


Understanding and achieving species elements in the Kunming–Montreal Global Biodiversity Framework

Philip J.K. McGowan , Alison Hutchinson , Thomas M. Brooks , Wendy Elliott, Michael Hoffmann , Louise Mair , Amy McDougall, Domitilla C. Raimondo and Stuart H.M. Butchart 

Philip J.K. McGowan (philip.mcgowan@newcastle.ac.uk) is a professor of conservation science and policy at Newcastle University, in Newcastle upon Tyne, England, in the United Kingdom, and is chair of the IUCN Species Survival Commission Global Biodiversity Framework Task Force. Alison Hutchinson is a postdoctoral research associate at Newcastle University, in Newcastle upon Tyne, England, in the United Kingdom. Thomas M Brooks is chief scientist at the International Union for the Conservation of Nature, in Gland, Switzerland. Wendy Elliott is deputy leader for wildlife practice with WWF International, in Nairobi, Kenya. Michael Hoffmann is head of wildlife recovery at the Zoological Society of London, in London, England, in the United Kingdom. Louise Mair is a Newcastle University academic track fellow at Newcastle University, in Newcastle upon Tyne, England, in the United Kingdom. Amy McDougall is the global biodiversity policy coordinator at BirdLife International, in Cambridge, England, in the United Kingdom. Domitilla C. Raimondo is the Threatened Species Programme manager at the South African National Biodiversity Institute, in Brummeria, Pretoria, in South Africa. Stuart H. M. Butchart is the chief scientist at BirdLife International, in Cambridge, England, in the United Kingdom.

Abstract

The Kunming–Montreal Global Biodiversity Framework was adopted in December 2022 by the parties to the Convention on Biological Diversity. The framework states outcomes for species to be achieved by 2050 in goal A and establishes a range of targets to reduce pressures on biodiversity and halt biodiversity loss by 2030. Target 4 calls for urgent recovery actions for species where the implementation of other targets is insufficient to eliminate extinction risk. We analyze key species elements of goal A and target 4, examine their meaning and clarify implementation needs. We emphasize that target 4 should not be seen simply as the species target, because effective implementation of all targets is essential to achieve the species ambitions in goal A, but, rather, as a target for species that require urgent focused actions and emphasize that an indicator is needed to measure the implementation of urgent management actions. We conclude by considering next steps to identify priorities, undertake further research, make use of resources, ensure cooperation and capacity development.

More than 40,000 species are assessed as being threatened with extinction on the IUCN Red List (IUCN 2023a). Extrapolations from these data suggest that more than 1 million species may be at risk of extinction, while extinction risk is increasing in those taxonomic groups that have been assessed (Purvis et al. 2019 section 2.2.5.2.4; see also Hochkirch et al. 2023). A total of 909 species are known or suspected to have gone extinct since 1500 (IUCN 2023a), and 84 species are known or suspected to exist only in captivity (IUCN 2023a). Although there are numerous other manifestations of the biodiversity crisis, such as declines in genetic diversity (Exposito-Alonso 2022), a risk of ecosystem collapse (Nicholson et al. 2021), and a reduction of ecosystem services (Chaplin-Kramer et al. 2019), the losses among the other species with which we share our planet are the most fundamental, popularly recognized, and best-known human impacts on living nature.

The Kunming–Montreal Global Biodiversity Framework

In response to this crisis, the parties to the Convention on Biological Diversity adopted the Kunming–Montreal Global Biodiversity Framework (KMGBF) in December 2022 (CBD 2022a). The framework has a vision of a world of living in harmony with nature where “by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people.” There are four goals that describe the outcomes to be achieved by

2050 so that this vision can be realized. There are then 23 targets that detail actions to be achieved by 2030 in order to achieve the 2030 mission, which is “To take urgent action to halt and reverse biodiversity loss to put nature on a path to recovery for the benefit of people and planet by conserving and sustainably using biodiversity and by ensuring the fair and equitable sharing of benefits from the use of genetic resources, while providing the necessary means of implementation.” (CBD2022a). The accompanying monitoring framework lists a suite of headline indicators for monitoring progress (CBD 2022b), supported by a long list of component and complementary indicators for optional use.

The first three goals (i.e., A–C) align directly with the three objectives of the convention: conservation of biological diversity, sustainable use of the components of biological diversity, and fair and equitable sharing of the benefits arising out of the use of genetic resources, with the fourth goal concerned with ensuring that there are adequate means of implementation for the framework. There are eight targets outlining action necessary to reduce threats to biodiversity (i.e., supporting goal A): five targets concerned with meeting people’s needs through sustainable use and benefit sharing (i.e., goals B and C) and 10 targets for actions needed to implement the KMGBF (i.e., goal D).

In the present article, we analyze key species-specific elements of the framework—namely, the outcomes described in goal A and the actions in target 4, which is concerned with urgent recovery measures for species that need them. We assess each element in detail, drawing on both the negotiations leading up

Received: March 19, 2024. Revised: May 22, 2024

© The Author(s) 2024. Published by Oxford University Press on behalf of the American Institute of Biological Sciences. This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited. For commercial re-use, please contact journals.permissions@oup.com

to the adoption of the KMGBF and relevant literature to promote understanding that supports operationalization of this goal and target. It is important to note that all CBD decisions, including those adopting the KMGBF and its monitoring framework, are agreed by consensus among all 196 parties after negotiations over concepts, overall structure, and precise wording. The result is inevitably a compromise in language and terminology that often creates some of the complexity and nuance that provide challenges in interpretation and operationalization. Although we do not focus on other targets (such as targets 1, 2, and 3 on habitat conservation or targets 5 on species overexploitation and 6 on invasive alien species) we recognize the crucial importance of those targets in achieving the species elements of goal A, given that habitat loss, overexploitation, and invasive alien species are the primary drivers of species decline.

Goal A: Outcomes for species

The first goal of the KMGBF is to conserve biodiversity at the level of ecosystem, species, and genetic diversity (see UN 1992, article 2 for the CBD's definition of *biological diversity*). It mandates that:

"The integrity, connectivity, and resilience of all ecosystems are maintained, enhanced, or restored, substantially increasing the area of natural ecosystems by 2050; human-induced extinction of known threatened species is halted, and, by 2050, the extinction rate and risk of all species are reduced tenfold and the abundance of native wild species is increased to healthy and resilient levels; the genetic diversity within populations of wild and domesticated species is maintained, safeguarding their adaptive potential."

In the present article, we consider the second of the three clauses, which is concerned with the species level of biodiversity (*sensu* article 2 of UN 1992) and which deals with three complementary aspects of species' conservation status: extinctions, extinction risk, and abundance. The 37 words in this clause contain some complex concepts and a considerable degree of nuance that have important implications for implementation. We address each in turn.

