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ARTICLES

Wildlife Ethics and Practice: Why We Need to Change the Way We Talk About 'Invasive Species'

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Abstract

This article calls for an end to the use of the term 'invasive species', both in the scientific and public discourse on wildlife conservation. There are two broad reasons for this: the first problem with the invasive species narrative is that this demonisation of 'invasives' is morally wrong, particularly because it usually results in the unjust killing of the animals in question. Following on from this, the second problem is that the narrative is also incoherent, both from scientific and philosophical perspectives. At the heart of both of these issues is the problem that the invasive species narrative oversimplifies what are in fact very complex biological processes. As a result, the policies carried out with the stated aim of 'controlling' these animals are often unethical. In light of the current global species decline, this article asserts that the way we think and talk about these animals should be changed and the term 'invasive species' should be discontinued, in the hope that this leads to changes in practice.

Keywords Invasive species · Wildlife conservation ethics · Wildlife policy · Killing animals · Animal ethics

Animals which have been labelled 'invasive species' are the great villains of the wildlife conservation world. They are represented, both by the popular media and within academic discourse, as marauders, aliens, killers and monsters (Strayer and Waldman 2013). As a result, the public is encouraged to perceive these animals, not as valuable members of the biotic community, but as a threat that needs to be met with deadly force. In the USA alone the Department of Wildlife Services, the government body charged with monitoring invasive species, is estimated to have killed around 40 million animals in the past 15 years. In the UK, a member of the public can legally kill animals such as grey squirrels by methods that including

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shooting, trapping and poisoning. The number of wild animals specifically targeted and slaughtered each year, solely because they have been deemed 'invasive', is thus impossible to accurately calculate.

There has been a great deal of recent conversation within the scientific community as to the nature and severity of the threats posed by so-called invasives (Blackburn and Russell 2017; Crowley et al. 2017; Bhagwat 2017). The aim of this article is not to weigh in on the nuances within the scientific arguments at play here. I accept the broad premise that a species which arrives into an ecosystem that it has not previously been a part of, *can* cause harm to other species. The argument which I will make is that, regardless of the validity of the above premise, the invasive species narrative is fundamentally flawed and the systematic devaluing of animal life is a practice that is not morally justified. It is therefore my conclusion that terms such as 'invasive', 'non-native' and 'foreign' should no longer be utilised in the wildlife conservation discourse. We should instead move towards a more measured understanding of the interactions between different species, particularly during rapid periods of environmental transformation caused by climate change.

Some in the academic community have tried to argue in defence of 'invasive' species, on the grounds that these species are filling in the ecological niches left by endangered or extinct species. As such, they may in fact be our best hope of regenerating wildlife numbers in the Anthropocene—the age of human caused extinctions (Pearce 2015; Schlaepfer et al. 2011). Others have explored the question of whether or not the invasive species narrative is useful or ethical with reference to specific events and places (van Dooren 2011; Lockwood and Latchininsky 2008). This article however seeks to attempt a new approach by combining these scientific and ethical discussions to reach a broader, more generally applicable conclusion on the morality of using the term 'invasive species'.

I will argue that the invasive species narrative is fundamentally flawed and as such we should cease to use it. My argument rests on two main points: the first problem with the invasive species narrative is that this demonisation of 'invasives' is morally wrong, particularly when it results in the killing of the animals in question. Following on from this, my second point is that the narrative is in fact also incoherent, both from scientific and philosophical perspectives. In highlighting these issues, I wish to call for changes in the way we describe and value these animals, in the hope that this in turn leads to changes in how public policy deals with the problems associated with them.

