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PRACTICE AND POLICY

Using the IUCN Environmental Impact Classification for Alien Taxa to inform decision-making

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It is Conservation Biology's style to use non-native species rather than alien species. The authors would have preferred the use of alien throughout the article because this term is used in all documents relating to the International Union for the Conservation of Nature's Environmental Impact Classification for Alien Taxa.

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Abstract
The Environmental Impact Classification for Alien Taxa (EICAT) is an important tool for biological invasion policy and management and has been adopted as an International Union for Conservation of Nature (IUCN) standard to measure the severity of environmental impacts caused by organisms living outside their native ranges. EICAT has already been incorporated into some national and local decision-making procedures, making it a particularly relevant resource for addressing the impact of non-native species. Recently, some of the underlying conceptual principles of EICAT, particularly those related to the use of the precautionary approach, have been challenged. Although still relatively new, guidelines for the application and interpretation of EICAT will be periodically revisited by the IUCN community, based on scientific evidence, to improve the process. Some of the criticisms recently raised are based on subjectively selected assumptions that cannot be generalized and may harm global efforts to manage biological invasions. EICAT adopts a precautionary principle by considering a species' impact history elsewhere because some taxa have traits that can make them inherently more harmful. Furthermore, non-native species are often important drivers of biodiversity loss even in the presence of other pressures. Ignoring the precautionary principle when tackling the impacts of non-native species has led to devastating consequences for human well-being, biodiversity, and ecosystems, as well as poor management outcomes, and thus to significant economic costs. EICAT is a relevant tool because it supports prioritization and management of non-native species and meeting and monitoring progress toward the Kunming–Montreal Global Biodiversity Framework (GBF) Target 6.

KEYWORDS
biological invasions, evidence synthesis, impact assessment, managing invasive species, precautionary principle

Uso de la Clasificación de Impacto Ambiental de los Taxones Exóticos de la UICN para la toma de decisiones

Resumen: La Clasificación de Impacto Ambiental de los Taxones Exóticos (EICAT, en inglés) es una herramienta importante para las políticas y manejo de las invasiones biológicas y ha sido adoptada como un estándar de la Unión Internacional para la Conservación de la Naturaleza (UICN) para medir la seriedad del impacto ambiental causado por los organismos que viven fuera de su extensión nativa. La EICAT ya ha sido incorporada a algunos procedimientos locales y nacionales de toma de decisiones, lo que la vuelve un recurso particularmente relevante para abordar el impacto de las especies no nativas. Algunos principios conceptuales subyacentes de la EICAT han sido cuestionados recientemente, en particular aquellos relacionados con el uso del principio de precaución. Aunque todavía son relativamente nuevas, las directrices para la aplicación e interpretación de la EICAT tendrán una revisión periódica, basada en evidencia científica, por parte de la comunidad de la UICN para mejorar el proceso. Algunas de las críticas recientes están basadas en suposiciones seleccionadas subjetivamente que no pueden generalizarse y podrían perjudicar los esfuerzos globales para manejar las invasiones biológicas. La EICAT adopta un principio de precaución cuando considera el historial de impacto de una especie en cualquier otro lugar ya que algunos taxones tienen características que podrían volverlos más dañinos. Además, las especies no nativas suelen ser factores de pérdida de bidiversidad, incluso bajo otras presiones. Cuando ignoramos el principio de precaución al abordar el impacto de las especies no nativas, hay consecuencias devastadoras para el bienestar humano, la biodiversidad y los ecosistemas, así como resultados pobres de conservación, y por lo tanto con costos económicos importantes. La EICAT es una herramienta relevante porque respalda la priorización y el manejo de las especies no nativas y ayuda con el cumplimiento y monitoreo del progreso para llegar al objetivo 6 del Marco Mundial de Biodiversidad Kunming-Montreal.