"Human induced." These words establish that this clause refers directly to extinctions driven by human activities. Species evolve and go extinct naturally. The intent of goal A is to focus attention on extinctions that are driven by human activities rather than "natural" extinctions such as those caused by, for example, volcanic eruptions (e.g., San Benedicto rock wren, *Salpinctes obsoletus exsul* in 1952; Brattstrom 1990), which would be extremely difficult to avoid. Some natural phenomena, such as hurricanes, floods, and fires are occurring at far higher intensity and frequency because of climate change (e.g., Habibullah et al. 2022, Tripathy et al. 2023; see also Preston-Allen et al. 2024), and these, in turn, are driving extinctions (Murali et al. 2023). Because recent climate change is human driven (IPCC 2023), it is appropriate that such extinctions should be considered human driven, although, in practice, it may be difficult to confirm that climate change has led to particular extinctions. Therefore, actions need to tackle the full range of threats that are driving species toward extinction, both directly and indirectly, including climate change.

"Known threatened species." The goal focuses on the extinction of species that have been documented as threatened. There are an estimated 8.1 million species on Earth (Mora et al. 2011), of which 1.5 million have been described (e.g., Costello et al. 2013). Nearly 160,000 species have been assessed for their risk of extinction using the categories and criteria of the IUCN Red List of Threat-

ened Species (IUCN 2023a), which is widely considered to be the most comprehensive and objective system for classifying species in terms of extinction risk (Rodrigues et al. 2006, Stuart et al. 2010, Roberts et al. 2023). Of these, over 42,100 are assessed as threatened with extinction. Numerous additional species have been assessed for their extinction risk at the national scale for national red lists, often using the guidelines for regional and national application of the IUCN Red List categories and criteria (IUCN 2012). The number of species being assessed at various scales is continually increasing (e.g., Hochkirch et al. 2023). There are, therefore, certain to be many more species that are threatened but are not yet formally documented as such, including large numbers of species that have not even been described to science. However, these undocumented species that may be threatened are excluded from the focus in this clause as a practical approach to guide the baseline for measurement. It is therefore critical to identify the factors affecting known threatened species and to address these factors to prevent the species' extinction and help recover their populations.

"Halted." This term makes clear the intention to put in place the action necessary to stop extinctions from a starting point of December 2022, when the framework was adopted. Therefore, in the first clause, the parties have committed to preventing human activities from driving any further extinctions of those species that have been identified as threatened. This is ambitious but arguably feasible, as has been evidenced by conservation's impact on preventing extinctions over the last three decades (Bolam et al. 2021). It will, however, require an increase in the scale of investment and action of at least an order of magnitude (McCarthy et al. 2012). Halting further extinctions will necessitate the implementation of urgent, targeted interventions, as is called for in target 4 (see below).

"By 2050, the extinction rate... of all species [is] reduced tenfold."

This element of the second clause focuses on *all* species, complementing the focus in the first clause on those that are known to be threatened. Therefore, it implicitly recognizes that, although we should aim to halt further extinctions of all species, it is practically challenging to halt extinctions of species that have not yet been described to science (Centinela extinctions; Wilson 1992) or to document having done so. A tenfold reduction in the rate of all extinctions means that the rate must fall to 10% of the current rate of extinctions by 2050. The CoP15 decision on the monitoring framework indicates that the reference period for determining the current rate, unless otherwise mentioned, is 2011–2020 (see paragraph 2 of CBD 2022b). The challenges of detecting extinctions (see Akçakaya et al. 2017, Roberts et al. 2023) mean that there are often time lags before a species can be declared extinct, so extinction rates are most accurately estimated retrospectively. Moreover, absolute extinction rates are also difficult to estimate, given considerable uncertainty over the total number of species on the planet. It is therefore useful to compare relative extinction rates, expressed as extinctions per million species per year (Pimm et al. 1995). Mean fossil species' lifetimes produce a background extinction rate of 0.1–1 extinctions per million species per year, whereas human activities have driven species to extinction at a rate perhaps 1000 times higher (Pimm et al. 2014). The difficulties in assessing extinction rate mean that it is not possible to make more precise estimates (Purvis et al. 2019).

For current extinction rates to be assessed meaningfully, Rounsevell et al. (2020; see also Diaz et al. 2020 especially supplemental material, pages 11 and 18) suggested an approach that is

How would we measure a ten-fold reduction in aggregate extinction risk by 2050?

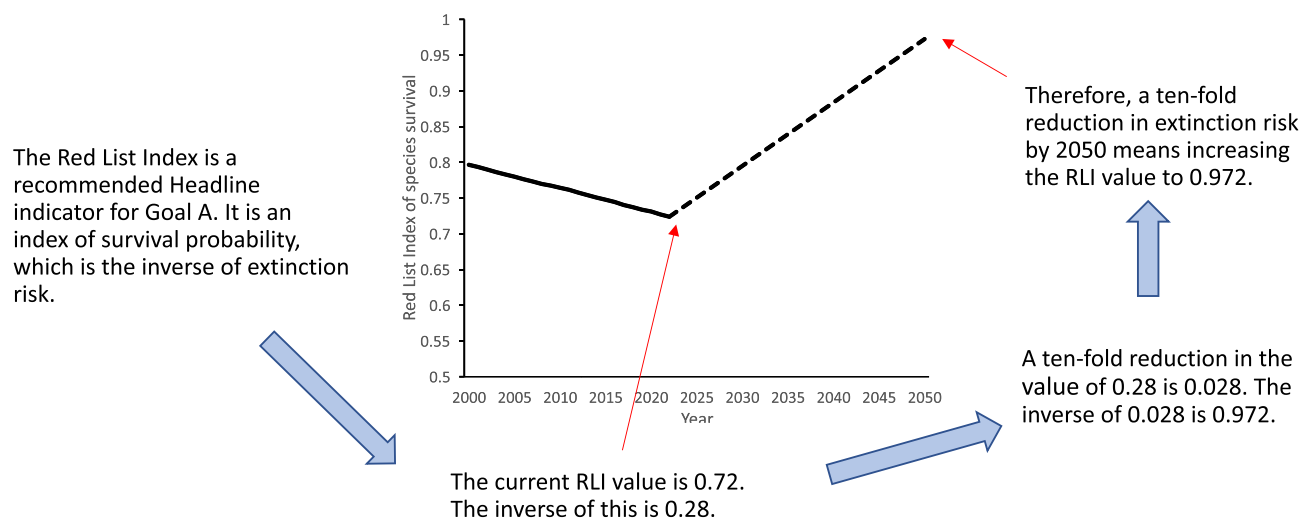


Figure 1. Calculation of a tenfold reduction in extinction risk, as is required in goal A of the Kunming–Montreal Global Biodiversity Framework. The value of the aggregated global Red List Index (calculated from the indices for mammals, birds, amphibians, corals, and cycads following methods outlined in Butchart et al. 2010) was 0.724 in 2022 when the framework was adopted. Red List Index values range from 0, where all species are extinct, to 1, where all species are Least Concern.

based on known extinctions, proposing to model extinction rates on the basis of extinctions that have been documented in the IUCN Red List. This has been considered problematic for several reasons, including failing to capture the diversity of biodiversity and variation in knowledge across realms and spatial scales and the practical limitations of detecting extinctions (Raven et al. 2020). An alternative for assessing the extinction rate of all species, including those not yet described by science, is to apply modeling approaches using proxies—for example, relating to the severity of threats such as habitat loss (Pimm et al. 1995, Visconti et al. 2016). Further work is therefore needed to explore the best approaches for capturing progress toward this element of the goal and for understanding associated uncertainties.

