology, thus in the way our species is cognitively coupled with the environment (i.e. conscious purpose and dualistic thinking); 3) such destructive fingerprint is particularly difficult to modify since we are naturally reluctant to change habits and beliefs even when we know they lead into error.

Considering this, I suggest moving forward from the widely accepted but timed-out metaphor of conservation as a "crisis discipline", which intrinsically suggests a temporary state and an optimistic perspective, in favour of a more "palliative" attitude towards our times.

Impact statement: From conservation as "crisis discipline" to conservation as "palliative care"

Key words: nature decline, human behaviour, conscious purpose, dualistic thinking, habit formation, embrace extinction

1. The need for transformative change

As the twenty-first century unfolds, the human-driven decline of life on Earth is, day by day, of greater concern and, despite tremendous growth in the volume of conservation science and many local successes, shows no clear signs of improvement (Williams et al. 2020).

It is more and more acknowledged that the reversal of nature's ongoing decline is only possible with urgent "transformative change" that tackles the root causes: the interconnected economic, sociocultural, demographic, political, institutional, and technological indirect drivers behind the direct drivers (Díaz et al. 2019). Diaz et al (2019) explain how such transformative change can be enabled and accelerated with the collaborative application of priority interventions to eight key points of intervention (leverage points) through innovative governance approaches: 1) embrace diverse visions of a good life; 2) reduce total consumption and waste; 3) unleash values and action; 4) reduce inequalities; 5) practice justice and inclusion in conservation; 6) internalize externalities and telecouplings; 7) ensure environmentally friendly technology, innovation, and investment; 8) promote education and knowledge generation and sharing.

Alternatively, another sort of transformative change has been proposed by some conservationists, where a radical detachment from industrialized civilization seems to be the only and ultimate solution. Among these, Guy McPherson (2011) drew attention and critiques when he resigned his position as a tenured, full professor to "go back to the land in the Age of Entitlement". He states that living in the industrial civilization inevitably requires obedience at home, oppression abroad, and wholesale destruction of air, water, soil, and non-human species (Pritchard 2012) and, the best intentions notwithstanding, conservationist themselves are easily tempted by prestige, money, and career.

In whatever form, either through innovative governance approaches or radically detaching from the old system, urgent transformative change is not an easy task and requires

great flexibility, where our perceptions and values need to be questioned; in a nutshell, our way of thinking (i.e., epistemologies). This demands a basic reorientation of our purposes and automatisms, how we understand and recognize ourselves, how we learn, and what we appreciate as knowledge.

2. No change without hopelessness

Kübler-Ross et al. (1972), in their famous schema, identify five stages (although they do not necessarily come in the same order, nor are all five stages experienced by all patients) of how we react upon learning that we have a terminal illness: denial; anger; bargaining; depression; acceptance. Kübler-Ross et al. (1972) demonstrated how these stages can be applied to any form of catastrophic personal loss whenever a society is confronted with some traumatic break.

Recently, Žižek (2020) employed Kübler-Ross et al. schema (1972) to describe what some of us are probably experiencing when eventually confronting the ongoing ecological collapse (similar to the Covid-19 outbreak) : "*first, we tend to deny it (it is just paranoia, all that is happening are the usual oscillations in weather patterns); then comes anger (at big corporations which pollute our environment, at the government which ignores the dangers); this is followed by bargaining (if we recycle our waste, we can buy some time; also there are good sides to it: we can grow vegetables in Greenland, ships will be able to transport goods from China to the US much faster on the new northern passage, new fertile land is becoming available in Siberia due to the melting of permafrost …), depression (it's too late, we're lost); and, finally, acceptance - we are dealing with a serious threat, and we'll have to change our entire way of life."*

What Zizek (2020) and Kubler-Ross (1972) are trying to tell us is that it is only when we despair and do not know what to do that an epistemological shift is more likely to occur, in what he defines the "courage of hopelessness". It follows that to trigger transformative change, we

first need to play with the idea of "hopelessness", pretending that no time or solutions are left to solve nature's decline (and this is not farfetched after all).