PALABRAS CLAVE
evaluación de impacto, invasión biológica, manejo de especies invasoras, principio de precaución, síntesis de evidencias

【摘要】
外来生物环境影响分类 (Environmental impact classification for alien taxa, EICAT) 是生物入侵政策和管理的重要工具, 已被世界自然保护联盟 (International Union for Conservation of Nature, IUCN) 作为标准来衡量生活在原产地以外的生物对环境影响的严重程度。一些国家和地区的决策程序也整合了 EICAT, 将其作为应对外来生物影响的一项重要的相关资源。然而, 近期 EICAT 的一些基本概念原则, 特别是关于使用预防性方法的原则受到了质疑。这一工具目前仍比较新颖, 而 IUCN 将根据科学证据, 定期重新审查其应用和说明指南, 以改进 EICAT 的流程。最近提出的一些批评是基于主观选择的假设, 不能一概而论, 且可能会破坏管理生物入侵的全球努力。由于某些类群的特性可能使其本身具有更大的危害性, 因此, EICAT 采用了预防性原则, 考虑了物种历史上在其他地方造成的影响。此外, 即使存在其他压力, 外来物种往往也是造成生物多样性丧失的重要因素。在应对外来物种的影响时忽视预防性原则, 已经给人类福祉、生物多样性和生态系统带来了灾难性后果, 并导致管理效果不佳, 因而也产生了巨大的经济损失。而 EICAT 是一个适用的工具, 因为它可以支持对外来物种进行优先排序和管理, 以及实现昆明-蒙特利尔全球生物多样性框架 (GBF) 目标6并监测其进展情况。**【翻译: 胡怡思; 审校: 聂永刚】**

关键词: 生物入侵, 证据整合, 影响评估, 管理入侵物种, 预防性原则

INTRODUCTION

Standards for the assessment and classification of environmental pressures have been used for many decades (e.g., The International Union for Conservation of Nature [IUCN] Red List of Threatened Species, IUCN Red List of Ecosystems, IPPC International Standards for Phytosanitary Measures) and have proven useful in prioritizing the conservation of natural resources (e.g., Betts et al., 2020). Clearly, no standard is perfect and fit for all purposes, and most have problems related to their practical implementation and use. Recognizing and addressing uncertainties in their application are crucial to keeping such standards relevant and useful, improving their effectiveness, and ensuring they are consistently applied geographically and over time (McGeoch et al., 2012; Probert et al., 2020; Vilà et al., 2019). Such efforts require arguments backed up by appropriate scientific evidence and should be constructively phrased (Volery et al., 2020).

The IUCN is the largest and most diverse environmental network in the world. It has over 1400 member organizations from over 170 countries and has access to over 15,000 scientists and experts who make up its commissions. The IUCN develops and adopts international standards for various aspects of nature conservation, including the IUCN Red List of Threatened Species (IUCN, 2012), Red List of Ecosystems (IUCN, 2016a), Key Biodiversity Areas (IUCN, 2016b), Nature-based Solutions (IUCN, 2020a), Green List of Protected and Conserved Areas (IUCN & WCPA, 2017), and the Environmental Impact Classification for Alien Taxa (EICAT) (IUCN, 2020b).

The genesis of EICAT was the Conference of the Parties of the Convention on Biological Diversity (CBD COP 12) Decision XII/17 (2014), which "Invites the Invasive Species Specialist Group of the International Union for Conservation of Nature and other technical partners […] to continue to develop a system for classifying invasive alien species based on the nature and magnitude of their impacts." This decision prompted members of the IUCN Species Survival Commission Invasive Species Specialist Group (SSC ISSG) to develop an initial methodology (Blackburn et al., 2014; Hawkins et al., 2015). After several rounds of a global, IUCN-wide consultation, with hundreds of responses received from various stakeholders, a revised version of EICAT was submitted to the IUCN Editorial Board, the SSC Steering Committee, and finally to the IUCN Council. After IUCN Council approval, EICAT became an official IUCN Standard in 2020 (IUCN, 2020b).

Although most comments received from stakeholders on EICAT were positive, criticism of the approach was voiced before (Ojaveer et al., 2015) and has been voiced since EICAT became an IUCN standard. Cassini (2023) recently challenged some of the underlying conceptual principles of EICAT. Cassini's (2023) arguments, which partially echo some of those made by Strubbe et al. (2019), mainly relate to the use of the precautionary principle; specifically, that, under EICAT, the summarized impact of a non-native species on one or more native species is its maximum (i.e., most severe) impact across all impact records and that impacts are assigned to the non-native species regardless of the influence of other potential drivers (causes) of the impact. To address these arguments, we sought to clarify the underlying principles, objectives, and uses of EICAT; recap how EICAT should be applied in accordance with the IUCN Standard (IUCN, 2020b) and Guidelines (IUCN, 2020c); and review recent EICAT-based studies (Kumschick, Bacher, et al., 2020; Volery et al., 2020). Our aim was to elucidate and support the rationale for adopting the precautionary principle under EICAT and limit confusion among individuals and organizations that will use EICAT in the future.