“By 2050, the extinction risk... of all species [is] reduced tenfold.”

This element of the second clause calls for extinction risk to be reduced tenfold—that is, to 10% of its current level. This reduction should apply to *all* species, but as was discussed above, the extinction risk of most species is not known, and many species remain undescribed. A reduction in extinction risk can therefore only be measured directly by quantifying trends in extinction risk for those species for which it has been assessed (i.e., through the IUCN Red List of Threatened Species). Simplistically, it could be assumed that this could be assessed by taking the proportion of species assessed for the IUCN Red List (or equivalent national lists) that are classified as threatened (i.e., in the categories of Critically Endangered, Endangered, or Vulnerable) in 2050, and comparing it with the proportion in 2022 (Smith et al. 1993). However, this would fail to account for two important factors. First, it is highly likely that the pool of species assessed for their risk of extinction will change between 2022 and 2050; for example, the number assessed for the global IUCN Red List has increased

from 150,388 in December 2022 (IUCN 2022) to 157,190 in December 2023 (IUCN 2023a). Species added to the pool may differ in their overall risk of extinction compared with those assessed prior to 2022. Second, even for the same pool of species, most reclassifications on the Red List result from improved knowledge or revised taxonomy (e.g., improved information on the population size, trends, and distribution of species) rather than genuine improvement or deterioration in status (Butchart et al. 2004, 2007). Therefore an overall change in the proportion of threatened species may reflect changes in knowledge more than the effectiveness of conservation efforts in addressing the drivers of extinction (Cuarón 1993).

It is therefore essential to consider only genuine changes in IUCN Red List category when assessing trends in species extinction risk. The Red List Index is designed to do exactly this and can therefore be used to assess progress toward achieving this clause in goal A. To avoid bias, the index is calculated only for groups that have been comprehensively assessed (i.e., those in which all species have been assessed) or those representing a random sample. A global aggregated index is currently calculated from the indices for mammals, birds, amphibians, corals, and cycads (the only groups that have been comprehensively assessed multiple times at present) following the methods outlined in Butchart et al. (2010). The 2022 value of this aggregated index (which is a measure of survival probability ranging from 0, where all species are extinct, to 1, where all species are Least Concern) was 0.724. Its inverse value (i.e., a measure of extinction risk) was therefore 0.276. A tenfold reduction in this value would be 0.028 (equating to a Red List index value of 0.972; figure 1). Progress in reducing extinction risk to increase the Red List index value to this level could be achieved through efforts to improve the status of the most threatened species (e.g., leading to all Critically

Endangered species being downlisted to Endangered) or the least threatened (e.g., leading to all Near Threatened species being downlisted to Least Concern) or by reducing the extinction risk of a combination of species (e.g., leading to all species moving to the next lowest category of extinction risk).

“By 2050, the abundance of native wild species is increased to....” In this third clause, abundance is a measure of population status and is usually expressed as the number of individuals per unit area (e.g., square kilometer). Native wild species are specified to make clear that the focus is on species that occur naturally in the wild in the area under consideration and so excludes alien species and domesticated species. Alien taxa are defined by the convention as “A species, subspecies, or lower taxon, introduced outside its natural past or present distribution, includes any part, gametes, seeds, eggs, or propagules of such species that might survive and subsequently reproduce” (<https://www.cbd.int/invasive/terms.shtml>). The inclusion of this element implies that broad-scale policies (e.g., addressing habitat loss, restoration, and sustainability of production systems such as agriculture, forestry, and fisheries) are required to recover the population abundance of all species, including those that remain common (but depleted) and widespread. The word *increased* clearly denotes a positive trend in abundance from a reference point. For practical purposes, one approach may be to measure the average population abundance of a suite of species compared with a baseline some decades ago for which data are available. For example, the Living Planet Index has a baseline of 1970 (WWF 2022, Ledger et al. 2023), and the Wild Bird Index for Europe uses a baseline of 1980 (Gregory and van Strien 2010), although it should be noted that considerable biodiversity loss occurred before these dates.

“Healthy and resilient levels.” These levels are not defined in the framework, but this wording implies that species face no threat of extinction, and their abundance is increased to a level that ensures they have the attributes necessary for long-term persistence even in the face of perturbations (Capdevilla et al. 2020) and improves their contribution to ecosystem structure and function. Although the goal refers to restoring population abundance, the wording *healthy and resilient levels* implies that species’ populations are healthy throughout their extant native range and that reintroduction to, or natural recolonization, of as much of the former range as possible is essential to meet this goal. Taken together, this would be equivalent to a species being at least Viable (the equivalent of either Least Concern or, otherwise, Near Threatened and not declining) and, ideally, Functional, in each part of its indigenous range, as it is defined in the IUCN Green Status of Species, which provides a standard (Akçakaya et al. 2018, IUCN 2021) for measuring species recovery on the basis of the elements of viability, functionality, and representation.

Target 4: Urgent action for species

The inclusion of this target in the KMGBF demonstrates the value of timely policy-relevant research designed to address specific knowledge gaps. The zero draft of the KMGBF (CBD 2020b) was released on 6 January 2020 and contained six targets to reduce pressures on biodiversity but contained no target to undertake the management actions that are necessary for some species to recover. In response, parties and observers called for this gap to be filled, drawing on evidence provided by a preprint of Bolam et al. (2020), which showed that more than a third of species

would require targeted recovery measures for their conservation status to improve. Subsequent drafts of the Global Biodiversity Framework included a target for undertaking urgent action. The final text adopted stated:

“Ensure urgent management actions to halt human induced extinction of known threatened species and for the recovery and conservation of species, in particular threatened species, to significantly reduce extinction risk, as well as to maintain and restore the genetic diversity within and between populations of native, wild and domesticated species to maintain their adaptive potential, including through *in situ* and *ex situ* conservation and sustainable management practices, and effectively manage human–wildlife interactions to minimize human–wildlife conflict for coexistence.”

There are presently 3960 species that have threats requiring urgent management actions under target 4 and that will not be addressed (or not addressed sufficiently) by actions under other targets, according to the approach outlined in Bolam et al. (2023; see [supplement S1](#)). The most significant threat that requires focused recovery action is invasive nonnative or alien species and disease, with 2361 species requiring urgent management actions to tackle such alien species and disease under target 4 (figure 2; see the [supplement S1](#)). The mitigation of these threats does not guarantee recovery, and additional focused actions will be needed, especially for species with small population sizes or very small ranges and for which species-specific management needs have been identified, to promote species recovery.