In order to address these problems this article is split into three parts. In part (1), I begin by looking at definitions of 'invasive species' and I discuss how the language that permeates the invasive species discourse can lead to unethical practices. In particular, I call attention to the parallels between the portrayal of animal and human immigrants as dangerous invaders. In part (2) I argue that branding animals 'invasive' is not only unethical, but it is also based on a confused understanding of species migrations over time. The reason that the rhetoric of invasive species has become so popular is because it provides a simplistic account of what are in fact very complicated biological processes. As such, the invasive species discourse is too often used as a political tool to scapegoat other living things for problems that are in fact caused or exacerbated by humans. In the final section I argue that,

given the preceding arguments, we should discard the term 'invasive species' and instead use the term 'potential problem species' to describe species which appear to be causing harm in a given time and place. I also provide a brief overview of the arguments which assert that these same species could in other contexts actually be very valuable in helping us to reduce the species decline which is currently having a tremendous impact on wildlife numbers and ecosystem stability. This is not to say that killing animals is *always* wrong, but rather that killing on the grounds of 'invasiveness' is ethically contentious, and thus kill policies should be instigated using a different ethical framework, if they are to be used at all. This would be a significant step towards ending the slaughter of millions of animals each year.

Before continuing to part (1) however, it will be necessary for me outline three assumptions which underpin this article, but which it is not within the scope of the article to explain in detail. The first, is that I am working from the philosophical position that all animal lives have intrinsic value, and that as such they should be treated as ends-in-themselves and not as mere means-to-an-end (Regan 2004). This is a well established position in the animal ethics field and variations of it can be found throughout the literature (Singer 1990; Rachels 1991; Gruen 2011) which is why it shall not be elaborated upon here. Nonetheless, it is important to note because if an animal has intrinsic value then killing it simply to meet instrumental ends will be, in most cases, unethical. The second point to note is that I will be discussing animals, but I also acknowledge that the argument put forward here might also be extended to include plants, as plants are usually included in lists of 'invasive' species and are routinely extirpated en mass. However, given the fact that there are a number of morally relevant differences between plants and animals which further complicate matters, this problem shall not be considered in this particular article. Finally, although I assert that sometimes it may be justifiable to kill the animals in question, detailing the circumstances under which this will be permissible is far too large a project to be able to include in this space. It is however an area that is ripe for exploration and which opens up possibilities for future research in this area.

Part (1) 'Invasive' Species: Definitions and the Influence of Language on Practice

In this section I will look at ethical problems arising from the language that we use to describe non-native animals. Words such as 'invaders', 'foreigners' and 'aliens' are frequently used to create a sense of otherness, making the persecution of non-native animals seem justifiable. This has parallels with narratives surrounding the vilification of human migrants (Staszak 2008). It is reasonable to assume that this kind of language will influence public perceptions (of both the humans and non-humans being described in these kinds of terms). Such language in modern wildlife politics is thus both misleading and morally inappropriate. Before discussing these issues in depth however I will provide some brief, historical background.

The categorisation of animals and plants as 'native' and 'non-native' or 'invasive' species only began in earnest in the nineteenth century, when amateur botanist H.C. Watson sought to devise a way to distinguish between long established and

newly emerging plant species in Britain (Thompson 2014). He defined 'native species' as those who were not introduced by human agency. To this day the conservation community has largely stuck by this definition but, as we shall see, it is too vague to be the basis of ethical wildlife management. Watson made the distinction between native and non-native species largely as part of an exercise in data collection and cataloging, but he fully acknowledged that we could not always put species into these categories with absolute certainty, because our knowledge of their history is limited.

Today however, this system of classification is no longer only of interest to botanists and zoologists, it is part of public policy. Watson's definition of native species is used today by organisations such as the Non-Native Species Secretariat (NNSS), which advises the UK government on how to react to the arrival of non-native species (Anon 2019a, b). Both the NNSS and the International Union for the Conservation of Nature (IUCN) consider the terms 'non-native' and 'alien' as being synonymous with one another. The term 'invasive' however is only used to describe non-native species that cause damage, either to the environment, economies or to human health. As I shall show later in the article, it is also often used by the media in a way which portrays conflict between natives and non-natives as a story of good vs evil. Using the terms 'non-native' and 'invasive' side-by-side can create the impression that species are dangerous precisely because they are not native. As shall be shown throughout this article, this careless use of language risks demonising and killing other living things, with little or no sound justification.