THE DÉJÀ VU OF CHALLENGING THE PRECAUTIONARY PRINCIPLE

The precautionary principle has been extensively discussed in the literature and in the context of underpinning policy (e.g., Boyer-Kassem, 2017; Foster et al., 2000; Riley, 2011; Stefánsson, 2019). It is recognized that this approach may conflict with other principles, such as free trade or less strict versions of the precautionary principle itself, such as under World Trade Organisation Sanitary and Phytosanitary Measures Agreement (e.g., Black, 2019; Haseeb Ansari & Wartini, 2014; Jenkins, 2005), which requires clear evidence of negative impacts to allow restrictions in trade. However, it is also widely agreed that the precautionary principle represents a way of managing uncertainty, which is an accepted premise in international environmental law, including in regulations on biological invasions (Riley, 2011). In particular, the function of the precautionary principle is to enable the implementation of preventative measures in cases where available scientific evidence on the risk of a hazard is not sufficiently certain. That means there is a possibility that the situation may worsen, with potentially severe or irreversible consequences, if the implementation of measures is postponed until higher certainty has been reached. Consequently, the precautionary principle is mandated explicitly in environmental policies of several countries (Raffensperger & Barrett, 2001), including national, regional, and international strategies on biological invasions (e.g., the European Union Regulation on Invasive Alien Species 1143/2014). Furthermore, the Convention on Biological Diversity of the United Nations in its Decision VI/23 includes a guiding principle on the precautionary approach: "Lack of scientific certainty about the various implications of an invasion should not be used as a reason for postponing or failing to take appropriate eradication, containment and control measures." Importantly, the IPBES thematic assessment on invasive non-native species and their control, in its key messages, stresses the importance of following a precautionary approach when defining the management actions needed to respond to biological invasions (IPBES, 2023).

We compiled evidence to show that preventative measures for managing non-native species are justified and highlight that there is often an imperative for rapid action. We further considered why ignoring the precautionary principle when tackling the impacts of non-native species is unwise because it can result in disastrous consequences for human well-being, biodiversity, and ecosystems and poor management outcomes for biological invasions, consequently leading to significant economic costs (Diagne et al., 2021).

SCIENTIFIC EVIDENCE FOR PREVENTATIVE MEASURES

Invasibility of ecosystems versus impactful non-native species

An argument could be made that applying the precautionary principle by considering a species' impact history elsewhere ignores the fact that invasibility and impacts differ between habitats and regions (e.g., Cassini, 2023; Ricciardi et al., 2013; Volery et al., 2021). If site characteristics and factors extrinsic to non-native species were the main determinants driving impacts, there would be no scientific reason to attribute impact magnitudes to non-native species. It has been extensively shown that the impact of a particular non-native species is likely to vary across sites (Vilà et al., 2006; Volery et al., 2021) and that impacts depend on context (e.g., Cameron et al., 2016; Gallardo et al., 2016; Pyšek et al., 2012; Thomsen et al., 2011), which is determined by factors such as location, species traits, introduction events, and their interactions (Pyšek, Bacher, et al., 2020). However, there is also considerable evidence that the cause of this variation does not depend only (or even mainly) on site characteristics. For example, species traits related to body size, degree of specialization, and reproduction strategy correlate with high impacts of non-native species (e.g., Evans, Kumschick, et al., 2018; Kumschick et al., 2013; Measey et al., 2016; Nentwig et al., 2010; Shirley & Kark, 2009). Species (and even higher taxa, such as classes) also differ in their probability of causing large impacts and in their impact magnitudes (e.g., Kumschick, Bacher, et al., 2015; Volery et al., 2021). Thus, knowledge of the impact of a non-native species elsewhere is useful for horizon scanning, which can inform preventative management actions (Kulhanek et al., 2011), as well as policy (e.g., Roy et al., 2019) and biosecurity (Dawson et al., 2023). For these reasons, categorizing and assessing information about the known impacts of non-native species worldwide, as is done when using EICAT, is helpful for guiding management decisions on non-native species.

