Title: A robust goal is needed for species in the Post-2020 Global Biodiversity Framework

Running title: A post-2020 goal for species conservation

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Abstract

In 2010, Parties to the Convention on Biological Diversity (CBD) adopted the Strategic Plan for Biodiversity 2011–2020 to address the loss and degradation of nature. Subsequently, almost all biodiversity indicators have continued to decline. Nevertheless, it is well established that conservation actions can make significant positive differences for species and ecosystems. Therefore, the Post-2020 Global Biodiversity Framework, which is currently being developed, has immense potential to motivate efforts to 'bend the curve' of biodiversity loss. Here we contend that Goal B on species, as articulated in the Zero Draft of the Post-2020 Framework, is inadequate for preventing extinctions, and ambiguous regarding reversing population declines, both of which are required to achieve the CBD's proposed 2030 mission "to put biodiversity on a path to recovery for the benefit of planet and people". We examine the limitations of the current wording of the goal and propose an articulation with a robust scientific basis. A global goal for species that strives to end extinctions and recover populations of all threatened and depleted species can help align actors towards the transformative actions and interventions needed to allow humans to live in harmony with nature.

1. INTRODUCTION

Human impact is driving a global increase in species extinction risk (Díaz et al. 2019), an overall decline in species population abundance, and has led to species extinction rates that are at least 10 - 100 times faster than natural background rates of extinction (IPBES 2019). The importance of reversing these declines is now not only recognized from an intrinsic perspective, but also more broadly for the fundamental role that species populations play in the functioning of ecological systems, and in the provisioning of ecosystem services on which humanity relies (Mace et al. 2012). Increasingly, species conservation is written into the legislation of national and sub-national jurisdictions, and features in many global policy conventions and commitments (United Nations 2019).

The most notable global commitment to safeguard species to date has been Aichi Target 12 of the Strategic Plan for Biodiversity 2011-2020 (the 'Strategic Plan') under the Convention on Biological Diversity (CBD) (Secretariat of the Convention on Biological Diversity 2011). This states: "*By 2020, the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained*". Yet, with ongoing declines in populations, and species continuing to be driven towards extinction, we have failed to meet this target (Butchart et al. 2019; Secretariat of the Convention on Biological Diversity 2020a).

With the Strategic Plan expiring in 2020, negotiations on the development of the Post-2020 Global Biodiversity Framework under the CBD are now well underway. In January 2020, the Zero Draft of the Post-2020 Framework (hereafter, the 'zero draft') was released, presenting an opportunity for the global community to assess the potential strengths and weaknesses of the

proposed plan for nature beyond 2020 (Secretariat of the Convention on Biological Diversity 2020b).

For the duration of the Strategic Plan, almost all indicators of the state of biodiversity - especially those relating to species - have continued to decline, thus increasing overall extinction risk (Mace et al. 2018; Díaz et al. 2019; IPBES 2019). However, a substantial body of evidence reveals that conservation actions, when well-planned and implemented, can stop species from going extinct, slow the rate at which species are driven towards extinction, and halt and reverse population declines (Hoffmann et al. 2015; Mace et al. 2018; Monroe et al. 2019; Bolam et al. 2020). Therefore, if effectively constructed, and in light of the biodiversity crisis we are facing, the Post-2020 Global Biodiversity Framework could be extremely important for shaping policy and directing efforts to halt species loss worldwide.

The zero draft proposes five outcome goals – three relating to different levels of ecological organisation (ecosystems, species, and genetic diversity), plus two reflecting the contributions that biodiversity makes to people through sustainable use and access and benefit-sharing. To achieve these five outcome goals, the framework proposes 20 action targets – an appropriate and potentially powerful framework. Despite the strength of this overall framework, however, we are concerned that the goal focusing on species (Goal B), as currently written - "*The percentage of species threatened with extinction is reduced by [X%] and the abundance of species has increased on average by [X%] by 2030 and by [X%] by 2050*" - carries serious risks. It is ambiguous, difficult to monitor, embeds the risk of unintended outcomes, and is not sufficient to prevent extinctions and stabilize populations. It also appears to be misaligned with other international agreements, and risks compromising the achievement of the 2030 Mission and 2050 Vision of the zero draft itself. While there is

still time before the Post-2020 Framework is finalised, our aim in this contribution is to highlight the three key problems with Goal B and propose how the goal can be improved.