In most circumstances, issues in conservation biology and policy are either framed in cold, scientific and seemingly objective terms or else they are sympathetic in tone, after all the aim of conservation strategies is usually to protect living things. However, the branch of conservation studies known as 'invasion biology' takes a very different tone. The following extract comes from *The Ecology of Invasions by Animals and Plants*, by Charles S. Elton, who is often considered to be the grandfather of invasion biology:

> […] I have described some of the successful invaders establishing themselves in a new land or sea, as a war correspondent might write a series of dispatches recounting the quiet infiltration of commando forces, the surprise attacks, the successive waves […] of attack and counter attack (sic) and the eventual expansion and occupation of territory. (Elton 1958)

We may be tempted to forgive Elton for his preoccupation with militaristic metaphors, he had after all lived through both World Wars and was writing during the era of Vietnam and the Cold War. Unfortunately this combative, militaristic way of writing about non-native species has proven to be a significant part of Elton's legacy. Even in current journals and newspapers, species are frequently described as 'aggressive killers', 'enemies' who 'slaughter', 'wreak havoc' and 'run rampant'. By way of response we must 'wage war', 'control' and form 'defence strategies' against them (Larson 2005). This personification and demonising of other living things is morally unacceptable because metaphors like these are not simply artistic embellishments, they are designed specifically to provoke emotions such

as fear and revulsion. As a result, people are made to feel justified in either allowing their deaths or actively participating in them.

The scientific community is just as responsible for the dispersal of this aggressive rhetoric as the popular media. As Matthew Chew and Manfred Laubichler describe in an article for the journal *Science*, metaphors can be used by scientists to make complicated biological process accessible to the general public. This is not in-and-of-itself a bad thing, but in doing this there is always a risk that the metaphor can be misunderstood or misappropriated (Chew and Laubichler 2003). This is evident in the invasion biology discourse. Of course it is safe to say that some species cause some damage in some circumstances, and in cases where the arrival of new species may introduce fatal diseases, such as malaria, we must of course take some form of action. But to paint animals and plants as malicious conquerors is to miss several very important points.

The first is the issue of intention; no biologist would argue that organisms such as insects, molluscs, or even most mammals can literally be intent on destruction, because they do not have the mental capacity to form complex intentions. Yet the image of invading hordes suggests that other living things are not only capable of such things but that this is *actually* what they are doing. While one may be able to argue that primates and other highly intelligent mammals and birds may be capable of forming something akin to intentions, it is still a huge stretch to suggest that these intentions are *malicious* and directed towards us.

Secondly, the nativist discourse tends to overlook the fact that most non-native species are either completely harmless or very useful in their new environment. For instance, wheat, rice, cattle, poultry and honeybees are all non-native to the USA. Some of these species (cattle and poultry, which are factory farmed for example) have had an enormous, negative environmental impact, but there are no government approved programs for reducing their numbers, because these animals are economically useful to us (United Nations News 2006). This inconsistent application of labels like ‘invasive’ or ‘non-native’ is similar to the narrative that we see in human-centred politics, which is evident when we talk about ‘the right kind of migrant’, where those who are useful can be integrated and accepted, while those who do not provide obvious economic benefits are marginalised (Mahtani 2017).

Further to this, perhaps most troubling issue with the language surrounding invasive species, is that adjectives such as ‘aggressive’ and ‘killer’ are frequently coupled with terms such as ‘foreign’, ‘exotic’ and ‘non-native’. The coupling of these terms is worrying because it reflects the xenophobic narratives that often accompany discussions of human immigration. In his article ‘The Aliens have landed!’, Banu Subramaniam points to several parallels which can be drawn between the way we describe foreign species and the way we describe foreign people (Subramaniam 2001). Non-native animals and humans are depicted as ‘others’, somehow fundamentally different from ourselves. They are often painted as aggressive, sexually voracious and likely to be ‘here to stay’, if given half the chance. They are also depicted as a silent hoard, taking over ‘our’ lands and waterways, often by stealthy and subversive means. For example, a 2012 poster by the U.S. Fish and Wildlife Service came with the following opening statement:

> This Halloween you might be expecting a parade of monsters, ghosts, vampires and werewolves to come knocking on your door […] But even more frightening is the knowledge that every day alien invaders […] are sneaking into our lakes, rivers, streams and even oceans and these critters aren't polite enough to knock! (USFWS 2012)

While such blatant attempts at fear mongering are far less likely to appear in government documents regarding human immigrants, the media is still rife with headlines and stories which attempt to evoke the same basic emotions. Take for instance a story from 2015 in the UK's Daily Telegraph which argued that illegal immigrants are a threat to the nation's food supply, because they "sneak" into lorries containing fresh food, which then has to be discarded (Anon 2015).