Drivers of environmental impact

Many aspects of human-induced global change contribute to today's biodiversity crisis, with biological invasions being one of the major drivers alongside climate change, land- and sea-use change, pollution, and natural resource exploitation (Díaz & Mahli, 2022; IPBES, 2023). Interactions among these drivers are context dependent, complicated, and often difficult to disentangle. Various scenarios have been proposed to describe these interactions, for example, the passenger–driver model (MacDougall & Turkington, 2005) and the backseat–driver model (Bauer, 2012). For biological invasions, global change drivers can cause variation in the severity of the impacts caused by non-native species (Vilà et al., 2021). Moreover, they can act synergistically and antagonistically, which has led some scientists to speculate that non-native species might not drive biodiversity loss but be mere passengers (Cassini, 2023; MacDougall & Turkington, 2005). However, a recent meta-analysis of interactions between global change drivers and non-native species shows that the combined effects of biological invasions and abiotic environmental changes are often detrimental but not worse than the impacts of biological invasions alone (Lopez et al., 2022). This strongly suggests that, in many cases, biological invasions are major drivers of biodiversity change and not the passengers of other drivers (e.g., Castro-Díez et al., 2019;

Pyšek et al., 2017). Furthermore, biological invasions can be primary drivers even among other stressors (e.g., Hermoso et al., 2011). They were the sole driver attributed to the extinction of 126 species of various taxonomic groups since 1500 AD (Blackburn et al., 2019). Indeed, biological invasions are the only threat attributed to 16% of all global species extinctions and are a driver or co-driver in 60% of all known extinctions (IPBES, 2023). A large body of evidence of the driving role of biological invasions in biodiversity decline comes from islands, where the eradication of non-native species has facilitated the widespread recovery of island communities (e.g., Jones et al., 2016; Spatz et al., 2022). These arguments support the use of the precautionary approach in EICAT to recognize that even formerly benign non-native species can become harmful if conditions change.

NEED FOR EMERGENCY ACTION WHEN MANAGING NON-NATIVE SPECIES

The lag phase prior to the invasion stage when a non-native species' distribution and density are comparatively low is particularly relevant because removing a non-native species is then easiest and most cost-effective (Cuthbert et al., 2022; Gallardo et al., 2022). Although at this stage the maximum potential impact of the species in the target location is often still unknown, being aware of how it manifests elsewhere can inform managers about the potential local impact in their area of interest. As explained in the EICAT Categories and Criteria Standard and Guidelines (IUCN, 2020b, 2020c), and contrary to claims in Cassini (2023), EICAT does not recommend any specific type of action. Instead, it aims to synthesize the available evidence to inform managers of the potential range of environmental impacts of a non-native species, enabling informed management decisions given the risks posed and the resources available (see discussion below on risk assessments).

Measures following the precautionary principle can lead to unintended side effects. This is in the nature of decision-making under uncertainty and cannot be avoided. It simply indicates that, ideally, any measures taken should always be carefully assigned and preceded by a comprehensive risk analysis (e.g., Kumschick, Wilson, et al., 2020). However, not acting in a timely manner in response to a newly arrived non-native species can also have severe consequences. For example, the documented economic impacts of invasive non-native species around the world have reached a staggering figure of US$423 billion annually, a cost that has quadrupled every 10 years in the past and yet is likely underestimated (e.g., IPBES, 2023). More timely management of non-native species can massively reduce long-term economic impacts (Leung et al., 2002). As an example, for mosquitoes of the genus *Aedes* alone, Ahmed et al. (2022) estimate that delays in management actions resulted in an additional total cost of approximately US$5 billion (accumulated until 2017) and that in the absence of management, these costs would have accumulated to US$32 billion.