In light of this, I will here identify and describe three reasons to be hopeless about the future of human society, while paradoxically suggesting new ways forward and providing the leverage to think differently. To this end I will remind that: 1) the main reports and projections about nature's decline paint a gloomy picture for the future of contemporary societies; 2) the destructive fingerprint of modern human societies (i.e., capitalist enterprise), although being just one of the many expressions in the evolution of human cultures, is now dominant and necessarily finds its root in the human biology, thus in the way our species is cognitively coupled with the environment (i.e. conscious purpose and dualistic thinking); 3) such destructive fingerprint is particularly hard to modify since we are naturally reluctant to change habits and beliefs even when we know they lead into error. Finally, I claim that the courage of hopelessness should be integrated into the conservation practice, moving forward from the widely accepted but timed-out metaphor of conservation as a "crisis discipline"(Soulé 1985), which intrinsically suggests a temporary state and an optimistic perspective, to conservations as a "palliative care".

3. Three reasons to be hopeless

3.1 Same reports and projections about nature's decline

Nowadays, the term "Anthropocene" is widely used and has become more than a concept; it has become a set of compelling narratives (Lidskog & Waterton 2016). Among these, it conveys the sense that humanity has become a global geophysical force acting upon the Earth System, similar to other natural processes. Besides, it is also a reminder that humanity is leaving a planetary environment – the Holocene – which we know, and within which human societies

have developed, pushing us towards a *terra incognita*. The latest reports and projections about nature's decline well support this alarming and irreversible perspective.

The Global Biodiversity Outlook 5 (GBO – 5) (Secretariat of the Convention on Biological Diversity 2020), the flagship publication of the Convention on Biological Diversity (CBD), reported that none of the 20 Aichi biodiversity targets agreed in Japan in 2010 to slow the loss of the natural world have been fully achieved by the international community.

The same holds for fossil CO_2 emissions. From the last comprehensive assessment of climate science (IPPC 2021), it emerges how, within the next two decades, temperatures are likely to rise by more than 1.5°C above pre-industrial levels, breaching the ambition of the 2015 Paris Agreement. Even if the world manages to limit warming to 1.5°C, some long-term impacts of warming already in train are likely to be inevitable and irreversible. These include sea level rises, melting of Arctic ice, and warming and acidification of the oceans, with serious consequences for marine and terrestrial biota.

In this context, Trisos et al. (2020) estimated the timing of exposure to dangerous climate conditions for more than 30,000 marine and terrestrial species, forecasting imminent biodiversity disruption. Under a high-emission scenario – "business as usual" with representative concentration pathway (RCP) 8.5 – the abrupt exposure events would begin before 2030 in tropical oceans and spread to tropical forests and higher latitudes by 2050. Of particular concern is the case of corals reef – even if global warming stays under 2°C, it is unlikely that this would save most reefs worldwide (Frieler et al. 2013).

Similarly, the report about nature's contribution to people (e.g., modulating air and water quality, sequestering carbon, building healthy soils, pollinating crops, and providing coastal protection from hazards), monitored by the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), paint a gloomy picture for the future of

132 contemporary societies, highlighting that over the past 50 years the capacity of nature to
133 support quality of life has declined for 14 of the 18 categories (Díaz et al. 2019).

134 In light of this, it is not unreasonable to assume that we have entered an "evolutionary
135 suicide" path (Parvinen & Dieckmann 2013) and we are bound for extinction through extinction
136 debt – the future extinction of other species due to events in the past, owing to a time lag
137 between an effect, such as habitat destruction or climate change, and the subsequent
138 disappearance of species (Tilman et al. 1994).

