



Finding a middle-ground: The native/non-native debate

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ABSTRACT

Throughout the history of invasion biology, there has been long-standing and sometimes fierce debate on the perception and management of non-native species. Some argue that non-native species are universally undesirable for their unpredictability and their ability to at times dramatically disrupt native species and systems. Others argue for an approach that weighs a species' impact and role in a system before determining its desirability, irrespective of its identity. We suggest a middle-ground approach, one that does add extra caution about the desirability of non-native species relative to native species, but also bases perception and management decisions on the population stage of the non-native species and in relation to a wider range of conservation goals. In initial stages of introduction and establishment, we argue that a cautious approach is most prudent, one assuming the potential dangers of the new species in systems. In later stages of established populations, we argue that impact assessments will provide the soundest and more efficient management information, with origin and other available data included as part of the subsequent decision-making process. We explore and expand on these suggestions, and hope that the perspective presented respectfully contributes to finding a common ground in a long and polarized debate.

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1. Introduction

Polarized debate is a feature of many major environmental issues. While properly informed debate is healthy, it should eventually lead to a new understanding or synthesis that provides a way forward. In this paper, we consider recent debate surrounding the focus on non-native species in conservation and management. We suggest the need for a middle-ground that recognizes the merit in both sides of the argument and prompts focus on the management implications of this recognition.

Perhaps no issue in conservation spawns as much emotional debate as the issue of managing non-native species. Depending on the context and perspective, non-native species may be villains, heroes, victims, or organisms just trying to survive. While invasive species management became a central conservation concern in the 1980s, there have been vigorous debates about the status and naming of non-native species starting in the late 19th century (see Coates, 2006). Those who defend the removal of non-native species have been accused of xenophobia and those who are more

ambivalent are charged with biological homogenization. Both sides have merit. Gould (1998) articulated well how native species are really just species that arrived first, rather than species shaped by evolution to be the “best conceivable” for any particular place. Various other biologists and humanities scholars highlight the potential fallibility of a management logic based on claims to essentialism and authenticity (Warren, 2007). Meanwhile, non-native species often decrease biodiversity and alter ecosystem function in remarkable ways (e.g. Mooney and Hobbs, 2000). And while the vast majority of non-native species will not have major effects on ecosystem structure and function (Williamson, 1996) it is difficult to determine when, where and which species are going to be problematic, leading many to err on the side of precaution.

The most recent iteration of debate was sparked in July, 2011 in *Nature Magazine* (Davis et al., 2011; Simberloff, 2011a), and continued for months in various global discussion groups (i.e. EcoLog). Here Mark Davis and co-authors appealed against the native-versus-alien dichotomy exercised in much of the current conservation work. They argued that in a world of extreme change and novelty, it is more practical to shift focus from species origin to the effects species have on “biodiversity, human health, ecological services and economies.” In a letter of response also published in *Nature* and signed by 141 prominent scientists, Simberloff (2011a,b) claims that Davis and co-authors have raised a straw man because land managers only focus on problematic non-native

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species anyway, and that origin is a key indicator of species that are most likely to cause trouble.

Invasion biology has shifted its rhetoric in recent years to reflect a focus on species with the greatest impact (Pyšek et al., 2008). However, how much of this shift reflects a change in attitude toward non-native species, rather than just limited resources and political appeal, is unclear. This point sits at the center of much recent controversy. Without resource and methodological constraints, many, if not most, conservationists would still probably prefer to rid systems entirely of non-natives regardless of impact. Young and Larson (2011) found that while most invasion biologists do not demonize non-native species, more agree than disagree with the statement that “exotics are an unnatural, undesirable component of the biota and environment”. Recognizing that this attitude toward non-native species exists and is widespread within the field helps contextualize Davis et al. (2011) and others.

In this paper, we attempt to find a middle ground in the native/non-native debate. We first highlight different non-native species management stances and their fundamental conservation goals, and explore management options with respect to these goals. Second, we present a framework that incorporates different approaches for new occurrences and introductions of non-native species versus established non-native and invasive species populations.