“Urgent management actions.” These are species-specific management actions that are required above and beyond the efforts to mitigate threats such as the loss, degradation, and fragmentation of natural habitats; unsustainable harvest; invasive alien species; pollution; and climate change, which are the focus of other targets in the framework. Bolam et al. (2023) found that 57% of threatened species from comprehensively assessed groups on the IUCN Red List of Threatened Species (IUCN 2020) required action in addition to that described in targets 1–3 and 5–7. These include actions necessary to stem population declines and to facilitate recovery, such as supplementary feeding, vaccinations, *ex situ* management (captive breeding, propagation, etc.), translocation, protection of breeding sites and of mature individuals, and the provision of additional habitats (Bolam et al. 2023’s Web Table 1). Achieving target 4 will require the identification of such actions and their urgent implementation at appropriate spatial scale.

Target 4 repeats text from goal A on the outcomes to be achieved: halting human-induced extinction of known threatened species and reducing extinction risk. The early drafts of the text for this target did not contain these outcomes and were focused on the actions needed to achieve the species outcomes described in goal A (see [supplement S2](#) for the text of this target that appeared in zero and first drafts and reports of open-ended working group meetings). The milestones were proposed in early drafts of the KMGBF to provide interim indications of progress toward the 2050 outcomes specified in the goals, but when the parties decided to remove milestones from the structure of the framework in order to simplify it, they considered that the outcome elements captured in the milestones should be reflected elsewhere in the text. The report of the fourth open-ended working group (June 2022) listed these elements as needing further consideration in target 4 (see [supplement S2](#)). Therefore, these species-level outcomes, with statements of what was to be

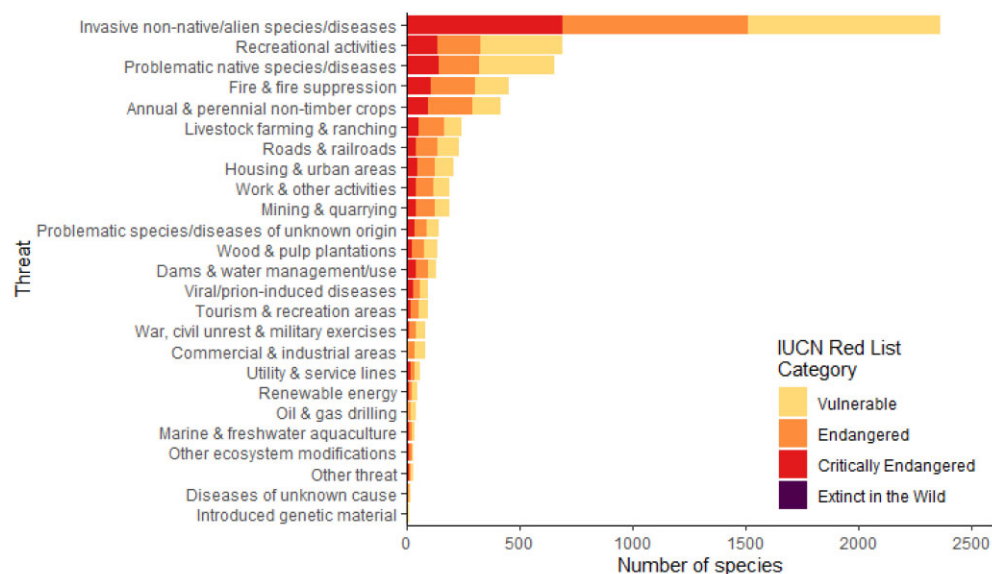


Figure 2. The number of threatened and Extinct in the Wild ($n = 8$ and thus is hard to visualise) species requiring urgent recovery action to address particular threats under target 4, as they are identified by the IUCN Red List (IUCN 2023a), sorted by IUCN Red List category.

achieved (i.e., halting human-induced extinctions and reducing extinction risk), were added to target 4 so that the text contained statements of what was to be achieved by 2030, the timeline for the KMGBF's targets. Most of these elements featured in the final text, and their repetition, especially of *threatened species*, helps to highlight the focus of this target.

Bolam et al. (2023) clarified that the reduction of extinction risk and halting extinctions for species that need recovery measures cannot be achieved solely through the actions identified in target 4 and require a range of other interventions, such as protected and conserved areas, ecosystem restoration, and threat mitigation as outlined in the other targets, especially 1–3 and 5–8. These and other targets are also critical to enable recovery of depleted populations of other threatened and non-threatened species to achieve all species outcomes described in goal A. For this reason, it is important that target 4 is not seen simply as the *species target* but, rather, as a *target for species that require focused recovery actions*. Put another way, in the absence of these urgent actions, such species would continue to decline and fail to recover, despite implementation of the rest of the framework.

“Recovery and conservation of species.” This wording implies not only reducing species' extinction risk (e.g., to Least Concern on the IUCN Red List) but also restoring their populations to levels at which they contribute to ecosystem function and then to maintain them at those levels, consistent with the abundance clause in goal A. There has been increasing attention paid to defining species' recovery (e.g., Redford et al. 2011, Akçakaya et al. 2018) and to demonstrating the recovery potential for species both in the short and long term under scenarios where conservation efforts are sustained and supported (Grace et al. 2021). There have been efforts to operationalize this for pursuing policy and management goals in Europe by defining *favorable conservation status* for species' populations in England (e.g., Mousley et al. 2023) and across the European Union (e.g., European Commission 2020), including setting favorable reference values for populations (e.g.,

Bijlsma et al. 2019). Achieving full recovery of threatened species will require a broader range of actions beyond the urgent management actions called for in target 4, as they are outlined in the other targets in the framework. Whatever the metric, recovery needs to be measured relative to an appropriate, quantifiable baseline.

“To significantly reduce extinction risk.” The wording in this phrase is concerned with implementing actions that contribute to a significant (i.e., large and measurable) reduction in extinction risk of species and ensuring the recovery and conservation of all species, consistent with the extinction risk clause of goal A. Using the IUCN Red List to document conservation status (e.g., Critically Endangered, Endangered, or Vulnerable) allows such large and sustained genuine reductions in extinction risk to be measured through the Red List Index (Butchart et al. 2004, 2007; see the “Indicators for measuring progress” section).

“In situ and ex situ conservation.” The target states that urgent management action includes both *in situ* and *ex situ* conservation—that is, in the wild and, where appropriate and needed, in captive breeding or propagation facilities from which individuals can be reintroduced back into native ranges. *Ex situ management* can be defined as “conditions under which individuals are spatially restricted with respect to their natural spatial patterns or those of their progeny, are removed from many of their natural ecological processes, and are managed on some level by humans.” (IUCN/SSC 2014). It is important that the full range of management possibilities is considered, as was indicated by the breadth of both *in situ* and *ex situ* management actions that has contributed to the avoidance of extinction of 28–48 bird and mammal species since 1993 (Bolam et al. 2021) and the importance of *ex situ* conservation in providing options for species recovery through the eventual return of Extinct in the Wild species back to their native range (Smith et al. 2023).