Thus, urgent implementation of management measures is often required when dealing with non-native species that are harmful elsewhere, even when in situ evidence of invasion and impact is lacking. Delaying action until more evidence about the species' impacts is gathered can lead to more deleterious consequences, increased costs of management, reduced management options, and, ultimately, less efficient control. That said, EICAT is not a protocol designed to solve emergencies, but it is a tool designed to synthesize available evidence to categorize the magnitude of reported impacts of non-native species globally. This ultimately contributes to prioritization of rapid action where appropriate, recognizing that prevention is the first and most cost-efficient step in managing the risks posed by non-native species (IPBES, 2023; Leung et al., 2002).

MAXIMUM IMPACT AS A PRECAUTIONARY APPROACH IN EICAT

EICAT classifies impacts into different categories based on the level of biological organization (i.e., individual, population, community) altered by the non-native species (Hawkins et al., 2015; IUCN, 2020b, 2020c). EICAT is based on available evidence of impacts. It prescribes a thorough and exhaustive literature search to collate all information on and records of the observed environmental impacts of the non-native taxon (most often at the species level) under investigation. It does not include extrapolated or potential impacts. Out of all the impact records, EICAT assigns the maximum impact category ("the worst case" out of 5 levels [minimal concern, minor, moderate, major, massive]) as the overall classification for the species (IUCN, 2020b). This maximum impact, together with all other impact records and individual impact categories, is published in the Global Invasive Species Database (GISD; http://www.iucngisd.org) after peer review by the EICAT Authority.

EICAT uses the maximum impact as an overall classification for a species to flag that it has been demonstrated to cause a certain level of damage in at least one location where it has been empirically documented. However, due to the context dependence of impacts, non-native species will likely not have the same impact everywhere they are introduced (e.g., Catford et al., 2022; Sapsford et al., 2020). For this reason, published EICAT assessments are transparent. They include information on all reported individual impacts caused by a non-native species at different locations, through different mechanisms, and the respective different levels of severity, fitting with what is proposed as good practice for impact assessments in general (Strubbe et al., 2019). This information shows the variability of the impacts caused by a certain species and facilitates context-dependent management decisions and can feed into local risk assessments. Managers, therefore, have access to information on the range of impacts already recorded and thus are able to make judgments about impacts known to occur at sites deemed relevant to their target area. It is common practice to use maximum values of potential impact in cases of uncertainty regarding actual impact (e.g., D'Hondt et al., 2015; Turbé et al., 2017), even though the maximum is not always the most appropriate measure to use. Different measures to create a summary impact score per species are possible (e.g., mean, median) and can inform conservation purposes in particular contexts (e.g., Kumschick, Bacher, et al., 2020; Strubbe et al., 2019). For example, Volery et al. (2021) suggest calculating the risk of high impacts from EICAT scores, considering the variability in all impacts recorded. Other measures, such as mean or median, can similarly be biased, for example, due to inherent difficulties in demonstrating impacts of large magnitude (e.g., Measey et al., 2020), and limited data could lead to underestimates of the magnitude of impact. Therefore, a measure of potential impacts, which should be included in risk assessments, can be larger than the maximum impact currently reported.

Cassini (2023) misquotes when stating that Volery et al. (2021) found that sheep are the most "dangerous" ungulates in the world and that Hagen and Kumschick (2018) found feral pigs to be the most "dangerous" species in South Africa—this is not what these authors claim nor what their results show. They simply found that feral sheep and pigs have had a major impact in at least one of their introduced sites by causing reversible population extinctions, specifically of threatened species on some islands. Whether feral sheep and pigs have the same level of impacts elsewhere is not demonstrated, or inferred, and this is not an assumption made by EICAT assessments or reported in the two papers. However, allowing for the introduction of these species to new sites and waiting to see if they have equivalent impacts before action is taken (i.e., not using the precautionary approach) seems a poor conservation strategy.

