Conservation Biology

Comment

Importance of complementary approaches for efficient vulture conservation: reply to Efrat et al

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Efrat et al. (2020) comment on our paper, Santangeli et al. (2019), in which we identified priority areas for Old World vulture conservation. We performed spatial conservation prioritization analyses based on modeled distributions of 15 vulture species that occur in Africa and Eurasia and on spatially explicit threats, such as poisoning, risk of collision with wind-energy infrastructure, and other human-related land-use and influence threats.

Efrat et al. contend that large-scale analyses require generalizations and typically overlook local-scale information and processes. We agree with their assertion and welcome their complement to our study with information at the local scale. Here, we highlight key aspects regarding scaling issues of global conservation priorities for vultures, their interpretation, and their value.

The issue of harmonizing global priorities with local-scale actions has been discussed previously (Rondinini et al. 2011), and it may affect the majority of attempts to map areas of conservation priority at the global level. Our study is no exception. Global priorities are useful in highlighting broad patterns of aggregation of areas of importance conditional on the prioritization criteria and features used (e.g., Montesino Pouzols et al. 2014). We agree with Efrat et al. that scaling down global priorities into local strategies and actions requires in-depth local-scale prioritization that embraces the complexity of local socioecological and geopolitical conditions and harnesses high-resolution data. However, we contend that global prioritization exercises are important for conservation, and this may be particularly so for wide-ranging species, such as vultures. To quantify the influence of national versus globally coordinated planning, we repeated the prioritization analysis of our earlier study (the holistic scenario) (Fig. 1 in Santangeli et al. [2019]) with a method that produces country-specific priorities based on the species' ranges within each country. In doing so, we used the strong administrative priorities analysis tool (available in Zonation version 4), as described in Montesino Pouzols et al. (2014). Essentially, this tool promotes the representation of all vulture distributions separately within each country, whenever possible and irrespective of how local distribution of the

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Article impact statement: *Global prioritization exercises are useful to inform policy, but must be interpreted correctly and complemented locally.*
Paper submitted April 21, 2020; revised manuscript accepted June 5, 2020.