“Sustainable management practices.” Reducing extinction risk for species that are the focus for this target requires sustained

intervention that will deliver a long-term improvement in conservation status. This phrase, therefore, refers to management practices that can be sustained over time, rather than the “sustainable management” of wild species, which is the subject of target 5, whereas the importance of sustainable use of biodiversity to people is the focus of target 9. During interventions by parties during the fourth and fifth meetings of the open-ended working group established to facilitate negotiations of the KMGBF, there were different interpretations of *sustainable*. Some parties assumed it to relate to sustainable use that would benefit species conservation, but the final wording makes clear that it is the sustainability of interventions that is the focus of this clause. This is important because many studies have shown that conservation recoveries take time to achieve (e.g., 16 years on average in the cases examined by Young et al. 2014), and even once recovery is achieved, many species will remain conservation dependent (Scott et al. 2010, Grace et al. 2021).

“Effectively manage human–wildlife interactions to minimize human–wildlife conflict for coexistence.” Human–wildlife conflict is a significant threat to species, as well as to human lives and livelihoods, food security, and sustainable development (Gross et al. 2021, IUCN 2023b). The issue of human–wildlife conflict was included in this target when it first appeared in the updated zero draft (see [supplement S2](#)). There was discussion about whether this element should remain in this target, which initially had a clear focus on recovery actions, or should be moved to target 5 (sustainable use) or target 9 (benefits to people) to reflect the ecological and social aspects of human–wildlife interactions (CBD 2021). In the adopted text, it remained in this target and was modified to reflect broader perspectives of human–wildlife interactions and coexistence (see [supplement S2](#)). Minimizing human–wildlife conflict will typically require a very different set of actions than the urgent management actions required by the first part of target 4 and holistic sociobiological approaches.

Indicators for measuring progress

A monitoring framework was also adopted at COP15, and it was agreed that this would be reviewed at COP16 (CBD 2022b) in late 2024. The Ad Hoc Technical Expert Group (AHTEG) on Indicators was established to work on further development and operationalization (see annex II of CBD 2022b), and the group's final report was released in April 2024 (CBD 2024a). The monitoring framework includes headline (a minimum set to measure global progress), component (optional, and covering elements of goals and targets), and complementary (optional for thematic or in-depth analysis of each goal and target) indicators. Many of the indicators envisaged at the point of adoption require further development, with the AHTEG developing metadata for each headline indicator, including recommended disaggregations (CBD 2024b). This group also developed a set of standard questions to be answered by countries in their CBD national reports to provide counts of the number of countries carrying out particular activities (referred to as *binary indicators*), but none of these relate to target 4. The group recommended that further development of the monitoring framework is needed to provide an adequate system for measuring progress toward the KMGBF's goals and targets (CBD 2024b).

The monitoring framework states that the Red List Index (Butchart et al. 2004, 2007) will be used as a headline indicator to monitor progress toward both goal A and target 4. Although the Red List Index is highly relevant for assessing progress toward

the tenfold reduction in extinction risk described in goal A and the significant reduction in extinction risk specified in target 4, it measures these outcomes, not the implementation of urgent management actions per se, as is called for in target 4. This is significant given that the intent of the targets is to define the actions to be implemented by 2030, whereas the goals state the outcomes to be achieved by 2050. There is, therefore, a clear gap as there is no indicator for measuring the implementation of action identified in target 4 that is necessary to achieve the required reduction in extinction risk (CBD 2024b). Bolam et al. (2023) provided a method for identifying the species that need urgent recovery action, which could form the focus for an appropriate indicator for this key element of target 4, while the development of the Green Status of Species may allow for development of an indicator of recovery of these species to be tracked in due course (Grace et al. 2021) and for determining whether species have indeed returned to healthy and resilient levels, as was stated in goal A. Monitoring progress toward increasing the abundance of native wild species will require indicators such as the Living Planet Index (available globally for vertebrates, with plans to expand to other taxa; WWF 2022, Ledger et al. 2023) or, given the methodological challenges associated with unstructured population indicators (Leung et al. 2020), with metrics based on more systematic monitoring of subsets of species and regions (e.g., the Wild Bird Index; BirdLife International 2022). Geldmann et al. (2023) highlighted that the absence of such an indicator at headline level on abundance appears as a key omission for tracking progress to goal A, and the AHTEG on indicators also noted that the existing headline indicators do not enable assessment of progress toward this element of the goal (CBD 2024b).

What is needed now?

This review is a first step towards a consistent understanding of the politically negotiated species elements in goal A and target 4 and makes clear the ambition for species agreed by all parties. As national biodiversity strategies and action plans are developed, it is important to consider what is needed to act efficiently and effectively in pursuing this ambition.

Identifying priorities for each party. Achieving the outcomes for species stated in goal A will require progress toward the delivery of all the targets in the framework, not just target 4. Targets 1, 5, 6, 7, and 8 are concerned with reducing pressures, all of which affect species. Target 2 is about restoring degraded ecosystems, which will increasingly benefit the species that these ecosystems once supported, and target 3 is concerned with the well-connected protection and conservation of areas of particular importance for biodiversity (e.g., key biodiversity areas; IUCN 2016), including for species. Target 4 recognizes that for some species these responses will be insufficient to prevent their extinction and enable their recovery, and targeted species-specific actions are needed. Targets 9–13 on “Meeting people's needs through sustainable use and benefit sharing” will also be important, as will those targets on “tools and solutions for implementation and mainstreaming,” particularly those targets focused on sectors with a significant impact on species and with increasing resources available for urgent management action and with reducing threats.

For many, if not the majority of threatened species, assessment of their threats and identification of actions has already been undertaken and is widely available (e.g., IUCN 2023a). For these species, accelerated implementation of those plans is now essential, recognizing that, although implementing the entire

KMGBF is understood to be urgent, target 4 is the only target in the framework where urgent action is explicitly called for.

However, for other species, such assessments have not yet been undertaken. Therefore, it will be necessary to understand which actions will make the biggest difference to species extinction rate, extinction risk, and abundance in each context (e.g., for each party). This will allow action to be focused on policies and management that are most likely to be effective in addressing targets and reducing pressures. In some countries, these may relate to addressing land-use change, whereas in others, it could be tackling invasive species. For most parties, actions covering a range of the targets will be necessary for success. This suggests that, first, it is necessary to understand which threats are driving extinction risk in each country, to allow the most appropriate interventions to be identified, maximizing impact and minimizing wasted effort. The Species Threat Abatement and Restoration metric (STAR; Mair et al. 2021, 2023, Chaudhary et al. 2022, Irwin et al. 2022) offers such an approach and identifies the main threats driving extinction risk in any spatial unit, showing where those threats are having their impact on threatened species. The accuracy of this metric will clearly increase over time as reassessments improve the documentation of species distributions and threats on the IUCN Red List (IUCN 2023a), as the number of taxonomic groups underpinning STAR is expanded, and as methods are developed to support STAR calibration with local data.