2. Management and research perspectives

2.1. The native/non-native dichotomy

Though most famously articulated by Elton (1958), the native/non-native distinction predates his oft-cited work. Chew and Hamilton (2011) trace the separation of ‘native’ and ‘alien’ species to Hewitt (H.C.) Watson in the early 19th century. Watson did not extend his definition into value judgments or conservation concerns; it took until the early twentieth century with Elton and his colleagues for the dichotomy to fully develop. The driving idea is that non-native species in a system – species whose presence in a region is attributable to human actions that enabled them to overcome fundamental biogeographical barriers (Richardson et al., 2011) – pose either a currently realized or a potential future threat to the native system and are therefore undesirable. The fear of future threat is based on examples in which non-native species appear benign or beneficial and have been managed accordingly, only to be found to have delayed or misunderstood negative impacts. In Germany, 51% of the 184 woody weed species took more than 200 years to become invasive (Kowarik, 1995).

Decades of accumulated anecdotes to this end have led to a conservative view among many ecologists, where the assumption is guilty until proven innocent (Ruesink et al., 1995; Simberloff, 2005). Most invasion biologists in the Young and Larson survey (2011) classified non-native species as inherently undesirable in natural systems. The common management application of this viewpoint is the removal of non-native species wherever possible and the absolute exclusion of non-native species in restoration and conservation practice. In California, for example, recent efforts have been made to remove non-native *Eucalyptus* trees. In some instances, *Eucalyptus* removal is based on efforts to manage local fire risk caused by trees that are known to be more-fire prone than native species (Simberloff, 2011b). However, in some cases, such as the Arastradero Preserve, CA, the girdling of a single, old mature tree with high cultural value, seemed to many to serve little purpose beyond removing a non-native tree species and caused much antipathy toward conservation aims (Dremann, 2004). Similarly, in the West Australian city of Perth, enhancement plans for a popular urban park included a proposition to cut down a group

of innocuous non-native plane trees (*Plantanus* sp.) despite the local community’s attachment to them. The proposal would have removed key sources of shade in the park and replaced them with native species known to potentially cause hayfever and allergic reactions (Trigger and Head, 2010).

Chew and Hamilton (2011) offer an interesting example of origin-based decision-making in an occurrence in Britain. Pool frogs, *Pelophylax lessonae*, are a common species across all of Europe thought to be descendent from a single Central European animal introduced to Britain in the 1800s. Genetic testing in 2005 found that a subspecies of the pool frog was descendent from Scandinavia, and was thus ‘native’ to Britain, not Central Europe. This subspecies, despite being ecologically interchangeable, morphologically similar, and able to freely interbreed with other (Central European) subspecies common to Britain, was given legal protection and released throughout regions of Britain in an effort to build its population. The logic behind decisions such as these demonstrates the assignment of an inherent value given to the native status of a species.

2.2. Questioning the dichotomy

An increasing number of scientists and practitioners are questioning the strict native/non-native dichotomy as a basis for management decisions. Proponents of this perspective emphasize the complexities of defining ‘native’ versus ‘non-native’, highlighting that often the definitions are purely a matter of temporal or spatial scale. This ‘relativity’ of native or non-native status has led some to suggest that there is a lack of scientific support for separating species based on their origin (e.g. Gould, 1998; Head, 2011), and thus it should be abandoned in favor of a purely impact-based determination of species control in a natural system (e.g. Brown and Sax, 2004; Warren, 2007; Chew and Hamilton, 2011).

A more contentious perspective goes further to highlight the desirability of some non-native species in systems to promote their active use in conservation and restoration planning. As some conservationists have shifted their focus from native biodiversity and historical fidelity, a higher emphasis has been placed on other ecological values such as biodiversity, ecosystem function, and resilience. Thus, the origin of a species is less relevant than its contribution to these values. This perspective stems from emerging examples of non-native species performing beneficial roles in novel communities, such as habitat provision (e.g. trees for bird species, such as pine in Australia for the endangered Carnaby’s cockatoo (Valentine and Stock, 2008)), functional provision (e.g. native plant pollinators, such as non-native birds in Hawaii (Cox, 1983)), and nursing effects during succession (Lugo, 2004).

3. A suggested middle-ground

Most scientists and practitioners in conservation and restoration have opinions that fall between the two extreme perceptions of non-native species. Often for pragmatic reasons and/or due to resource constraints, managers have long tolerated the persistence of low-impact non-native species. Many scientists have also adopted this approach. As Simberloff (2011a,b) points out, “... most conservation biologists and ecologists do not oppose non-native species per se – only those targeted ... as threatening ecosystems, habitats or species”. Similarly, Richardson et al. (2008) states that ‘xenophobes’ in invasion biology are on the fringe of the conservation movement, and that most invasion ecologists see the native/non-native classification as a continuum rather than absolute poles.

The extreme perspectives detailed above offer blanket generalizations about how to perceive and manage non-native species.

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