139

140 ***3.2 Conscious purpose and the dualistic thinking***

141 Recently, there is growing consensus that despite the success of the term
142 "Anthropocene", this is profoundly unsatisfying, since it treats "humanity" as a single entity
143 while obscuring profound differences between (groups of) people with vastly different impacts
144 and claims on the environment (Büscher & Fletcher 2019). The term "Capitalocene" has been
145 recently proposed to better point out the responsibility: this pervasive ecological crisis has
146 been mostly produced by the globalization of capitalist production over the past five hundred
147 years, not by some general "Anthropos" (Büscher & Fletcher 2019). Although this term is certainly
148 helpful in zooming in the causes of the ecological crisis, in a wider sense, it fails again to account
149 for the fact that the destructive fingerprint of modern human societies (i.e., capitalist
150 enterprise), although being just one of the many expressions in the evolution of human cultures,
151 is now dominant and necessarily originates in the human ("Anthropos") biology, thus in the
152 way our species is cognitively coupled with the environment. Identifying and acknowledging
153 this coupling is necessary for promoting an epistemological shift, providing the leverage to
154 think differently and disengage from the evolutionary suicide path.

155 In the animal domain, the cognitive coupling with the environment is managed by the
156 "consciousness", supporting the organism in directing its attention, and its movements, to

whatever in the environment is most important for its survival and reproduction (Pierson & Trout 2017). Practically, consciousness is a goal-directed behaviour, characterized by active deliberation of future consequences, high computational cost, and adaptive flexibility to changing environments (Lipton et al. 2019).

Specifically, what has made human consciousness unique is the phylogenetic interaction of three forms of animal behaviour: play, tool use, and communication. Despite all three elements being present in many animal species, when the three components meet in humans, they strengthen and mutually reinforce each other, producing a positive feedback loop: there are no other species that plays, communicates, and uses tools as much as humans do (Kotchoubey 2018). Thanks to our consciousness, our abilities as ecosystem engineers are unprecedented, to the point that no species have modified their selective environment in such a short time to the same extent as humans (Laland et al. 2001)

Although a fundamental theory of what is consciousness has not been elaborated yet (Koch 2018; Seth & Bayne 2022), the global workspace theory (GWT:(Baars 1997, 1998)), one of the most elaborated psychological theory of consciousness in the last 30 years, compares consciousness to a theatre of mind, in which "*conscious contents resemble a bright spot on the stage of immediate memory, selected by a spotlight of attention under executive guidance. Only the bright spot is conscious; the rest of the theater is dark and unconscious."*(Baars 1997). This is to mean that a prerequisite of consciousness is to be always selective: only a certain amount of information about what is happening in the total mind seems to be relayed to what we may call the "stage of consciousness", which ultimately produces a single conscious experience.

Therefore, what gets played on the stage is not a random sampling, but a systematic selection of multiple sensory inputs guided by a concurrent specific purpose. Therefore, the selective attention exerted by consciousness provides a "simplified" understanding of our environment to achieve a specific purpose. It follows that the goal-directed consciousness is

good in dealing with simple cause and effect, necessarily without considering broader systemic implications(Palmer 2022). Practically, *human consciousness is a short-cut device to enable you to get quickly at what you want; not to act with maximum wisdom in order to live, but to follow the shortest logical or causal path to get what you next want, which may be dinner; it may be a Beethoven sonata; it may be sex. Above all, it may be money or power."* (Bateson 1972a).

Here, it is important to remember that our deliberate conscious purposes are not separate from emotions (Damasio 1998) and the vast domain of the "unconscious" is always orienting and directing human purposes, with the worst emotions of the human person possibly being involved - greed, envy, jealousy, anger, competitiveness, etc. This is particularly dangerous in a capitalist society, where the dominant emotions promote competitiveness over mutualism and exploitation over sustainability.

A further consequence of goal-directed consciousness is that we tend to draw boundaries and frames around things and systems to make them appear as discrete, definable, and readily graspable objects. Although indisputably useful, this systematically blinds us to the wider relationships and interconnectedness in which the parts of our environment we are manipulating are embedded (Guddemi 2011), feeding the illusion of being apart from and having control over the natural world. This can contribute to the "othering" of groups of people, and creatures or mask connections and interactions, finally nurturing dualistic thinking (Palmer 2022): *mind versus matter, elite versus people, chosen race versus other, nation versus nation, and man versus environment* (i.e., human-nature dichotomy)(Bateson 1972b).

