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CORRESPONDENCE

The recent past is not a reliable guide to future climate impacts: Response to Caro et al. (2022)

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Caro et al. (2022) assert that there is an "inconvenient misconception" in conservation biology that climate change poses a significant risk to biodiversity. They support their claim with suggestions that climate change has not been a major recorded driver of species extinctions since 1900 and has not been reported as a key driver in IUCN threat analyses. However, given the accelerating and nonlinear nature of climate change impacts, we argue that the recent past is not a reliable guide to future change, and that conservation must look to the future if it is to successfully anticipate and mitigate biodiversity loss.

The latest IPCC Working Group II report states that up to 14% of species will face a very high risk of extinction at 1.5°C of heating, rising to up to 29% at 3°C. Such temperature increases are worryingly imminent, with the 1.5°C threshold expected to be passed within decades, and 3°C anticipated within the century given current emissions trajectories (IPCC, 2022). In those biodiversity hotspots classed as vulnerable, 2°C of climate change is expected to double the number of species at very high risk of extinction, and by 3°C the risk is expected to be an order of magnitude larger than at present (IPCC, 2022). The scale of the threat shocked even the report's authors, with one remarking that; "*One of the most striking conclusions in our report is that we're seeing adverse impacts that are much more widespread and much more negative than expected*" (Plummer & Zhong, 2022).

Caro et al.'s focus on the decline and extinction of individual species, while easier to quantify, masks the more pervasive and critical impacts climate change can have on ecosystems; most species in any ecosystem are adapted to similar abiotic conditions, thus climatic change will stress most species simultaneously, undermining the resilience of the system and increasing the potential for dramatically nonlinear changes in its structure and function. These rapid changes may lead to the simultaneous losses of whole communities of species (Trisos et al., 2020). For example, tropical warm water corals are estimated to support at least 25% of known marine species, but anthropogenic global warming has already led to a >20-fold increase in marine heat waves, resulting in bleaching which risks not only the loss of corals but the species reliant on these ecosystem engineers (Hoegh-Guldberg et al., 2017). Australia's Great Barrier Reef has already lost half its coral cover within just the last three decades (Dietzel et al., 2020). The potential for such rapid ecosystem-wide changes is not restricted to aquatic ecosystems; substantial parts of the Amazon rainforest are rapidly losing resilience due to a combination of warming-induced drought and expanding deforestation, pushing the system toward a tipping point beyond which fire will create a savannah-like ecosystem, leading to a catastrophic loss of forest-obligate wildlife (Boulton et al., 2022).

Clearly, climate change has the potential to severely damage biodiversity, both in isolation and in combination with other anthropogenic threats, emphasizing the need to proactively manage ecosystems to protect them from the multifaceted nature of future global change. Indeed, failure to do so threatens the resilience of human societies and natural systems (Pörtner et al., 2021). While assessing past biodiversity loss can help evidence the negative impacts humanity has on the global biosphere, the past is a poor guide for where we are headed. Fixating on retrospective analyses as a predictor of future trends in a world characterized by increasingly rapid environmental change risks catastrophically underestimating future biodiversity loss (Gardner & Bullock, 2021) and is unnecessary when robust predictive approaches are available (see e.g., Trisos et al., 2020 and work synthesized in IPCC, 2022). Of particular importance is understanding how a rapidly changing climate will interact with other drivers of biodiversity decline such as habitat fragmentation and overexploitation of populations (Brook et al., 2008). Conservation science must quickly orient itself toward the oncoming threats we face.

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DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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