Conservation Biology, Volume 0, No. 0, 1–3

DOI: 10.1111/cobi.13579

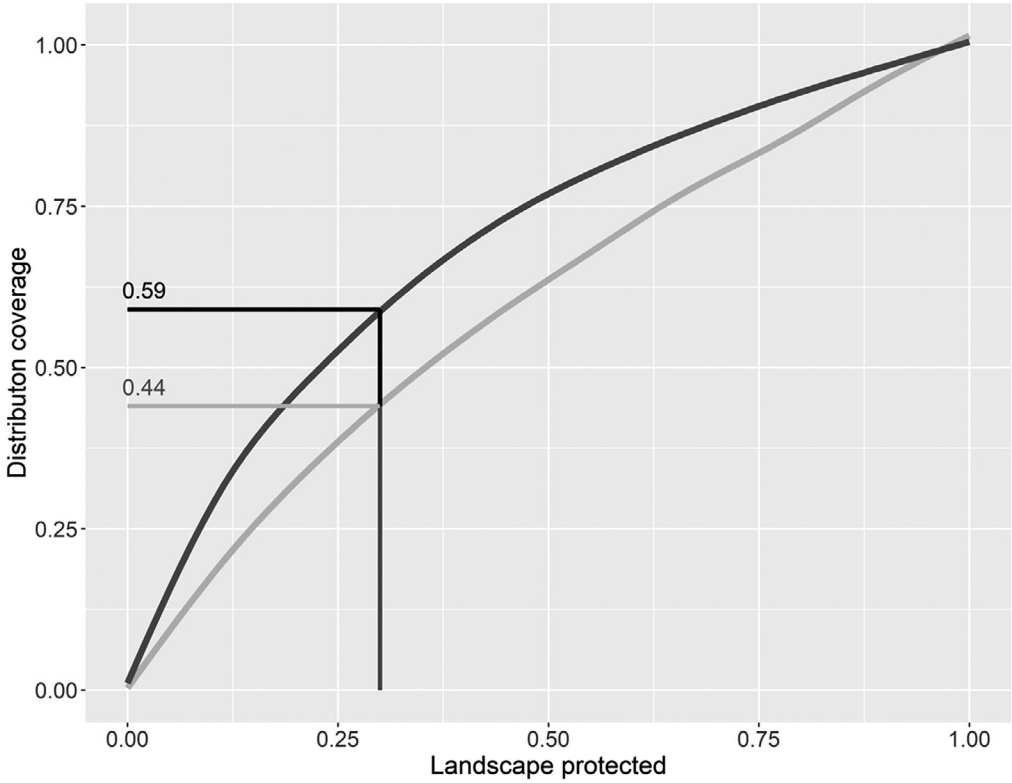

Figure 1. Zonation performance curves. Average distribution coverage of the 15 Old World vulture species (1, all species' ranges protected) as the hypothetical proportion of the landscape protected for vultures increases (1, entire study area protected) as derived from the globally coordinated (black curve) and local planning scenario (gray curve, priorities identified in each country independently) in Zonation (straight vertical line, top 30% priority areas are hypothetically protected; horizontal black line, coverage under the global planning scenario; gray horizontal line, coverage under the local planning scenario).

species compares with the global distribution (Moilanen et al. 2014). In practice, this scenario assumes that each country identifies its own priorities separately based on the local species present. Therefore, a species that is categorized as least concern (IUCN 2020) globally may drive the priorities in a country if it is rare and highly localized in that particular country. By comparing the average representation of species distributions in any given fraction of the landscape, we identified a major loss in performance efficiency in the nationally compared with the globally coordinated conservation planning. For example, hypothetical protection of the top 30% of high-priority areas would on average allow coverage of only 44% of the range of Old World vultures under the national planning scenario, whereby conservation priorities are set independently within each country, compared with coverage of 59% of vulture ranges under a globally coordinated scenario (Fig. 1).

Efrat et al. underscore inaccuracies in large datasets, such as those we used for species distributions and as proxies of threats to vultures. Although we minimized commission errors by using robust species distribution modeling and by penalizing areas of high uncertainty of species occurrence, our approach did not address potential omission errors in the species' range maps, such as those pointed out by Efrat et al. for Israel. Regarding the proxies for the threat layers we used, particularly those on poisoning and collision with wind-energy infrastructure, generalizations and assumptions are inevitable when working at such large extents. These layers were meant to capture broad patterns of potential threat occurrence, rather than representing local conditions.

To Efrat et al.'s point on the importance of long-range movements for vulture conservation, in our study, we did explicitly focus on the breeding and resident ranges of the species, and we were explicit about this. We believe this decision does not have a major impact on global priority areas for vultures because only a small fraction of Old World vultures is migratory and because they are generally less threatened than most other Old World vulture species (Buechley & Şekercioğlu 2016). Because our prioritization assigned higher weight to the more highly threatened species and applied a complementarity principle, it is unlikely that including nonbreeding and passage ranges for those few species would have shifted overall priorities across the Old World.

We agree with Efrat et al. on the importance of being cautious regarding the potential of protected areas for sheltering vulture populations from threats, given the wide distributions that vultures have. Thus, we did not include protected areas as an input in our assessment of vulture priority areas.

Overall, we appreciate Efrat et al.'s call for more local-scale research into the threats and drivers of vulture declines and how to avert them in an increasingly human-affected world. However, large-scale prioritization analyses are needed to inform global conservation policies (e.g., Montesino Pouzols et al. 2014). This is confirmed by the severe loss in efficiency when conservation is planned nationally as comapred with globally. Ultimately, we see global and local prioties as complementary rather than mutually exclusive. Both should be considered when planning conservation because focusing on one or the other may impair efficiency and could compromise the remaining chances of saving one of the most threatened vertebrate groups from extinction.

Acknowledgments

A.S. and E.D.M. are funded by the Academy of Finland (grants 307909 and 296524), and E.R.B is funded by the Smithsonian Institution and HawkWatch International. We also thank 3 reviewers for constructive feedback on an earlier version.

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