2. ACCEPTING EXTINCTIONS AND EXACERBATING EXTINCTION RISK

Despite three decades of biodiversity policy commitments under the CBD, species continue to be driven extinct. Aichi Target 12 in particular took a clear and bold stance on extinction, stating that: "*By 2020, the extinction of known threatened species has been prevented....*" Even so, during the 10-year period of nations acting to achieve Target 12, at least four vertebrate species went extinct (IUCN 2020a). Unfortunately, Goal B of the zero draft is a retreat from Aichi Target 12 regarding extinctions and extinction risk, and could result in unintended outcomes. The proposed goal in the zero draft fails to reiterate an explicit ambition to prevent further extinctions: *"The percentage of species threatened with extinction is reduced by [X%].."*. In other words, contrary to Aichi Target 12, it could be seen as implying that some extinctions are acceptable. Indeed, as currently written, Goal B could perversely be achieved by allowing species to go extinct, thus reducing the number of species 'threatened' with extinction.

Moreover, the outcome of reducing species extinction risk – lacking in the zero draft – is crucial to include within Goal B, as during the 2011-2020 period, overall levels of extinction risk increased: while 22 species (in groups that have been comprehensively assessed at least twice) improved in status sufficiently to qualify for down-listing to lower categories of threat, more than six times that number (131 species) deteriorated in status sufficiently to qualify for up-listing to higher categories of threat (Figure 1). Regarding extinction risk, the proposed language in the zero draft's Goal B (*"The percentage of species threatened with extinction is reduced by [X%].."*) is problematic for two reasons. First,

classification of species as threatened or not is binary, meaning that this measure is not very sensitive, and does not reflect movement of species between the categories of Vulnerable, Endangered or Critically Endangered (either as a consequence of improvements or deteriorations in status). Hence, this element of the goal could be achieved solely by down-listing a sufficient number of Vulnerable species to Near Threatened or Least Concern (to reduce the proportion of species threatened with extinction by X%), while potentially allowing all Endangered or Critically Endangered species to deteriorate in status further. This could draw attention and critical resources away from these species more at risk of extinction, towards less threatened species, further imperilling Endangered and Critically Endangered species.

Second, the proportion of species threatened with extinction changes over time owing to non-genuine reasons, for example through revisions in taxonomy, reassessment of Data Deficient species, improved knowledge, and the addition of newly assessed species in less well-known groups. Hence, each time the proportion is reported, it would be necessary to communicate and explain changes in the baseline (2020) values for the proportion too. While the Red List Index (Butchart et al. 2004, 2005, 2007) factors out non-genuine reclassifications to show trends in survival probability driven by genuine improvement or deterioration in extinction risk, it cannot be simplistically converted into trends in the percentage of species threatened with extinction.
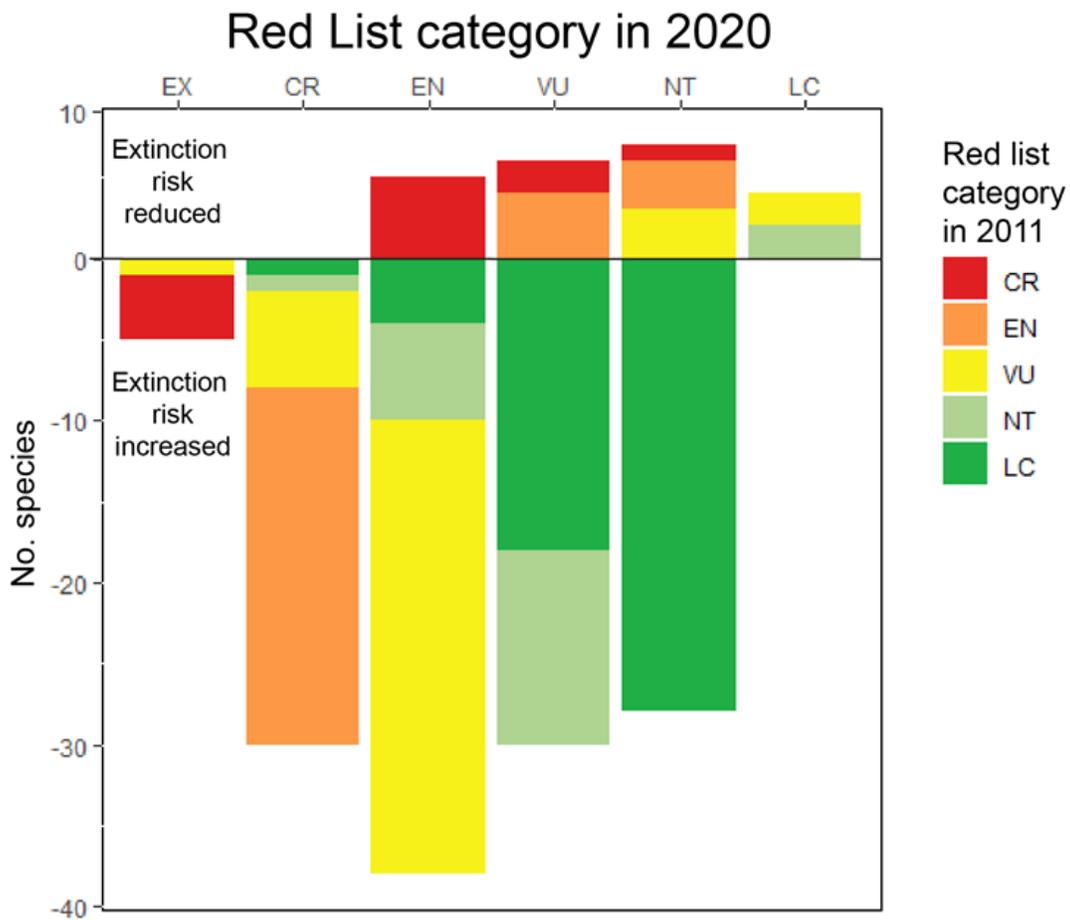
Figure 1. Since the Strategic Plan for Biodiversity 2011–2020 and its 20 Aichi Biodiversity Targets came into force in January 2011, there have been nearly six times as many species that qualified for up-listing to a higher category of extinction risk on the International Union for Conservation of Nature (IUCN) Red List than qualified for down-listing to a lower category of extinction risk. This figure is based on data from comprehensively assessed species groups (birds, mammals, amphibians, corals, and cycads) and on genuine recategorizations (i.e. excluding those resulting from improved knowledge, corrections, revised taxonomy etc.) (Butchart et al. 2005; IUCN 2020b). For some taxa, the period between repeated Red List assessments spanned the end of one decade and the start of the next (e.g. 2008-2012 for birds). To account for this, we randomly sampled the relevant proportions of genuine changes to assign to each decade (e.g. three-quarters of the