In addition, it is critical that urgent recovery actions are directed toward those species most in need. Bolam et al. (2023) described a method for identifying those species. A priority action for all parties now is to use this method to first identify those species in need of urgent actions, then identify which threats most urgently require abatement, and use this information to plan, cost, resource, and implement these actions to halt extinctions, reduce extinction risk, and improve population status.

Access to information that will support attainment of species elements in goal A. Implementing targets 1–8 in order to achieve the species outcomes in goal A, as well as the ecosystem and genetic diversity outcomes, will require substantial effort. Section C of the KMGBF gives a suite of considerations to be taken into account when implementing the framework. These include taking a whole of government and whole of society approach, indicating that responsibility lies across government departments and agencies. It also means ensuring the full, equitable, inclusive, effective, and gender-responsive representation and participation in decision-making of Indigenous peoples and local communities, galvanizing collective effort, and acknowledging the importance of scientific evidence and traditional knowledge and practices when implementing the framework. The last clause of the framework states the importance of “raising awareness on the critical role of science, technology, and innovation to strengthen scientific and technical capacities to monitor biodiversity, address knowledge gaps, and develop innovative solutions to improve the conservation and sustainable use of biodiversity.” All of this recognizes the need to draw on all available science, evidence, approaches, worldviews, knowledge, and tools to make the most progress toward the goals and targets.

There is a wide range of resources on species available to support decision-making and monitoring. These include the IUCN Red List of Threatened Species (IUCN 2023a), which is not only an assessment of the extinction risk facing species but is also a source of information on each species’ threats and the conservation actions required for their recovery. A number

of countries have developed their own national Red Lists (see, e.g., Raimondo et al. 2022 and www.nationalredlist.org), and in some, it informs decision-making (e.g., Kyrkjeeide et al. 2021). The Red List is one of several globally authoritative data sources available through the Integrated Biodiversity Assessment Tool (IBAT; www.ibat-alliance.org), which also includes the World Database on Protected Areas (part of Protected Planet) and the World Database on Key Biodiversity Areas and allows STAR (see above) scores to be derived at a range of spatial scales.

Many of the resources that can inform actions to pursue implementation of the species elements in the KMGBF have been brought together in the *Global Species Action Plan* (IUCN 2023c), which lists the actions needed to implement each of the KMGBF targets to achieve species outcomes and should therefore be helpful in the development of national biodiversity strategies and action plans. The *Global Species Action Plan* is linked to an online toolkit of tools, training support, and technical guidance.

Capacity building, cooperation, and knowledge exchange. Maggs et al. (2022) described some of the capacity that will need to be developed and shared in order to implement the species-level ambitions of the KMGBF. Although the capacity-building plan that was adopted at CoP15 (CBD 2022c) provides the high-level approach, Maggs et al. (2022) suggested that there is a need to develop capacity in two overarching areas: first, the need for tools and data to identify and prioritize both the threats that need to be tackled and the species that need particular attention under target 4 and, second, to develop and maintain an increase in the capacity of people who can act. The resources above may well provide many of the tools, approaches, and methods needed, but there is a clear need to significantly upscale support to parties, especially those from developing countries with high levels of species endemism, to build the capability of people, resources, and organizations that can act for species in the KMGBF, especially before 2030.

The KMGBF contains ambitious outcomes for species in goal A and targets to achieve these. Our analysis of the species elements in the framework provides an interpretation of what these politically negotiated elements mean for implementation, given their social and ecological contexts. It is critical that all stakeholders, parties, businesses, and members of civil society identify where they can act and then implement necessary actions. Efficient provision of and access to information and the development and sharing of capacity that will inform and enable implementation are urgently needed to achieve these outcomes. Furthermore, it is essential that adequate financial resources are available to parties and other actors to meet agreed targets and goals. This will require substantial scaling up of current investments.

Conclusions

Our review helps to clarify the ambition of the species elements of the KMGBF and begins the process of providing consistent interpretation of key terms and phrases within goal A and target 4. This common understanding is critical if implementation is to be adequate and comparable across parties and other actors and to ensure that implementation is focused on those actions that are most important to achieve the agreed outcomes for species that are stated in goal A. Although these outcomes are ambitious, research has shown that, with sufficient resources deployed appropriately, extinctions can be avoided, and species’ populations can be recovered. Our review may support parties updating and implementing their national biodiversity strategies

and action plans, by clarifying the outcomes required and actions needed to achieve these.

There is much scientific literature that can inform implementation, and a range of relevant guidance, tools, and metrics exist to support actors in developing appropriate interventions. There are clear research needs arising from our review, including developing more robust approaches for modeling the extinction rate of all species (inferred from extinction rates for known species or severity of threats or from other methods), developing an operational definition of what constitutes a healthy and resilient population that can be applied across taxonomic groups, and producing an appropriate indicator to measure this and that can be applied in countries with greatly varying access to resources, defining the set of species and the urgent management actions they require that are relevant to target 4, and developing an indicator to measure progress toward target 4 by quantifying implementation of urgent recovery actions for species. Filling these knowledge gaps may make a significant difference to interpretation of what can be achieved and measured by 2030.

With only 6 years remaining until 2030, governments and other actors must rapidly translate the bold commitments made in the KMGBF into effective policies and management actions that are implemented comprehensively and at adequate scale. Achieving the species outcomes in the framework will be challenging but is necessary to ensure the persistence of biodiversity and achieving the CBD's vision of living in harmony with nature by 2050.

Supplemental material

Supplemental data are available at [BIOSCI](#) online.

Author contributions

Philip J.K. McGowan (Conceptualization, Project administration, Writing – original draft, Writing – review & editing), Alison Hutchinson (Conceptualization, Writing – original draft, Writing – review & editing), Thomas M. Brooks (Writing original draft, Writing review & editing), Wendy Elliott (Writing – original draft, Writing – review & editing), Michael Hoffmann (Writing – original draft, Writing – review & editing), Louise Mair (Visualization, Writing – review & editing), Amy McDougall (Writing – review & editing), Domitilla C. Raimondo (Writing – original draft, Writing – review & editing), and Stuart H.M. Butchart (Conceptualization, Writing original draft, Writing review & editing, Visualization).

