
Biodiversity Indicators Based on Trends in Conservation Status: Strengths of the IUCN Red List Index

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Introduction

In 2002, through the Convention on Biological Diversity, the world's leaders adopted a target of significantly reducing the rate of biodiversity loss by 2010. This target has stimulated considerable interest in developing and testing indicators for tracking trends in the status of biodiversity. Quayle and Ramsay (2005) analyzed the 1992 and 2002 British Columbia Red List of terrestrial vertebrates to determine whether changes in the composition of taxa on the list reflected changes in the status of those taxa and hence to test its utility as an indicator of biodiversity trends. These lists derive entirely from the British Columbia subnational conservation status ranks for these species (based on criteria developed by NatureServe) and bear no relation to global or national IUCN (World Conservation Union) Red Lists.

Quayle and Ramsay found that almost two-thirds of additions and deletions from the list were the result of improved knowledge, different assessment procedures, and taxonomic revisions, rather than genuine changes in the status of taxa. Furthermore, they examined finer-resolution information on the status of these species (their "S rank") and found that some species improved or deteriorated in status over the period but not sufficient to be added or removed from the provincial red list. Finally, they suggest that 21% of taxa on the British Columbia Red List would have still qualified to be listed even in prehistoric times, owing to their naturally small and/or vulnerable populations and distributions, and hence that

a biodiversity indicator based on the British Columbia Red List would have a baseline shifted away from zero.

Based on these findings, particularly the first, they "discourage the continued use of indicators based solely on conservation status as a means of tracking biodiversity" and "believe it is clearly inappropriate, and potentially misleading, to use a threatened species list as a means of tracking biodiversity over time." Although it may be valid to conclude that an analysis of the British Columbia Red List alone is inadequate as an indicator of biodiversity trends, not all such lists should be dismissed. In the case of the IUCN Red List of Threatened Species (www.iucnredlist.org), the difficulties can be overcome to provide a robust, useful, and policy-relevant index of trends in the extinction risk of species (Brooks & Kennedy 2004; Butchart et al. 2004, 2005).

IUCN Red List Index

The IUCN Red List Index (RLI) overcomes the three problems identified by Quayle and Ramsay. It is based on the IUCN Red List, which is widely recognized as the most objective and authoritative listing of species that are at risk of global extinction (Lamoreux et al. 2003; Hambler 2004; Rodrigues et al. 2006; Regan et al. 2005). Quantitative criteria based on population size, rate of decline, and area of distribution are used to assign species to categories of relative extinction risk (IUCN 2001). The criteria are

clear and comprehensive but are sufficiently flexible to deal with uncertainty (Akçakaya et al. 2000). The assessments are not simply based on expert opinion; they must be supported with detailed documentation of the best available data, with justifications, sources, and estimates of uncertainty and data quality (IUCN 2005). Red List Authorities are appointed to organize independent scientific review and to ensure consistent categorization between species, groups, and assessments. A Red List Standards and Petitions Working Group monitors the process and resolves challenges and disputes to listings. A coordinated global program is overseen by four partner organizations: the IUCN Species Survival Commission, BirdLife International, NatureServe, and the Center for Applied Biodiversity Science at Conservation International, with additional partners being recruited, in particular to provide plant and marine expertise.

The RLI illustrates changes in the overall threat status (relative projected extinction risk) for sets of species. An RLI has been calculated for the world's birds for 1988–2004 (Butchart et al. 2004), a preliminary RLI has been produced for the world's amphibians for 1980–2004 (Butchart et al. 2005), a national-scale RLI has been calculated for the birds, mammals, and amphibians of Madagascar (D. Knox et al., unpublished data), and global RLIs will also be available for mammals, cycads, and conifers by 2010, along with the first data points for reptiles and selected freshwater fishes, plants, and marine groups. As well as monitoring global trends for different taxonomic groups, the RLI can be disaggregated to compare trends for suites of species in different biogeographic regions, ecosystems, habitats, or taxonomic subgroups or for species relevant to different international treaties such as the Ramsar Convention on Wetlands (Butchart et al. 2004, 2005).

Each of the three problems identified by Quayle and Ramsay are addressed by the methods used to calculate the RLI. (1) Quayle and Ramsay's primary reason for dismissing the use of red lists alone to track biodiversity trends is that the majority of changes to the lists reflect changes in knowledge, taxonomy, or assessment protocols. This is equally true for the IUCN Red List, with, for example, only 20% of category changes for birds between 2000 and 2004 reflecting genuine improvement or deterioration in the status of the species concerned. However, the IUCN Red List assessment procedure requires the reason for any category change to be identified (IUCN 2001; IUCN 2005). "Genuine" is only assigned when there has been a real improvement or deterioration in the status of a species and when the magnitude of the change in population size or distribution area has been sufficient to cross the thresholds for a higher or lower red list category (Butchart et al. 2004). The RLI formulation is such that only these genuine category changes contribute to the changing index value. Although there may be delays for some species before assessors become aware of gen-

uine changes in status having occurred, it is possible to estimate the extent of this problem and calculate error estimates for the most recent RLI value (Butchart et al. 2004, 2005). Genuine status changes that are retrospectively identified because of such time lags can be included in the index so that it represents the best possible understanding of the timing and magnitude of changes in extinction risk.