However, the conscious purpose and the related ability of ecosystem engineers have been characterizing the behaviour of *homo sapiens* for thousands of years. Indeed, the common assertion that preindustrial societies had only local and transitory environmental impacts is mistaken and reflects a lack of familiarity with a growing body of archaeological data (Boivin et al. 2016). Nonetheless, it is only in the last 200 years that the human enterprise experienced a

remarkable and destructive explosion (i.e., Great Acceleration) with the onset of industrialization and the pervasive use of fossil fuels (Steffen et al. 2007; Ellis et al. 2021). Indeed, all the potentially destructive consequences of the conscious purposes (i.e., goal-directed behaviour, lack of consideration of the broader systemic implication, and nature-people dichotomy) are exacerbated by more and more effective machinery, that empowers us to further upset the balance of the body, society, and the environment. On the contrary, "indigenous societies" may have successfully maintained ecosystems over long periods not necessarily because of intrinsic superiorities within their ways of thinking, but because they had to adapt sensitively to those environments to survive and persist (Berkes et al. 1998; Laland et al. 2001; Guddemi 2011).

3.3 Human habits and the loss of flexibility

Besides the detrimental effect of consciousness, a further human feature hampers the epistemological shift towards a transformative change. To accomplish such shift, a good degree of flexibility is required, while it seems we are naturally reluctant to change our habits and beliefs (Glasersfeld 1988).

The development of behavioural habits is deeply rooted in our biology, being important and functional for a broad array of life circumstances, some that are essential to survival and reproduction, and others that are not (Newlin & Strubler 2007). Indeed, creating repetitive habits or beliefs, which can emerge both at the social and individual level (Tomasello 1999), is one of the brain's evolutionary survival mechanisms. For example, to appreciate some of the functions of habits, imagine having to completely relearn how to eat every time there is food available or one is hungry.

While purposeful behaviour will diminish if the outcome is no longer desired, habitual performance of such behaviour will persist because, during its development, the action

becomes dissociated from the outcome, and its performance is driven instead by antecedent stimuli and/or emotional states (Daw et al. 2005; Robbins & Costa 2017; Lipton et al. 2019). Major benefits come from automaticity, freeing us to dedicate our conscious cognitive resources to other matters while nevertheless engaging in complex actions. It is estimated that almost half of our daily behaviour is performed repetitively in stable contexts (Wood et al. 2002).

However, automaticity inevitably leads to a loss of flexibility, proceeding even when the consequences are knowingly unwanted or underlying the susceptibility to the development of maladaptive habits (e.g., compulsions and addictions) (Marteau et al. 2012; Lipton et al. 2019). For instance, it has been observed that believing that (anthropogenic) climate change is real had only a small to moderate effect on the extent to which people are willing to act in climate-friendly way (Hornsey et al. 2016).

In addition, it is important to remember that automatism refers not only to behavioural motor actions but also includes automatism of thinking. This, in addition to the necessity of automatisms to be inflexible, it brings what Maturana and Varela (1992) names "the temptation of certainties". So, as we naturally do not like to give up comfortable habits or beliefs, we do not like to give up our certainties in the light of errors. Bateson (1972b) alternatively describes the process of creating certainties as the "ecology of thinking": *"But in mental evolution, there is also an economy of flexibility. Ideas which survive repeated use are actually handled in a special way which is different from the way in which the mind handles new ideas. The phenomenon of habit formation sorts out the ideas which survive repeated use and puts them in a more or less separate category. These trusted ideas then become available for immediate use without thoughtful inspection, while the more flexible parts of the mind can be saved for use on newer matters"*.

Therefore, we necessarily behave as if these trusted ideas objectively mapped the external world. On one the hand, this slows us to see the feedback from the destruction of the ecosystem. For instance, it took several decades to acknowledge that growth-oriented

economies, rooted in free enterprise capitalism and freedom of the commons (Hardin 1968), are a major cause of the environmental crisis (Pacheco et al. 2018). On the other hand, we fail in agreeing on what is relevant knowledge abstracted from habits and beliefs. Indeed, as stated above, the formation of habits (and trusted ideas) is driven by antecedent stimuli and/or emotional states, which can also be collectively shared within a cultural domain or political lines. For instance, much of the heterogeneity in attitudes on climate change in America falls along political lines: conservatives show less belief in and concern over climate change than do liberals (McCright & Dunlap 2011). This becomes particularly true because of the abstract, probabilistic, and intangible nature of climate change (Markowitz & Shariff 2012).

