

## Towards a standardized framework for managing lost species

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1 **Response**

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3 **Towards a standardized framework for managing lost species**

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34 We thank Biggs *et al.* (2023) and Fisher (2023) for their thoughtful commentaries on our  
35 simple overview of lost terrestrial vertebrate species (Martin *et al.* 2023). We agree with  
36 these authors that reducing the Latimerian knowledge shortfall is dependent on both co-  
37 ordinated fieldwork efforts and the development of a well-managed, standardized framework  
38 for administering lost species data. We focus this response on further discussion of such a  
39 framework and highlight some of the challenges involved.

40

41 We agree that important steps toward developing a robust lost species management  
42 framework include a systematic expansion of last-seen dates on IUCN Red List accounts,  
43 standardizing terminology regarding lost species (Long & Rodríguez, 2022), and curating a  
44 single, authoritative list. We also agree with including species that have been lost for less  
45 than 50 years on such a list. As a recent example, the Critically Endangered Bahaman  
46 Nuthatch (*Sitta insularis*) was last observed <4 years ago at the time of writing, but there are  
47 fears it could already be extinct following the impacts of Hurricane Dorian in 2019  
48 (Mlodinow *et al.*, 2021). Highlighting such species of conservation concern after a short  
49 absence can be valuable.

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51 However, the call of Biggs *et al.* to produce an annually updated list of all taxa unobserved  
52 for >5 years may prove challenging, for several reasons. First, systematically obtaining data  
53 on species missing for shorter time periods (e.g. five years) may prove difficult. As Fisher  
54 (2023) reminds us, most of the players involved (including the SSGs that coordinate the red  
55 list assessments) are volunteers, such that new species accounts are often asynchronously  
56 updated on longer time scales - unless, like the Bahama Nuthatch, the species in question is  
57 of high conservation concern. For more conspicuous taxa, citizen scientist platforms may  
58 provide useful data on recent records, although limitations of citizen scientists' detection

59 skills may be a real impediment for more cryptic taxa (Kremen *et al.*, 2011). Indeed, groups  
60 sufficiently cryptic to be dependent on expert-level identification are rarely uploaded to such  
61 platforms (Haelewaters *et al.*, under review). Second, numbers of species in need of curation  
62 increase rapidly when shifting to shorter timeframes, and when including taxa beyond  
63 terrestrial vertebrates. In addition, large proportions of under-studied taxa are likely to *de*  
64 *facto* qualify as lost species. For example, a case study of a poorly-researched fungi taxon  
65 (Laboulbeniomycetes) by Haelewaters *et al.* (under review) found that, from a sample of  
66 1,117 species, 73% have no published records in the literature or on online data platforms  
67 after their initial description, and 51% had not been observed in >50 years. If similar patterns  
68 occur elsewhere (e.g. in marine invertebrates), this would present an extremely unwieldy  
69 number of lost species to administer. It may also be difficult to assign categorical reasons  
70 behind the lost status of many of these cryptic species, given so little information is known  
71 about them. Finally (and not independently), many groups of organisms possess a complex  
72 and often chaotic taxonomy (Garnett & Christidis, 2017). Even generally well-studied taxa  
73 have their problems: Fisher (2023) points out that some 40 species of mammals had only a  
74 single record by 2012; many of these would be the putative type specimen. From our  
75 database (based on IUCN data for species unobserved for >50 years) we identified 47  
76 mammals (slightly higher than reported by Fisher; in likelihood due to subsequent taxonomic  
77 splitting), three birds, 54 amphibians, and 123 reptiles known only from their holotypes;  
78 many of these could also possess dubious taxonomies.

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80 Another issue to consider is what ‘counts’ as a species rediscovery (Fisher, 2023). Long &  
81 Rodríguez (2022) suggest guidelines, but nuances may require further discussion. Peer-  
82 reviewed publications or information on Red List accounts remain a gold standard for this,  
83 but these may not always be available, especially for species rediscovered in shorter

84 timeframes. Is direct physical evidence via a specimen, photograph, or video necessary (with  
85 consideration to the fact that even such media can be controversial – see, e.g., discussion in  
86 Troy & Jones, 2022)? What about expert observations without supporting evidence? Can  
87 sound recordings, tracks and signs, or eDNA signals provide sufficient evidence in isolation?  
88 Are records on citizen science platforms such as iNaturalist (<https://www.inaturalist.org/>)  
89 acceptable? And indeed, are strict guidelines regarding what constitutes a rediscovery  
90 desirable, or is it better to assess data on a case-by-case basis, e.g. via a committee?  
91  
92 Biggs *et al.* (2023) highlight important actions towards developing a standardized framework  
93 for the management of lost species, and Fisher (2023) reminds us of the strengths and  
94 weaknesses of the Red List. We suggest that further steps could involve decision-making on  
95 which species to prioritize, how to refine the ‘rules’ on rediscovery, and where best to curate  
96 an authoritative list. Given the importance of Red List ‘last seen’ dates for keeping track of  
97 many lost species, and because species included on the Red List benefit from having a set  
98 taxonomy and at least some published information available (not least regarding their  
99 conservation status), it may be practical for a centralized list to primarily focus on species  
100 with a Red List account (at least initially). This would still represent a daunting undertaking  
101 given the IUCN curates data on >42,100 species, but is probably realistic. Indeed, given the  
102 central importance of the IUCN and its IT infrastructure for both obtaining data on lost  
103 species and for implementing recommendations regarding the status of these species, it may  
104 be advantageous for any decision-making committee on lost species to be integrated into the  
105 organization, perhaps through the creation of an IUCN-sanctioned Specialist Group or Task  
106 Force under the Species Survival Commission. Regardless of who convenes this, the  
107 establishment of a global standardized framework for the management of lost species seems a  
108 worthy, perhaps pressing, endeavour, and we hope the IUCN, organizations like Re:Wild

109 (Biggs *et al.*, 2023), specialist field scientists (see, e.g. <https://www.lostsharkguy.com/about>),  
110 and conservation experts will help spearhead the process. Given what we know (Fisher, 2023;  
111 Martin *et al.*, 2023), we could start with Reptilia.

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