(2) The British Columbia Red List is a list of species and subspecies that are extirpated, endangered, or threatened in British Columbia (<http://srmwww.gov.bc.ca/atrisk/red-blue.htm>). Quayle and Ramsay note that the number of species added to or deleted from the list are a crude measure of changes in the status of species. Three species (2.8%) were known (from changes in their "S rank") to have improved in status over the period, but the improvements were insufficient for them to be dropped from the list. Another four species (3.8%) on the list deteriorated in status. The IUCN Red List comprises ordinal ranked categories of relative extinction risk ranging from extinct, extinct in the wild, critically endangered, endangered, vulnerable, and near threatened to least concern (IUCN 2001). The RLI is based on movements of species through these categories and not simply those joining or leaving the threatened categories (extinct in the wild, critically endangered, endangered, and vulnerable). It is therefore a more precise measure of changes in the status of species.

(3) As with the British Columbia Red List, a number of species are listed on the global IUCN Red List because of their inherently high extinction risk owing to natural rarity (particularly those listed as vulnerable under criterion D2). Quayle and Ramsay argue that indicators based on such lists have nonintuitive baselines. However, baselines for many biodiversity indicators tend to be set at the earliest date of available data (e.g., 1970 for the Living Planet Index (Loh & Wackemagel 2004), 1980 for the European Wild Bird Index (Gregory et al. 2005), 1950 for an index of global amphibian population trends (Houlahan et al. 2000), and 1950 for the Marine Trophic Index (Pauly & Watson 2005). In each case, the indicator has to be presented with appropriate interpretation to explain that the baseline value is arbitrary to some extent. In a similar way, the RLI baseline is set to the index value in the first assessment of the species group concerned (e.g., 1980 for amphibians, 1988 for birds). In terms of the 2010 target, the baseline value is irrelevant because the target is framed in terms of the rate of loss of biodiversity rather than absolute levels of biodiversity relative to some arbitrary baseline value or date.

Quayle and Ramsay (2005) also argue that the natural rarity of some species on red lists causes status-based indicators to have a restricted dynamic range because such species are unlikely to respond to positive environmental change. Although this may be a problem with lists at small spatial scales (e.g., provincial), it is less significant at the global or continental scale. For example, species that are

naturally rare might have a very small or restricted population within a small country or province but a large-enough global population that they would not have been globally red listed in historical times. This, combined with the relative nature of the 2010 target and of the baselines of most indicators as discussed above, means that the natural rarity of some species does not make it particularly difficult to interpret conservation-status-based indicators at global or bioregional levels.

Strengths of the RLI

The key strength of the RLI is its geographic representativeness, being based on information for nearly all species in a taxonomic group (worldwide or at the relevant sub-global scale). Its principal weakness is that it has a somewhat coarse temporal resolution: species may take some time to change in population size, trend, or range size sufficiently to cross the thresholds to qualify for placement in a higher or lower red-list category. Although population-trend-based indicators show higher temporal resolution (greater sensitivity to status changes), such information tends to be available only for certain types of species in better-known (often biodiversity poor) regions (Brooks & Kennedy 2004). Hence the RLI and population-trend-based indicators are highly complementary in terms of their geographic representativeness and temporal resolution.

The strengths of the RLI have been recognized at the global level, and an indicator on “trends in the status of threatened species” has been moved into the top group of indicators for “immediate testing” by the Convention of Biological Diversity Subsidiary Body on Scientific, Technical and Technological Advice (Secretariat of the Convention on Biological Diversity 2005). In addition, RLIs based on appropriate subsets of species are currently being considered for adoption by the Ramsar Convention on Wetlands, the Convention on Migratory Species (CMS), the Agreement on the Conservation of Albatrosses and Petrels under the CMS, and for European threatened species through the Streamlining European Biodiversity Indicators—2010 initiative coordinated by the European Environment Agency, the European Center for Nature Conservation, and the United Nations Environment Program—World Conservation Monitoring Center.

Conclusions

We concur with Quayle and Ramsay’s final point: indicators need to be presented with explicit clarification of the assumptions, limitations, and implications. Although we agree with their conclusions regarding the limitations of the British Columbia Red List, we suggest these limitations should not be generalized to all threatened species

lists. In particular, the authors may not have been aware of the recently developed IUCN Red List Index when they wrote their paper. The RLI overcomes the issues identified by Quayle and Ramsay, and other potential limitations, to provide a powerful tool among the suite of indicators needed to measure trends in biodiversity at the global, regional, and national scale.

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