EICAT assessments are transparent and based on peer-reviewed and gray literature containing empirical evidence of impact on native species. It is not the aim of EICAT to quantify the impact of a particular species at a location where it has not been studied. Therefore, EICAT is mainly a standardization tool (e.g., Vilà et al., 2019). However, for many species, impact records are only available for one or a few invaded sites, and often none at all. Thus, the maximum impact observed so far can also be an underestimate of the true potential impact of the species. This provides an additional value to the way EICAT data are presented, which relates to the issue that often there is a lack of studies performed on the impacts of species in specific regions where they occur, especially where research funding is limited (Measey et al., 2020; Pyšek, Hulme, et al., 2020). This is even more relevant for non-native species that have been recently introduced and established in a region because little research is likely to have been focused on them. Unfortunately, high-quality information on impacts is generally scarce due to the large amounts of funding, time, and capacity required to conduct field or experimental assessments with appropriate treatment manipulation and controls (see Kumschick, Gaertner, et al., 2015; Measey et al., 2020). This lack of high-quality information leads to uncertainty when classifying the impacts of many non-native species. This uncertainty is made explicit in EICAT assessments (see also Probert et al., 2020); every EICAT impact record and classification is accompanied by a confidence level ("low," "medium," or "high" confidence [IUCN, 2020b]). For instance, low confidence means the actual impact is likely to be larger or smaller than evaluated.

SOCIOECONOMIC IMPACTS AND BENEFITS

Many non-native species have been intentionally introduced to their new ranges for their perceived benefits (e.g., Kelsch et al., 2020), and it is generally accepted that not all non-native species are equally harmful. Conversely, accounting for the benefits of non-native species is important when making decisions about their management and regulation in order to avoid or minimize conflicts (e.g., Vimercati et al., 2020; Zengeya et al., 2017).

The objective of EICAT is to assess the harmful impacts of non-native species on native biodiversity (IUCN, 2020b, 2020c). However, various tools have been developed to evaluate their impacts in a broader context, and this is certainly reasonable for several purposes. For instance, to provide a decision-support tool on the positive impacts of non-native taxa on native species, EICAT+ was developed (Vimercati et al., 2022). Additionally, the Socio-Economic Impact Classification of Alien Taxa (SEICAT) represents a standardized method for classifying non-native taxa in terms of their negative impacts on human well-being (Bacher et al., 2018). Indeed, the IUCN EICAT Guidelines recommend and encourage the submission of supporting "information on the socio-economic impacts of the alien taxon, including beneficial (e.g., human use) as well as deleterious impacts, if known," although "this information should not contribute to the classification of the alien taxon under EICAT" (IUCN, 2020b). It must be noted that the outcomes of assessments on species' positive impacts should not be used to counter the management of invasive non-native species or justify their negative impacts (Lockwood et al., 2023; Vimercati et al., 2020, 2022).

VALUES IN EICAT

Although EICAT is based on certain principles that have been agreed on by IUCN members (e.g., native species are of conservation concern), this does not imply that all non-native populations or species are by definition undesirable. The allegation that EICAT seeks to classify "…all living beings of exotic origin as intrinsically evil" (Cassini, 2023) is an unlikely outcome of this approach. If all non-native populations were considered intrinsically evil by the IUCN, there would be no need to develop a system like EICAT to discern negligible impacts from harmful ones. In fact, published EICAT assessments for several taxonomic and functional groups show that non-native species with massive, major, or moderate impacts ("harmful" impacts [IUCN, 2020b, 2020c]) are in the minority (Figure 1); most non-native species maximum impacts are reported as minor or of minimal concern. Exceptions are ungulates and Australian acacias, which arguably include some of the worst invaders globally (Kumschick & Jansen, 2023; Volery et al., 2021). Notably, most species in all groups are classified as data deficient (reflecting the significant lack of information available to assess their impacts), and many of these non-native species are likely to have impacts that are minor or of minimal concern (Evans, Pigot, et al., 2018).

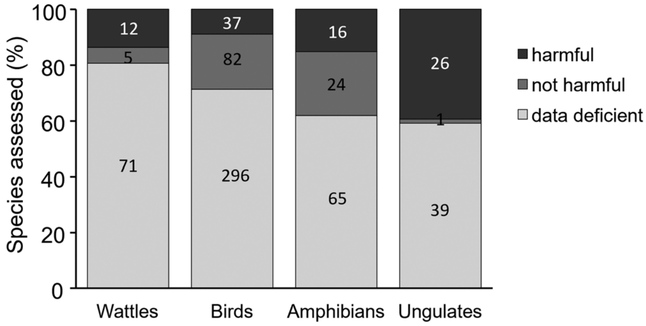

FIGURE 1 Percentage of species in 4 taxonomic/functional groups assessed as data deficient, harmful (massive, major, or moderate), and not harmful (minimal concern or minor) under the Environmental Impact Classification for Alien Taxa (EICAT) (numbers in bars, absolute numbers of species classified in the respective categories). Data for wattles (*Acacia* spp.) were extracted from Kumschick and Jansen (2023), for birds from Evans et al. (2016), for amphibians from Kumschick et al. (2017), and for ungulates from Volery et al. (2021).