genuine changes for birds from the period 2008-2012 were assigned to the decade 2000-2010, and one-quarter to the decade 2011-2020). This random sampling was repeated 1000 times using a bootstrapping approach, and we used the mean number of respective category transitions from these iterations to represent up-listings and down-listings for each decade. The values for each taxon group were summed and plotted. IUCN Red List categories EX = Extinct, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern. For illustrative purposes, Extinct here includes species classified as Extinct in the Wild, or Critically Endangered and tagged as Possibly Extinct or Possibly Extinct in the Wild.

3. THE ABUNDANCE COMPONENT IS AMBIGUOUS

Increases in species populations are fundamental to threatened species recovery. Another essential aim of conservation is maintaining and where necessary recovering the populations of non-threatened species to prevent them from declining or becoming threatened, given the key role they may play in the function of ecosystems and the delivery of ecosystem services. Concern over population declines of invertebrates (Sánchez-Bayo & Wyckhuys 2019), and common vertebrate species (Ceballos et al. 2017), highlight the importance of including population abundance as a key component of any goal focused on species.

However, the current wording of this element of the draft goal '*the abundance of species has increased on average by [X%] by 2030 and by [X%] by 2050*' contains two unhelpful ambiguities. First, 'abundance of species' can be interpreted as the number of species; the appropriate terminology should be "population abundance of species". Second, the target could be perversely met through facilitating increases in population abundance of

invasive alien species, while allowing native species to decline, so it is important to specify that the focus is on native species.

4. OTHER OBJECTIVES ARE COMPROMISED

The zero draft's Goal B is currently misaligned with broader international and societal goals. For example, Sustainable Development Goal 15 (Target 15.5) seeks to halt biodiversity loss by 2030 (United Nations 2019), which does not accord with the currently proposed species goal in the zero draft. Additionally, as currently written, Goal B potentially conflicts with other goals and action targets captured in the zero draft. For example, a direction of resources towards Vulnerable species, allowing unabated declines in Endangered and Critically Endangered species, could, in some cases, have adverse implications for the function of ecosystems (Estrada et al. 2017) (compromising Goal A with its aim of net loss of ecosystem integrity). Extinction of species, the prevention of which is not captured in Goal B, would also clearly result in a loss of genetic diversity (Spielman et al. 2004), contrary to Goal C. Reductions in populations and/or extinctions will also reduce the benefits from the use of genetic resources through potential missed opportunities for sustainable use (Goal D) or for new medicines or increased scientific understanding (Goal E) (Luck et al. 2003).