4. Ways forward: embracing extinction

To summarize, the main reports and projections about nature's decline paint a gloomy picture for the future of contemporary societies and the technology-empowered conscious purpose together with our natural reluctancy to change our habits and beliefs give little chance to achieve a transformative change. Indeed, throughout our days we shift between two broad categories of behaviour (Marteau et al. 2012). On the one hand, we consciously act by directing ourselves toward particular purposes, often without considering broader systemic implications. In other instances, we act without reflection, relying on our developed automatisms and beliefs, where we are tempted by establishing certainties that eventually constrain our ability to see, react, and agree on the destructiveness of our activities.

Our ancient and current history of population growth, environmental impact, and harm to other species might easily confirm that the powers of generating conscious purpose can far outstrip our wisdom and foresight in their application and that even when we are aware of our responsibility in nature's ongoing decline (Matter & McPherson 2000), it remains difficult to change our habits. As a matter of fact, in 2020 we had the lowest decrease in global annual

emissions ever observed when the Covid-19 outbreak stopped human beings from their daily frenetic purposes and changed many of our habits (Le Quéré et al. 2021). Similarly, the dualistic thinking is especially linked to Western society since the Enlightenment and the related Scientific Revolution(Merchant 2006), building on the very religious tenet that humans are separate from nature, that humans can be abstracted from the rest of the world, and that they possess the faculties to understand the world in its entirety through the objective pursuit of universalities (Fletcher et al. 2021). Practically, the dualistic thinking is reflected in the increasing alienation from nature defined as "extinction of experience" (Pyle 1993), which is nowadays of great concern. Younger generations are becoming less likely to have direct contact with nature, diminishing a wide range of benefits relating to health and well-being, but also discouraging positive emotions, attitudes, and behaviour with regard to the environment (Soga & Gaston 2016).

In this context, embracing the perspective of possible human extinction is a necessary act of courage. Afterall, the estimate of any mammals' species life span, from origin to extinction, is about 1 million years and there is no reason to believe the human species is exempt from this estimate (Lövei 2007).

Does this really mean that we should abandon the search for better conservation strategies? Of course not, but without first dwelling in the space of hopeless acceptance, we cannot experience a fearless awareness and, from there, respond appropriately to the threats that face us and future generations. Practically, this can be done by not fearing to engage, even in conservation practices, in less conscious purpose attitudes of human behaviour which typically fall outside the scientific approach (i.e. conviviality, art, contemplation, reflexivity, sacredness, or interconnectedness). Such attitudes are often common in Indigenous societies which successfully maintained ecosystems over long periods, actualizing the need to complement our scientific knowledge with traditional knowledge (Berkes et al. 1998).

307 Similarly, it means that we must reconnect with the idea, typical of traditional societies, of
308 ecosystems (and life) as unpredictable and uncontrollable, and of ecosystem processes as
309 nonlinear, multiequilibrium, and full of surprises (Berkes et al. 1998). Unpredictability, death,
310 or eventual extinction are not problems to be solved, but rather facts to be embraced. In doing
311 so, we can experience and feel more easily the sense of interconnectedness and humbleness
312 that can partially sew up our illusory detachment from nature and, the best intentions
313 notwithstanding, disengage from the dominant emotions guiding our conscious purposes in
314 capitalist societies (e.g., competitiveness, exploitation, fear, etc).

315 Additionally, the reluctance to change our habits and beliefs can be overcome, although
316 the effort will take time and will never be complete. Thus, we can train in resisting the
317 temptations of certainties and beliefs, cultivating the idea of "alternativism" - that there is
318 always another way to think about and explain phenomena.