References cited

- Akçakaya HR, Keith DA, Burgman M, Butchart SHM, Hoffmann M, Regan HM, Harrison I, Boakes E. 2017. Inferring extinctions III: A cost–benefit framework for listing extinct species. *Biological Conservation* 214: 336–342.
- Akçakaya HR, et al. 2018. Quantifying species recovery and conservation success to develop an IUCN Green List of species. *Conservation Biology* 32: 1128–1138.
- Bijlsma RJ, Agrillo E, Attorre F, Boitani L, Brunner A, Evans P, Foppen R, Gubbay S, Janssen JAM, van Kleunen A. 2019. Defining and applying the concept of favourable reference values for species habitats under the EU birds and habitats directives: Examples of setting favourable reference values. Wageningen Environmental Research. Report no. 2929.
- BirdLife International. 2022. *State of the World's Birds*. BirdLife International.
- Bolam FC, et al. 2021. How many bird and mammal extinctions has recent conservation action prevented? *Conservation Letters* 14: e12762.
- Bolam FC, et al. 2023. Over half of threatened species require targeted recovery actions to avert human-induced extinction. *Frontiers in Ecology and the Environment* 21: 64–70.
- Brattstrom BH. 1990. Biogeography of the Islas Revillagigedo, Mexico. *Journal of Biogeography* 17: 177–183.
- Butchart SHM, Stattersfield AJ, Bennun LA, Shutes SM, Akçakaya HR, Baillie JEM, Stuart SN, Hilton-Taylor C, Mace GM. 2004. Measuring global trends in the status of biodiversity: Red List Indices for birds. *PLOS Biology* 2: e383.
- Butchart SHM, Akçakaya HR, Chanson J, Baillie JEM, Collen B, Quader S, Turner WR, Amin R, Stuart SN, Hilton-Taylor C. 2007. Improvements to the Red List Index. *PLOS ONE* 2: e140.
- Butchart SHM, et al. 2010. Global biodiversity: indicators of recent declines. *Science* 328: 1164–1168.
- Capdevila P, Stott I, Beger M, Salguero-Gómez R. 2020. Towards a comparative framework of demographic resilience. *Trends in Ecology and Evolution* 35: 776–786.
- [CBD] Convention on Biological Diversity. 2020a. *Zero Draft of the Post-2020 Global Biodiversity Framework*. CBD/WG2020/2/3. Secretariat of the Convention on Biological Diversity, Montréal, Canada.
- [CBD] Convention on Biological Diversity. 2020b. *Update of the Zero Draft of the Post-2020 Global Biodiversity Framework*. CBD/POST2020/PREP/2/1. Secretariat of the Convention on Biological Diversity, Montréal, Canada.
- [CBD] Convention on Biological Diversity. 2021. *Reflections by the Co-Chairs Following the First Session of the Third Meeting of the Working Group on the Post-2020 Global Biodiversity Framework*. CBD/WG2020/3/6. Secretariat of the Convention on Biological Diversity, Montréal, Canada.
- [CBD] Convention on Biological Diversity. 2022a. *Kunming–Montreal Global Biodiversity Framework*. CBD/COP/DEC/15/4. Secretariat of the Convention on Biological Diversity, Montréal, Canada.
- [CBD] Convention on Biological Diversity. 2022b. *Monitoring Framework for the Kunming–Montreal Global Biodiversity Framework*. CBD/COP/DEC/15/5. Secretariat of the Convention on Biological Diversity, Montréal, Canada.
- [CBD] Convention on Biological Diversity. 2022c. *Capacity-Building and Development and Technical and Scientific Cooperation*. CBD/COP/DEC/15/8. Secretariat of the Convention on Biological Diversity, Montréal, Canada.
- [CBD] Convention on Biological Diversity. 2024a. *Guidance on Using the Indicators of the Monitoring Framework of the Kunming–Montreal Global Biodiversity Framework*. CBD/SBSTTA/26/INF/14. Secretariat of the Convention on Biological Diversity, Montréal, Canada.
- [CBD] Convention on Biological Diversity. 2024b. *Monitoring Framework for the Kunming–Montreal Global Biodiversity Framework*. CBD/SBSTTA/26/2. Secretariat of the Convention on Biological Diversity, Montréal, Canada.
- Chaplin-Kramer R, et al. 2019. Global modeling of nature's contributions to people. *Science* 366: 255–258.
- Chaudhary A, Mair L, Strassburg BBN, Brooks TM, Menon V, McGowan PJK. 2022. Sub-national assessment of threats to Indian biodiversity and habitat restoration opportunities. *Environmental Research Letters* 17: 054022.
- Costello MJ, May RM, Stork NE. 2013. Can we name Earth's species before they go extinct? *Science* 339: 413–416.
- Cuarón A. 1993. Extinction rate estimates. *Nature* 366: 118.
- Díaz S, et al. 2020. Set ambitious goals for biodiversity and sustainability. *Science* 370: 411–413.