Perhaps most importantly, Goal B is overtly misaligned with the zero draft's own 2030 Mission "To take urgent action across society to put biodiversity on a path to recovery for the benefit of the planet and people". Potentially compromising Critically Endangered and Endangered species, and allowing species to go extinct will not put biodiversity on a "path to recovery". This also jeopardizes our ability to live "in harmony with nature", a key tenet of the zero draft's 2050 Vision.

5. AN IMPROVED GOAL FOR SPECIES

Given the limitations we identify for Goal B of the zero draft, we propose the following revised wording for a species-focused goal in the Post-2020 Framework:

"Species extinctions are halted from 2020 onwards, the overall risk of species extinctions is reduced by 20% by 2030 and is zero by 2050, and the population abundance of native species is increased on average by 20% by 2030 and 60% by 2050."

This revised goal takes the necessary bold stance on species extinctions (consistent with Aichi Target 12) by stating "*Species extinctions are halted from 2020 onwards*". Even under Aichi Target 12, some extinctions occurred, but it is also clear that conservation action prevented many more extinctions (Bolam et al. 2020). We argue that any relaxation on the expectations of nations to prevent extinctions would be a failure in response to the biodiversity crisis. For simplicity, we do not specify 'human-induced' extinctions, but note that a tiny fraction of extinctions may be caused by geological events (volcanoes, tsunamis, etc.) that are not feasible to mitigate, and generate the "background" rate of species extinction through the geological record. By extension, we also suggest that even the species at highest risk of extinction can be recovered with sufficient resources and transformative change in the way we manage the environment.

We interpret the CBD Vision for 2050 of living "in harmony with nature" to mean that no species are threatened with extinction. To achieve this vision by 2050, a demonstrable reduction in extinction risk is required by 2030. The goal we propose requires a quantifiable gauge for improvement by 2030 as a means by which to check whether we are "on the path to recovery" – we propose 20% is an achievable reduction in the decade from 2020. As such,

the revised goal we propose embeds and allows for the tracking of global extinction risk, "*the overall risk of species extinctions is reduced by 20% by 2030 and is zero by 2050*". Importantly, achieving the milestone of an overall reduction in extinction risk of 20% by 2030 should be driven by improvements in species across all categories from Near Threatened through to Critically Endangered and Extinct in the Wild. This is because focussed efforts in the next 10 years (to 2030) to stabilise and recover a subset of threatened species should not perversely lead to an increase in the extinction risk of other threatened species, by, for example, diverting resources.

We propose as the third element of the goal: "*and the population abundance of native species is increased on average by 20% by 2030 and 60% by 2050*". This specifies average abundance (recognising that some population declines for very common or overabundant species will be offset by increases in others) and native species (recognising that increases in invasive alien species are not desirable). Increases in population sizes should occur only within or contiguous to (to allow for climate tracking) the native ranges of species, and that such population maintenance/increases be considered across all species, and not just those that are listed as threatened with extinction. Average population abundance as measured by the Living Planet Index has declined by 60% since 1970 (McRae et al. 2017), which is the earliest time-point with sufficient data for global trends to be assessed. Therefore, we suggest the aim should be to recover populations to at least their 1970 baseline (i.e. increasing "60% by 2050" from 2020), with "20% by 2030" being a potential milestone for tracking progress.

The release of the zero draft in January 2020 has already generated a great deal of discussion and critique around what is needed for species in a post-2020 world (Secretariat

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of the Convention on Biological Diversity 2020c). We suggest that the formulation of the goal presented here best addresses the deficiencies of the language proposed in the zero draft, while capturing the key tenets of the various alternatives that have been proposed to supersede it. Crucially, it is clear, measurable, avoids perverse incentives for unintended outcomes, and embeds outcomes that are consistent with the vision and mission of the Post-2020 Framework.