319

320 **5. The courage of hopelessness in conservation sciences**

321 Conservation practice and theory considerably evolved and adapted to the emerging
322 challenges of our time. For instance, Kareiva & Marvier (2012) revisited the core principles of
323 "conservation biology" in favour of a more systemic approach of "conservation sciences", with
324 a wider range of disciplines to be included. In this context, major shifts in the framing and
325 goal(s) of conservation occurred (Mace 2014; Evans 2021): from an early "nature for itself" to the
326 most recent "peoples and natures" approach, the latter emphasizing interdisciplinarity and
327 socioecological systems for resilient interactions between human societies and different
328 understandings of nature. Researchers are becoming self-critical, responsive, and adaptable
329 (Montana et al. 2020); for instance, recognizing that ecological assumptions have been so far
330 shaped and held back by exclusionary western society, often excluding diverse peoples
331 inhabiting Earth's varied ecosystems. (Malavasi 2020; Nuñez et al. 2021; Trisos et al. 2021).

Despite all the above, conservation is not exempted from the pitfalls of conscious purpose, dualistic thinking, and the temptation of certainties. The dualism between nature-culture remains so entrenched in mainstream Western culture and environmental conservation that is seldom critically challenged in dominant institutions(Fletcher et al. 2021). For instance, a protected area, although necessary in many circumstances, aims by its very definition at protecting nature from people. This is about foraging nature–people dichotomies rather than celebrating the many inherent links between them (Malavasi 2020).

Similarly, I argue that the common attitude towards conservation has remained mostly unchanged (reluctancy to change ideas) since the time Soulé (1985) defined conservation biology as a "crisis discipline" - metaphorically comparing conservation biologists to medical doctors who are often called on to act rapidly without considering broader systemic implications (hidden by the conscious purpose). Since the concept of crisis intrinsically suggests a temporary state and an optimistic perspective, the risk is that such a metaphor, keeping us in a permanent responsive and bargaining state (see Kübler-Ross et al. 1972), does not allow for dwelling in the space of hopeless acceptance and for "thinking differently", as opposed to "act rapidly". In light of this, although rapidly, I suggest moving forward from the widely accepted metaphor of conservation as a "crisis discipline"(Soulé 1985) in favour of a more "palliative" attitude toward our times.

All in all, I believe that it is the very sensation of ephemeral interconnection and sacredness while we are walking through whatever preserved natural area, and that cannot be captured by the great authority of quantitative science, that persuaded us to engage in the conservation affair. In this context, I believe that Bateson sentence is still very timely (Bateson 1979): w*e are beginning to play with ideas of ecology, and although we immediately trivialize these ideas into commerce or politics, there is at least an impulse still in the human breast to unify and thereby sanctify the total natural world, of which we are.*

6. References

Baars BJ. 1997. In the theater of consciousness: The workspace of the mind. Oxford University Press Press, Inc.

Baars BJ. 1998. Metaphors of consciousness and attention in the brain. Trends in Neurosciences **21**:58–62.

Bateson G. 1972a. Effect of conscious purpose on human adaptation. Pages 447–454 Steps to an ecology of mind. Ballantine, New York.

Bateson G. 1972b. The Cybernetics of "Self": A Theory of Alcoholism. Pages 315–344 Steps to an ecology of mind. Ballantine, New York.

Bateson G. 1972c. Ecology and flexibility in the urban civilization. Pages 499–511 Steps to an ecology of mind. Ballantine, New York.

Bateson G. 1979. Mind and Nature: A Necessary Unity. Wildhood House, London.

Berkes F, Kislalioglu M, Folke C, Gadgil M. 1998. Exploring the basic ecological unit: Ecosystem-like concepts in traditional societies. Ecosystems **1**:409–415. Springer New York.

Boivin NL, Zeder MA, Fuller DQ, Crowther A, Larson G, Erlandson JM, Denham T, Petraglia MD. 2016. Ecological consequences of human niche construction: Examining long-term anthropogenic shaping of global species distributions. Proceedings of the National Academy of Sciences **113**:6388–6396. National Academy of Sciences.

Büscher B, Fletcher R. 2019. Towards Convivial Conservation. Conservation and Society **17**:283–296.

