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Do not publish: limit open access information on rare and endangered species

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Biological sciences have long valued publishing detailed information on rare and endangered species. Until a few decades ago, much of this information was hidden from the public, accessible only through relatively obscure scientific journals. However, much of these data have been transferred online with the advent of digital platforms and a rapid push to open access publication. Information is increasingly also available online in public reports and wildlife atlases, and research published behind paywalls can commonly be found in the public domain. Many benefits flow from increased data and information accessibility, including improved repeatability in scientific studies and enhanced collaboration (*1, 2*). While these benefits should be embraced, in the context of conserving endangered species, there are major problems created by such readily accessible information. Increasingly, the dual use research dilemma (*sensu* (*3*)), in which research can have both significant positive but also negative impacts, is pervading research on rare and endangered species with information intended to aid conservation fueling illegal actions that harm biodiversity. We argue that biologists must urgently unlearn parts of their 400+ year publishing culture and rethink the benefits of publishing location data and habitat descriptions for rare and

endangered species to avoid unwittingly contributing to further species declines. Restricting information entails some costs, but we argue that these must be weighed against the increasing harm of unrestricted information accessibility. We evaluate these trade-offs and discuss parallel challenges and responses in other fields dealing with dual use research dilemmas.

At least three key issues associated with unrestricted access to information on rare and endangered species warrant careful attention. These risks are not new, but are greatly exacerbated in an era of digital proliferation and open access. First, unrestricted access to species location information is triggering a surge in wildlife poaching (*4, 5*), with many species at risk (*6*). Poaching has been documented in species within months of their taxonomic description in journals (*4*). For example, over 20 newly described reptile species have been targeted in this way, potentially leading to extinction in the wild. Indeed, when the names of some of these species are typed into a search engine, the text autopopulates to suggest a search to purchase these animals (e.g. Chinese tiger gecko *Goniurosaurus luii*)*!*

Second, unrestricted access to location data and habitat descriptions can disrupt the often delicate relationships between scientists and landowners. We have personal experience of this. Our research in Australia on restoring farmland biodiversity requires repeated access to farms and is dependent on high levels of trust with landholders. We have detected populations of endangered species like the pink-tailed worm-lizard (*Aprasia parapulchella*). Our research permits demand location records be uploaded to open access government wildlife atlases. Soon after uploading records, people seeking the rare worm-lizard were caught trespassing, upsetting farmers, damaging important rocky outcrop habitats, and jeopardizing scientist-farmer relationships that have taken years to establish.

Third, unrestricted access to species information has the potential to accelerate habitat destruction and create other negative disturbances. The digital age has brought a desire

among many nature enthusiasts to observe, photograph and sometimes remove animals and plants (*7*). Animal behavior and habitats are often heavily disturbed in the process (*8*).

Decisions to publish sensitive information on endangered and newly described rare species must be based around a careful assessment of whether its publication will benefit or harm the target species (Fig. 1). Key trade-offs must be weighed. For example, easily accessible data can help amass the evidence to challenge development proposals that may impact on endangered species. Increased data accessibility also can foster improved scientific repeatability and greater collaboration. Therefore, while withholding information may have some negative consequences, this action is increasingly needed (*9*), as calls for better regulation and law enforcement to protect at risk species have met limited success (*4, 5*). Where species have high economic value (e.g. the Chinese tiger gecko), withholding information may be the only option. Importantly, relevant government or regulatory agencies should be notified of scientific discoveries, and pathways for access from legitimate persons remain open. In moderate risk situations, spatial data might be buffered and only very broad location data provided. Where there is low risk of perverse outcomes, unrestricted publication of habitat descriptions and location information remains appropriate (Fig. 1).

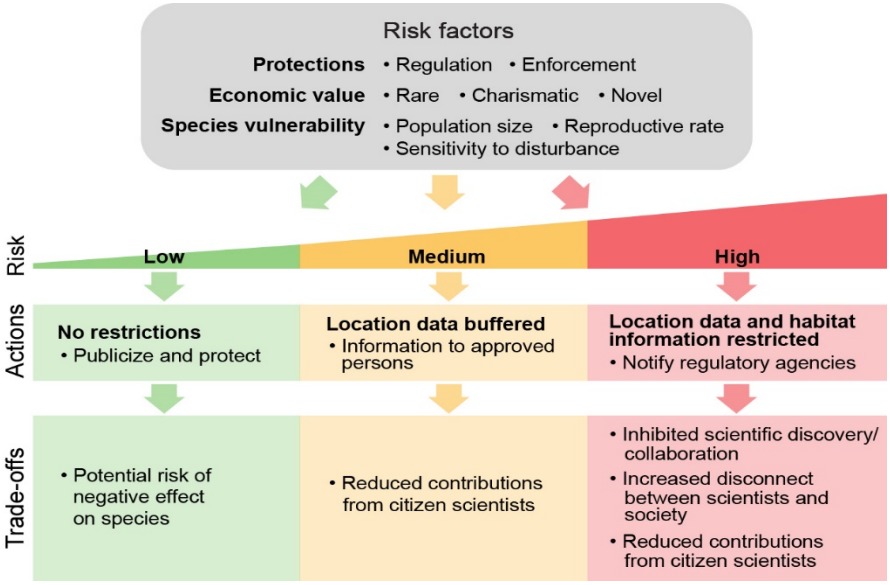
We suggest that much information on endangered and newly described species can still be published without location data being provided and without undermining the integrity or repeatability of the scientific work. As such, negative trade-offs arising from the dual use research dilemma are not as pronounced as other fields. For example, restrictions on publishing methodological advances in the study of pathogen virulence can inhibit scientific research that can have significant human health benefits, but is sometimes deemed necessary due to potential for this information to facilitate perverse outcomes (e.g. in bioterrorism) (*10, 11*).

Some fields like paleontology and archeology have long maintained restrictions on the publication of site locations and promoted government policies and regulations to limit collection and trade in fossils, artefacts, and culturally-sensitive and/or scientifically important material (e.g. see (*12*)). Organizations like the US Forest Service do not disclose geospatial data to protect research sites (*13*). Other solutions include modification of research permits so that endangered species locations are not automatically uploaded into wildlife databases and masking such records on private land, as presently occurs in some states in the USA. Some of these approaches are already in place in conservation (e.g. the open access journal PLoS One has data exemptions for endangered species). However, current policies are specific to individual journals, data repositories or organizations and lack consistent enforcement. A major benefit to author-led self-censorship that we advocate is that restrictions of the dissemination of sensitive information can be implemented widely and immediately.

Promisingly, there are signs this problem is beginning to be addressed. Journals such as Zootaxa – that carry taxonomic descriptions of new species – now publish new descriptions without location information (e.g. (*14*)). More researchers, journal editors and data custodians need to follow their lead. Otherwise the potential benefits of open access scientific information and data for biodiversity conservation will be outweighed by the perverse effects of exposing wild populations to significant added conservation threats. Although much information on endangered and rare species is already available online, it remains crucial to change our actions now to avoid unwittingly contributing to further species declines.

Figure 1. Conceptual framework for assessing risk to endangered or newly discovered species from publishing location and other data in the public domain. We show levels of

risk and trade-offs associated with actions to restrict access to location and other information.



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