MONITORING PROGRESS

Progress towards the revised goal that we propose can be monitored and tracked at a global scale using the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (for documenting extinctions), the Red List Index (for tracking levels of extinction risk) and robust population indicators (for tracking average population abundance), which were appropriately highlighted in the zero draft as key indicators for measuring progress towards achieving Goal B (Secretariat of the Convention on Biological Diversity 2020b). The Red List Index measures trends in overall species extinction risk, based on population and range size and trends as quantified by IUCN Red List Categories (Butchart et al. 2004, 2005, 2007). The 2030 goal would be achieved if the current Red List Index value increased by 20% (as a Red List Index value of 1 equates to all species qualifying as Least Concern, while an index value of 0 equates to all species qualifying as Extinct). The abundance component of the revised goal can be quantified using population indices, of which the best-known include the Wild Bird Index and the Living Planet Index.

The Red List Index and established population indices are useful measures of species extinction risk and abundance, and the former can be disaggregated for national

reporting (with this being possible for the latter where data allow). However, they have limitations. Red List Categories are broad (reducing sensitivity), many species are classified as Data Deficient (adding quantified uncertainty), and relatively few groups have been comprehensively assessed multiple times for the IUCN Red List and hence included in the Red List Index (IUCN 2020a, 2020b) (limiting representativeness). The Living Planet Index measures the average abundance of vertebrate populations using time-series data (Loh et al. 2005). However, many of the input data for the Living Planet Index appear to be from populations measured because they are known *a priori* to be declining, and so the indicator may not yield robust insight into population trends of common species overall. The effects of combining population time series from single sites, from portions of species ranges (e.g. countries), and from across the entirety of species ranges are also unclear. Therefore, the effectiveness of these metrics should be enhanced through greater monitoring of species populations (particularly in countries with a disproportionate lack of information) and expanded numbers of species regularly assessed for the IUCN Red List. Increasing the frequency of reassessments for the IUCN Red List would also help to mitigate time-lags before status changes are reflected on the IUCN Red List (Butchart et al. 2006). This requires much more substantial investment in biodiversity monitoring than is currently the case.

Other metrics of extinction risk and abundance may also be used, and may be more appropriate for regional and national scales. For example, the most robust measures of abundance are those based on structured samples across all populations for given regions and taxonomic groups, like the Wild Bird Index (Gregory et al. 2019). While effective, these are still highly restricted geographically and taxonomically. Improved monitoring to

underpin more rigorous, scalable indices will better allow us to track progress towards achievement of the quantifiable elements of the revised goal that we propose.

Table 1 – Proposed species goal for the Post-2020 Global Biodiversity Framework broken into each element, and how it can be monitored.

Component	Revised goal	Quantifiable indicator
Extinctions	*Species extinctions are halted from 2020 onwards*	IUCN Red List
Extinction risk	*...the overall risk of species extinctions is reduced by 20% by 2030 and is zero by 2050*	Red List Index
Abundance	*…. and the population abundance of native species is increased on average by 20% by 2030 and 60% by 2050"*	Population indices

We note that meeting this goal will require mitigating key threats to species. These are, principally, unsustainable agriculture, unsustainable exploitation (including logging, fisheries and hunting/gathering wild species), the negative impacts of invasive alien species, pollution, commercial and residential development, and increasingly, climate change (Maxwell et al. 2016; IUCN 2020a). The proposed action targets 1-7 in the zero draft largely cover these actions. However, to prevent extinctions, recovery actions and active interventions will be urgently needed for many of the most highly threatened species, for which mitigating external threats alone will be insufficient to prevent their extinction. Such species are frequently reduced to populations that are not demographically or genetically viable, and so require emergency actions. Examples include translocation, assisted colonization, captive breeding and release for animals and propagation for fungi and plants, and targeted recovery actions such as supplementary feeding and breeding site

provision (Cochrane et al. 2007; Comizzoli & Holt 2019). Therefore, we recommend that an additional target should be included in the Post-2020 Framework to promote implementing emergency, proactive species recovery actions above and beyond threat alleviation for those species whose survival and recovery requires such actions.

6. CONCLUSION

The revised species goal we propose is ambitious, unambiguous, easy to communicate, and comprises quantifiable elements against which nations can transparently measure their progress. Post-2020, we must halt any further extinctions, reduce the extinction risk of those species that are threatened, and recover and maintain populations of species in their native range at levels to ensure the continued functioning of ecosystems. To be 'on a path to recovery' by 2030, and 'living in harmony with nature' by 2050, we must take decisive action for biodiversity from 2020. A clear and adequate goal for species conservation is fundamental to these efforts.

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