Damasio AR. 1998. Emotion in the perspective of an integrated nervous system. Brain research. Brain research reviews **26**:83–86. Netherlands.

Daw ND, Niv Y, Dayan P. 2005. Uncertainty-based competition between prefrontal and dorsolateral striatal systems for behavioral control. Nature Neuroscience **8**:1704–1711.

Díaz S et al. 2019. Pervasive human-driven decline of life on Earth points to the need for transformative change. Science **366**:eaax3100.

Ellis EC et al. 2021. People have shaped most of terrestrial nature for at least 12,000 years. Proceedings of the National Academy of Sciences **118**:e2023483118.

Evans MC. 2021. Re-conceptualizing the role(s) of science in biodiversity conservation. Environmental Conservation **48**:151–160. Cambridge University Press.

Fletcher M-S, Hamilton R, Dressler W, Palmer L. 2021. Indigenous knowledge and the shackles of wilderness. Proceedings of the National Academy of Sciences **118**:e2022218118. Proceedings of the National Academy of Sciences. Avai

Frieler K, Meinshausen M, Golly A, Mengel M, Lebek K, Donner SD, Hoegh-Guldberg O. 2013. Limiting global warming to 2 °C is unlikely to save most coral reefs. Nature Climate Change **3**:165–170.

Glasersfeld E von. 1988. The Reluctance to Change a Way of Thinking. The Irish Journal of Psychology **9**:83–90. Routledge.

Guddemi P. 2011. Conscious Purpose in 2010: Bateson's Prescient Warning. Systems Research and Behavioral Science **28**:465–475. John Wiley & Sons, Ltd.

Hardin G. 1968. The Tragedy of the Commons. Science **162**:1243–1248. American Association for the Advancement of Science.

Hornsey MJ, Harris EA, Bain PG, Fielding KS. 2016. Meta-analyses of the determinants and outcomes of belief in climate change. Nature Climate Change **6**:622–626.

IPPC. 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

Kareiva P, Marvier M. 2012. What Is Conservation Science? BioScience **62**:962–969.

Koch C. 2018. What is consciousness? Nature **557**:S8–S12.

Kotchoubey B. 2018. Human Consciousness: Where Is It From and What Is It for .

Kübler-Ross E, Wessler S, Avioli L v. 1972. On Death and Dying. JAMA **221**:174–179.

Laland KN, Odling-Smee J, Feldman MW. 2001. Cultural niche construction and human evolution. Journal of Evolutionary Biology **14**:22–33. John Wiley & Sons, Ltd.

Le Quéré C, Peters GP, Friedlingstein P, Andrew RM, Canadell JG, Davis SJ, Jackson RB, Jones MW. 2021. Fossil CO2 emissions in the post-COVID-19 era. Nature Climate Change **11**:197–199.

Lidskog R, Waterton C. 2016. Anthropocene – a cautious welcome from environmental sociology? Environmental Sociology **2**:395–406. Routledge.

Lipton DM, Gonzales BJ, Citri A. 2019. Dorsal Striatal Circuits for Habits, Compulsions and Addictions .

Lövei GL. 2007. Extinctions, Modern Examples of. Pages 1–13 in Levin SABT-E of B, editor. Elsevier, New York.

Mace GM. 2014. Whose conservation? Science **345**:1558–1560. American Association for the Advancement of Science.

Malavasi M. 2020. The map of biodiversity mapping. Biological Conservation:108843. Elsevier Ltd. Available from https://doi.org/10.1016/j.biocon.2020.108843

Markowitz EM, Shariff AF. 2012. Climate change and moral judgement. Nature Climate Change **2**:243–247.

Marteau MT, Hollands JG, Fletcher CP. 2012. Changing Human Behavior to Prevent Disease: The Importance of Targeting Automatic Processes. Science **337**:1492–1495. American Association for the Advancement of Science.

Matter WJ, McPherson GR. 2000. No Lurking Inconsistency. Conservation Biology **14**:1204–1205. [Wiley, Society for Conservation Biology].

