

Lost but not forgotten: a new nomenclature to support a call to rediscover and conserve lost species

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Because we are experiencing a sixth mass extinction event (Jablonski, 1995; Ceballos et al., 2010), caused by the action of humans, this era is known as the Anthropocene (Crutzen & Stoermer, 2000). With extinction rates probably a thousand times higher than the background rate (Pimm et al., 2014), we must take meaningful action to avert extinctions. For an animal, plant or fungus to be categorized as extinct on the IUCN Red List of Threatened Species, there should be ‘no reasonable doubt that the last individual has died’ and that ‘exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. . . over a time frame appropriate to the taxon’s life cycle and life form’ (IUCN, 2012). Of the estimated 8.7 million eukaryotes (Mora et al., 2011), c. 1.8 million are known to science (Fisher, 2019). Of these, there is greater uncertainty in categorizing as extinct those that are less well known, harder to detect and perceived as less charismatic. Species may be sliding into extinction without us knowing, as only 142,577 have been assessed for the Red List. Of these, 40,084 (28%) are considered threatened with extinction (IUCN, 2021). Most of the c. 1.65 million whose extinction risk has yet not been assessed probably have less appeal to our emotions or culture, are hard to observe or photograph, or do not have common names we can relate to.

There is a subset of known species that have simply dropped off science’s radar. These are the so-called lost species that have not been seen in the wild for long periods of time and are not under human care at any ex situ organization such as a zoo, aquarium or botanical garden. Lacking knowledge of where these species persist hinders conservation action. Here, we call for an enthusiastic and energetic expansion of efforts to find such species, so that their conservation needs can be addressed (e.g. through threat reduction and population recovery) before they quietly slide into extinction.

The term lost species has not been formally defined but is widely used to mean different things. It may refer to extinct species (Campbell et al., 2016; Hirsch, 2017; de Massol de Rebetz, 2020) or to those not seen for a period of time (Twomey & Brown, 2008; Cottee-Jones et al., 2013; Silcock

et al., 2020). So-called missing or long-lost species are also part of the lexicon on the subject. Here, to help catalyse conservation action and prevent extinctions, we propose a nomenclature that distinguishes the various terms and aims.

A *lost species* is one not confirmed alive by photographic, audio or genetic information for over 10 years in the wild and has no ex situ population under human care. We consider under human care the maintenance of whole, living specimens, not cryopreserved samples in a biobank. A species’ lost status is independent of its category on the IUCN Red List of Threatened Species but has not met the conditions to be classified as Extinct or Extinct in the Wild. Although a simple definition, it is applicable to all taxa irrespective of life traits or the biome in which they live.

Some have called for a shorter time period to consider a species lost, as much can change in 10 years. We recommend using *missing species* for those not seen in the wild and not held under human care for > 5 years but < 10. The term *long-lost* has also been applied (Villarreal et al., 2014; David & Davis, 2017), and we propose a time span of 50 years for these species. By consistently using these terms we identify a pathway from missing to lost to long-lost that facilitates the catalysis of stage-specific actions to prevent species identified as missing from becoming lost and subsequently becoming long-lost.

Although not universally true, it is likely that the longer a species is lost and the more extensive the search effort without rediscovery, the higher the likelihood it is extinct. The missing–lost–long-lost pathway and efforts to find a species may help determine whether it is extinct or not, but extinction is not an automatic outcome, as species can remain hidden, leading to difficult decisions on when and how to call a species extinct (Roberts & Fisher, 2020). The decision to designate a species extinct should lie with the appropriate IUCN Red List Authority (SSC, 2020), and be based on evidence provided by relevant experts on that species and the species’ distribution.

Species can be lost for many reasons. Some are naturally rare or cryptic and so are hard to document conclusively (e.g. de Lirio, 2018; Paglia et al., 2022), others have had their numbers reduced to such low levels that finding them is difficult (e.g. Lee et al., 2008; Richmond et al., 2022). Some have not been searched for since their discovery (e.g. Edwards et al., 2018), and others have become lost following reclassification.

Look for them and you may find them is the premise of the Search for Lost Species launched by Re:wild in 2017

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(then Global Wildlife Conservation). Building on the knowledge and expertise of the 10,000+ volunteer experts of the IUCN Species Survival Commission (SSC), Re:wild and the SSC have compiled a list of c. 2,100 lost species and made the list publicly available (Re:wild, 2021) to encourage searches to find these species. Annual updates will probably lead to expansion of the list as new animals, plants and fungi are added. Since Re:wild launched its top 25 lost species in 2017, eight species on the list have been rediscovered, as have 67 species from the entire list of lost species. Partnerships and campaigns focused on specific taxonomic groups, such as birds and freshwater species, are leading to further rediscoveries, such as that of the Batman River loach *Paraschistura chrysicristinae* in Turkey in 2021 (Green, 2021). Scheffers et al. (2011) documented 351 species rediscoveries over 122 years, with an average time lost of 61 years. The fact that lost species are being rediscovered, even when they have not been seen in decades, is reassuring. Most rediscovered species tend to have restricted ranges and small populations and therefore remain highly threatened with extinction and require swift conservation action.

The search for lost species is a call to everybody, everywhere, not to overlook species from any taxonomic group. We invite the conservation community to focus on lost species, to initiate conservation action for them if rediscovered, and to prevent their extinction. The pathway of loss described here provides a framework for increasing levels of urgency to help us focus on all species in need of conservation.

This Editorial and the *Oryx* articles cited herein are freely available as a virtual issue of the journal at cambridge.org/core/journals/oryx/virtual-issues.

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