Measurement uncertainty may stall global biodiversity targets

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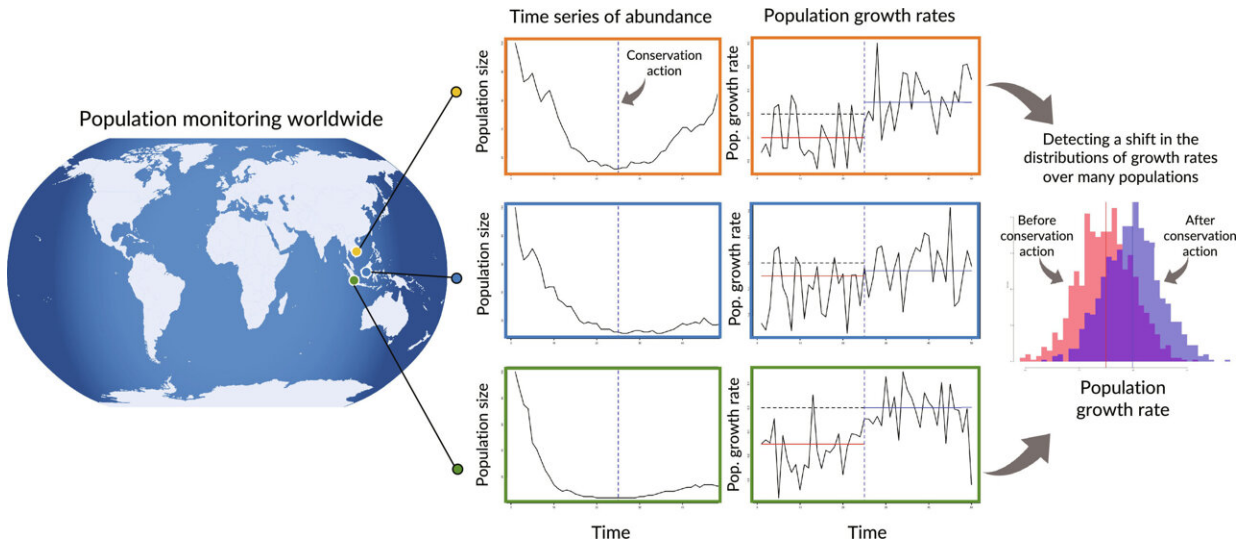

Conceptual diagram of the trend assessment process.Monitoring produces time series of trends in abundance for the many populations worldwide; here, we illustrate this for three populations. Our goals are twofold: (i) to assess trends and the risk of very rapid declines worldwide and (ii) whether we have the statistical power to detect whether population trends have generally improved after conservation action (vertical lines). To do so, we convert population abundance time series (left column of graphs) into annual population growth rate estimates [$\log(N_{t+1}/N_t)$] (middle column of graphs) to account for the expected temporal autocorrelation. We then estimate the mean trend before (red horizonal lines) and after (blue horizontal lines) implementation of conservation action. We show three populations here, but in reality, each taxonomic group per country (system) is composed of many sampled populations. We aggregate growth rates across all populations within a system, resulting in a distribution of growth rates (right) before (red) and after (blue) action. We tested whether we could detect a shift in

the mean of the distribution, before and after conservation. Credit: *Science Advances* (2024). DOI: 10.1126/sciadv.adj1448

More than ever before, there is a growing interest in dedicating resources to stop the loss of biodiversity, as recently exemplified by the Kunming-Montreal Global Biodiversity Framework (GBF) decided at COP15 in December 2022. The GBF focuses on understanding why biodiversity is declining and what actions are needed to reverse this trend.

However, according to researchers at McGill University, implementing the plan is challenging because information about biodiversity changes is not evenly available everywhere and is uncertain in many places.

With the available data, can the scientific community and policymakers truly know if they are making progress toward international biodiversity targets, even if their efforts were effective? The research says that without a better picture of how and why biodiversity is changing in most countries, it is difficult to evaluate the effect of national plans outlined in the GBF.

"Even if policies stopped the decline of animal populations, we show mathematically that it will be hard to detect improvements with high certainty in many places for various types of species (48 of 62 countries and species groups)," explains Prof. Brian Leung from McGill's Department of Biology and Bieler School of Environment and lead author of the study.

"This is because detecting progress is limited by the current levels of uncertainty in the data (the records are either too sparse or too variable) describing animal population trends."

To further this point, co-author Prof. Andrew Gonzalez compares this issue with monitoring recovery in heart health after an illness.

"This would not be easy to do if a doctor had not kept good historical records about a person's heart health, and without good past records, it would be difficult to know if the heart is recovering because of the treatment it is receiving. Now, imagine trying to detect if heart health was improving on average across all Canadians (perhaps by following government recommendations on diet) if data on national heart health was not collected in the past or measured into the future."

Prof. Gonzalez continues, "Instead of heart health we assessed the health of animal populations—how fast they are declining or recovering—and whether we can conclude if populations are recovering worldwide. Tracking biodiversity targets and evaluating progress cannot be done well without filling the gaps in the information at hand and reducing the uncertainty that hinders our ability to evaluate if current trends are improving."

Measuring efforts across the board

In light of these findings, how should the scientific community and policymakers evaluate their efforts to meet such ambitious goals as preserving 30% of land and water by 2030 and slowing the rate of human-caused species extinctions? The researchers make several suggestions, including proposing a risk framework that would establish unacceptable thresholds for biodiversity decline, which are easier to detect.

Also, the authors suggest investment in national and international biodiversity monitoring systems to improve trend estimates worldwide.

As Prof. Leung concludes, "Our results highlight that care must be taken

to structure how we gather knowledge about biodiversity, so that we will be able to report whether we have succeeded in meeting our global targets given international investment in nature conservation or alternatively, whether we need to re-orient our actions."

In summary, these recommendations put forward a more rigorous approach to interpreting biodiversity trends, incorporating risk considerations, boosting investment in monitoring, explicitly deciding thresholds for success, and the use of reference benchmarks to make informed conservation decisions. If implemented, many countries potentially could benefit, given the international reach of the GBF.

"Global monitoring for biodiversity: uncertainty, risk and power analyses to support trend change detection" by Brian Leung and Andrew Gonzalez is published in *Sciences Advances*.

More information: Brian Leung et al, Global monitoring for biodiversity: Uncertainty, risk, and power analyses to support trend change detection, *Science Advances* (2024). DOI: 10.1126/sciadv.adj1448

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