Maturana HR, Varela FJ. 1992. Knowing How We Know. Pages 17–30 The tree of knowledge: the biological roots of human understanding. Shambhala, Boston.

McCright AM, Dunlap RE. 2011. The Politicization of Climate Change and Polarization in the American Public's Views of Global Warming, 2001–2010. The Sociological Quarterly **52**:155–194. Routledge.

McPherson G. 2011. Going back to the land in the age of entitlement. Conservation biology **25**:855–857. United States.

Merchant C. 2006. The Scientific Revolution and The Death Of Nature. Isis **97**:513–533. [The University of Chicago Press, The History of Science Society].

Montana J, Elliott L, Ryan M, Wyborn C. 2020. The need for improved reflexivity in conservation science. Environmental Conservation **47**:217–219. Cambridge University Press.

Newlin DB, Strubler KA. 2007. The Habitual Brain: An "Adapted Habit" Theory of Substance Use Disorders. Substance Use & Misuse **42**:503–526. Taylor & Francis.

Nuñez MA, Chiuffo MC, Pauchard A, Zenni RD. 2021. Making ecology really global. Trends in Ecology & Evolution **36**:766–769.

Pacheco LF, Altrichter M, Beck H, Buchori D, Owusu EH. 2018. Economic Growth as a Major Cause of Environmental Crisis: Comment to Ripple et al. BioScience **68**:238.

Palmer H. 2022. "Think different" to prevent extinction. Connecting Gregory Bateson's Cybernetic Epistemology with Posthumanism. Murmurations: Journal of Transformative Systemic Practice **5**:14–27.

Parvinen K, Dieckmann U. 2013. Self-extinction through optimizing selection. Journal of Theoretical Biology **333**:1–9. Elsevier.

Pierson LM, Trout M. 2017. What is consciousness for? New Ideas in Psychology **47**:62–71.

Pritchard SB. 2012. The Politics of Opting Out. Conservation Biology **26**:382–383. John Wiley & Sons, Ltd.

Pyle RM. 1993. The thunder tree: lessons from an urban wildland. Houghton Mifflin, Boston.

Robbins TW, Costa RM. 2017. Habits. Current Biology **27**:R1200–R1206. Elsevier.

Secretariat of the Convention on Biological Diversity. 2020. Global Biodiversity Outlook 5. Montreal.

Seth AK, Bayne T. 2022. Theories of consciousness. Nature Reviews Neuroscience **23**:439–452.

Soga M, Gaston KJ. 2016. Extinction of experience: the loss of human–nature interactions. Frontiers in Ecology and the Environment **14**:94–101. John Wiley & Sons, Ltd.

Soulé ME. 1985. What is Conservation Biology?: A new synthetic discipline addresses the dynamics and problems of perturbed species, communities, and ecosystems. BioScience **35**:727–734.

Steffen W, Crutzen PJ, McNeill JR. 2007. The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature? Ambio **36**:614–621.

Tilman D, May RM, Lehman CL, Nowak MA. 1994. Habitat destruction and the extinction debt. Nature **371**:65–66.

Tomasello M. 1999. The Human Adaptation for Culture. Annual Review of Anthropology **28**:509–529. Annual Reviews.

Trisos CH, Auerbach J, Katti M. 2021. Decoloniality and anti-oppressive practices for a more ethical ecology. Nature Ecology & Evolution **5**:1205–1212.

Trisos CH, Merow C, Pigot AL. 2020. The projected timing of abrupt ecological disruption from climate change. Nature **580**:496–501.

Williams DR, Balmford A, Wilcove DS. 2020. The past and future role of conservation science in saving biodiversity. Conservation Letters **13**:e12720. John Wiley & Sons, Ltd.

Wood W, Quinn JM, Kashy DA. 2002. Habits in everyday life: Thought, emotion, and action. Journal of Personality and Social Psychology **83**:1281–1297. American Psychological Association, Wood, Wendy: Texas A&M U, Dept of Psychology, College Station, TX, US, 77843, w-wood@tamu.edu.

Žižek S. 2020. Pandemic!: COVID-19 shakes the world. OR Books, New York and London.