Ultimately, management options are decided on by national and local authorities at different geographical scales and do not follow directly from EICAT assessments. Conservation managers will act within the context of the values of their own organizations and the land they manage, and EICAT assessments are an option to include or not in their decision frameworks. However, the transparency of the EICAT process means that all managers can remain well informed of how the impact level was reached and can use the EICAT data as a resource to justify and inform their local decisions.

FINAL CONSIDERATIONS

There is overwhelmingly strong evidence that some non-native species cause serious environmental impacts, including local and global extinctions and community and habitat changes (Bellard et al., 2016; Blackburn et al., 2019; IPBES, 2023; Pyšek, Hulme, et al., 2020; Smith, 2020). The quantity and quality of evidence available for different non-native species in different contexts vary. But, even in cases where evidence is considered limited, inaction until more evidence is gained can substantially increase impacts and management costs incurred. In some cases, such delays mean that management will no longer be cost-effective or even feasible (e.g., Ahmed et al., 2022; Leung et al., 2002; Simberloff et al., 2013).

No standard meets everyone's needs; therefore, periodic revision and adjustments on their interpretation and application are merited, as has been done several times for other IUCN standards and the accompanying guidelines. Being a very recently adopted standard, EICAT has not yet undergone this process, but undoubtedly the guidelines will be revised based on scientific evidence and user experience. Similarly, accepted and published EICAT assessments are open to challenge, and they can and will be updated if new data become available, errors are identified, or EICAT categories change (see IUCN [2020b, 2020c] for a list of potential changes).

The evidence-based challenge of existing procedures is a valuable part of the scientific process. However, papers, such as Cassini (2023), can be a distraction and might have harmful consequences if taken at face value by policymakers as justification to abandon the management of biological invasions. They are also harmful to a field that is already battling with denialism (e.g., Ricciardi & Ryan, 2018a, 2018b; Richardson & Ricciardi, 2013; Russell & Blackburn, 2017a, 2017b) in a world where alternative views are often accepted as facts, regardless of the level of scientific evidence and knowledge available (Perry et al., 2020). Of course, biological invasions are not the only threat to native biodiversity and ecosystems, and IUCN does not claim that invasions should be prioritized above other drivers of biodiversity loss. However, to face the challenge of halting biodiversity loss, the negative impacts of many non-native species need to be appraised honestly and acknowledged where identified, and in this, standardized, transparent impact scoring systems such as EICAT are important and useful.

Ultimately, one of the goals of conservation practitioners is to contribute to halting the major threat caused by invasive non-native species to biodiversity worldwide and to support the achievement of Target 6 of the Kunming–Montreal Global Biodiversity Framework (GBF) by triggering action from policymakers from the onset of (and preferably even before) an invasion. The recent IPBES thematic assessment of non-native species concluded that filling data gaps, including on impacts, can bring about important improvements in the cost-effectiveness and success of prevention and management actions (IPBES, 2023). EICAT can provide valuable data on the impacts of non-native taxa, which can feed into policymaking and management decisions (e.g., Bindewald et al., 2021; Coville et al., 2021; Kumschick, Bacher, et al., 2020; Kumschick, Wilson, et al., 2020). EICAT is used as a decision-support tool for non-native species management in its application in national lists, for example, in South Africa (Kumschick, Wilson, et al., 2020), Switzerland (FOEN, 2022), and Italy (Bertolino et al., 2020), in cities such as Cape Town, South Africa (Gaertner et al., 2017), and in the Spanish network of protected areas (Gallardo & Capdevila, 2018). Therefore, EICAT can aid policy and management at various levels. These examples show that EICAT has already been considered sufficiently useful to be incorporated into local and national decision-making procedures on invasive non-native species. We expect more widespread adoption as the utility of this objective approach to non-native species classification is increasingly recognized.

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