- European Commission. 2020. Report from the Commission to the European Parliament, the Council and the European Economic and Social Committee: The State of Nature in the European Union Report on the Status and Trends in 2013–2018 of Species and Habitat Types Protected by the Birds and Habitats Directives. European Commission. Report no. COM(2020) 635 final.
- Exposito-Alonso M. 2022. Genetic diversity loss in the Anthropocene. *Science* 377: 1431–1435.
- Geldmann J, Byaruhanga AB, Gregory RD, Visconti P, Xu H. 2023. Prioritize wild species abundance indicators. *Science* 380: 591–592.
- Grace MK, et al. 2021. Testing a global standard for quantifying species recovery and assessing conservation impact. *Conservation Biology* 35: 1833–1849.
- Gregory RD, van Strien A. 2010. Wild bird indicators: Using composite population trends of birds as measures of environmental health. *Ornithological Science* 9: 3–22.
- Gross E, Jayasinghe N, Brooks A, Polet G, Wadhwa R, Hilderink-Koopmans F. 2021. A Future for All: the Need for human Wildlife Coexistence. World Wildlife Fund.
- Habibullah MS, Din BH, Tan SH, Zahid H. 2022. Impact of climate change on biodiversity loss: Global evidence. *Environmental Science and Pollution Research* 29: 1073–1086.
- Hochkirch A, et al. 2023. A multi-taxon analysis of European Red Lists reveals major threats to biodiversity. *PLOS ONE* 18: e0293083.
- [IPCC] Intergovernmental Panel on Climate Change. 2023. Summary for policymakers. Pages 1–34 in Lee H Romero J, eds. *Climate Change 2023: Synthesis Report: Contribution of Working Groups I, II, and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. IPCC.
- Irwin A, Geschke A, Brooks TM, Siimaki J, Mair L, Strassburg BBN. 2022. Quantifying and categorizing national extinction-risk footprints. *Scientific Reports* 12: 5861.
- [IUCN] International Union for Conservation of Nature. 2012. *Guidelines for Application of IUCN Red List Criteria at Regional and National Levels*, vers. 4.0. IUCN.
- [IUCN] International Union for Conservation of Nature. 2016. *A Global Standard for the Identification of Key Biodiversity Areas*, vers. 1.0. IUCN.
- [IUCN] International Union for Conservation of Nature. 2020. *The IUCN Red List of Threatened Species (v2020-3)*. IUCN.
- [IUCN] International Union for Conservation of Nature. 2021. *IUCN Green Status of Species: a Global Standard for Measuring Species Recovery and Assessing Conservation Impact*, vers. 2.0. IUCN.
- [IUCN] International Union for Conservation of Nature. 2022. *The IUCN Red List of Threatened Species*, vers. 2022-2. IUCN.
- [IUCN] International Union for Conservation of Nature. 2023a. *The IUCN Red List of Threatened Species*, vers. 2023-1. IUCN.
- [IUCN] International Union for Conservation of Nature. 2023b. *IUCN SSC Guidelines on Human–Wildlife Conflict and Coexistence*. IUCN.
- [IUCN] International Union for Conservation of Nature. 2023c. *Global Species Action Plan: Supporting Implementation of the Kunming–Montreal Global Biodiversity Framework*. IUCN.
- [IUCN/SSC] International Union for Conservation of Nature Species Survival Commission. 2014. *Guidelines on the Use of ex Situ Management for Species Conservation*, vers. 2.0. IUCN/SSC.
- Kyrkjeeide MO, Pedersen B, Evju M, Magnussen K, Mair L, Bolam FC, McGowan PJK, Vestergaard KM, Braa J, Rusch G. 2021. Bending the curve: Operationalizing national red lists to customize conservation actions to reduce extinction risk. *Biological Conservation* 261: 109227.
- Ledger SHE, et al. 2023. Past, present, and future of the Living Planet Index. *npj Biodiversity* 2: 12.
- Leung B, Hargreaves AL, Greenberg DA, McGill B, Dornelas M, Freeman R. 2020. Clustered versus catastrophic global vertebrate declines. *Nature* 588: 267–271.
- Maggs G, Slater HD, McGowan PJK. 2022. How can we increase capacity for species conservation in the post-2020 Global Biodiversity Framework? *Oryx* 56: 321–322.
- Mair L, et al. 2021. A metric for spatially explicit contributions to science-based species targets. *Nature Ecology and Evolution* 5: 836–844.
- Mair L, et al. 2023. Quantifying and mapping species threat abatement opportunities to support national target setting. *Conservation Biology* 37: e14046.
- McCarthy D, et al. 2012. Financial costs of meeting global biodiversity conservation targets: Current spending and unmet needs. *Science* 338: 946–949.
- Mora C, Tittensor DP, Adl S, Simpson AGB, Worm B. 2011. How many species are there on Earth and in the ocean? *PLOS Biology* 9: 1–8.
- Mousley S, Van Vliet W, Cork C. 2023. *Defining Favourable Conservation Status in England: Natural England Approach*. Natural England. Evidence information note no. EIN062.
- Murali G, Iwamura T, Meiri S, Roll U. 2023. Future temperature extremes threaten land vertebrates. *Nature* 615: 461–467.
- Nicholson E, et al. 2021. Scientific foundations for an ecosystem goal, milestones and indicators for the post-2020 global biodiversity framework. *Nature Ecology and Evolution* 5: 1338–1349.
- Pimm SL, Russell GJ, Gittleman JL, Brooks TM. 1995. The future of biodiversity. *Science* 269: 347–350.
- Pimm SL, Jenkins CN, Abell R, Brooks TM, Gittleman JL, Joppa LN, Raven PH, Roberts CM, Sexton JO. 2014. The biodiversity of species and their rates of extinction, distribution, and protection. *Science* 344: 1246752.
- Preston-Allen RGG, Häkkinen H, Cañellas-Dols L, Ameca y Juárez EI, Orme CDL, Pettorelli N. 2024. Geography, taxonomy, extinction risk and exposure of fully migratory birds to droughts and cyclones. *Global Ecology and Biogeography* 33: 63–73.
- Purvis A, et al. 2019. Status and trends: Nature. Pages 209–308 in Brondizio ES, Settele J, Díaz S Ngo HT, eds. *Global Assessment Report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.
- Raimondo D, et al. 2022. Using red list indices to monitor extinction risk at national scales. *Conservation Science and Practice* 5: e12854.
- Raven PH, Ceballos G, Ehrlich PR, Lovejoy TE. 2020. RE: Quantitative targets for biodiversity preservation. *Science* (7 July 2020). www.science.org/doi/10.1126/science.aba6592.
- Redford KH, et al. 2011. What does it mean to conserve a (vertebrate) species? *BioScience* 61: 39–48.
- Roberts DL, Hinsley A, Fiennes S, Verissimo D. 2023. Understanding the drivers of expert opinion when classifying species as extinct. *Conservation Biology* 37: e13968.
- Rodrigues ASL, Pilgrim JD, Lamoreux JF, Hoffmann M, Brooks TM. 2006. The value of the IUCN Red List for conservation. *Trends in Ecology and Evolution* 21: 71–76.
- Rounsevell MD, Harfoot M, Harrison PA, Newbold T, Gregory RD, Mace GM. 2020. A biodiversity target based on species extinctions. *Science* 368: 1193–1195.
- Scott JM, Goble DD, Haines AM, Wiens JA, Neel MC. 2010. Conservation-reliant species and the future of conservation. *Conservation Letters* 3: 91–97.
- Smith D, et al. 2023. Extinct in the wild: The precarious state of Earth's most threatened group of species. *Science* 379: eadd2889.

- Smith FDM, May RM, Pellew R, Johnson TH, Walter K. 1993. Estimating extinction rates. *Nature* 364: 494–496.
- Stuart SN, Wilson EO, McNeely JA, Mittermeier RA, Rodríguez JP. 2010. Barometer of life. *Science* 328: 177.
- Tripathy KP, Mukherjee S, Mishra AK, Mann ME, Williams AP. 2023. Climate change will accelerate the high-end risk of compound drought and heatwave events. *Proceedings of the National Academy of Sciences* 120: e2219825120
- [UN] United Nations. 1992. Convention on Biological Diversity. Convention on Biological Diversity: Rio de Janeiro, 5 June 1992. UN. https://treaties.un.org/doc/Treaties/1992/06/19920605%2008-44%20PM/Ch_XXVII_08p.pdf.
- Visconti P, et al. 2016. Projecting global biodiversity indicators under future development scenarios. *Conservation Letters* 9: 5–13.
- Wilson EO. 1992. *The Diversity of Life*. Belknap Press.
- [WWF] World Wildlife Fund. 2022. *Living Planet Report 2022: Building a Nature-Positive Society*. WWF.
- Young RP, Hudson MA, Terry AMR, Jones CG, Lewis RE, Tatayah V, Zuel N, Butchart SHM. 2014. Accounting for conservation: Using the IUCN Red List Index to evaluate the impact of a conservation organization. *Biological Conservation* 180: 84–96.

Received: March 19, 2024. Revised: May 22, 2024

© The Author(s) 2024. Published by Oxford University Press on behalf of the American Institute of Biological Sciences. This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited. For commercial re-use, please contact journals.permissions@oup.com