This leads us to another parallel that is drawn between invasive species and immigrant humans: they are invariably described as destructive in some way. Just as immigrants are accused of taking local people's jobs, so invasive species are accused of out-competing native flora and fauna. At their very worst, arguments such as these take on an overtly xenophobic tone. This has led several scholars to draw comparisons between current ecological, nativist movements and Heinrich Himmler's 'Rules of the Design of the Landscape', which demanded the exclusive use of native German plants in gardening (Peretti 1998).

While the comparison of organisations such as Natural England to Nazi Germany may seem a little extreme, there is one very clear commonality between their ideologies. Both have a very skewed vision of what it means for a thing to be 'native', their systems of categorisation are arbitrary and show a complete disregard for biogeographical history. This will be the subject of part (2) of this essay. Before closing this section, it is important to reiterate the point that public perceptions of non-natives are often tainted by the language that this discourse is couched in. The terms 'alien', 'invasive' and 'non-native' evoke fear of 'the other'. Such language stirs up sentiments which are strikingly similar to xenophobia in inter-human relationships, and the creation of such negative emotions makes it harder to take a more objective ethical stance on how to manage conflicts between humans and non-human species. Furthermore, the behaviour of these 'invaders' is often described using militaristic tones and metaphors. By personifying and painting these living things as thugs or barbarians intent on destruction, groups and policy makers intent on carrying out culls are better able to gather public support through this appeal to fear.

In summary, there are two key points which this section has put put forward: firstly, the animals often labeled 'invasive' cannot literally have malicious intention, to portray them as having such intentions is misleading and therefore we should stop to ask about the moral justification of our linguistic practice. Secondly, we are using language which is resonant of xenophobic discussions of human immigrants, and this too is morally innappropriate. In the next section, I will show that in addition to these moral issues, there are also practical problems with the discourse.

Part (2) The Incoherence of the 'Non-native' Argument

'Invasive' species stand accused of a number of crimes, from costing the global economy trillions of dollars each year to being the greatest threat to biodiversity on remote islands (Steiner 2010). The validity of such claims will be considered and challenged in this section through discussion of four central points: the first is that the invasive species discourse relies on a human-centred conception of the 'proper' place for living things in the world. My second point is that this kind of anthropocentrism is not grounded in a scientific understanding of how life on Earth actually functions. The third point is that this anthropocentric view excuses human violence toward animals. The final issue is that in targeting animals for causing environmental problems, we too easily overlook the possibility that these problems may in fact have originally arisen from human actions. As previously stated, I do not dispute the notion that under certain circumstances, some non-human species can cause significant harms. However, these harms are usually only a small part of a broader problem and the invasive species discourse is unhelpful as a part of conservation practice as it only serves to distract us from wider, and often much deeper, problems.

As I mentioned in the previous section, distinctions such as 'native/non-native' and 'invasive' are often used by both scientists and politicians as a simple means of explaining very complex processes. The most significant process, in this context, is species migration. By conflating the concept of nativeness with the arrival of humans, in line with H.C. Watson, the biological invasion discourse projects a false image of biogeographical history, because the history of life on Earth does not actually begin and end with the arrival of humans. This results in several ethical and practical problems. The first problem is that it assumes that humans have dominion and centrality in the way that the Earth is organised; that we are the shapers of this world and that we alone should dictate which species go where. Such blatant anthropocentrism assumes that before humans came along that nature was in a state of disorder and that we have formed order from the chaos. Ken Thompson, in his book *Where do Camels Belong?* criticises this belief in what he terms 'the frozen moment' (Thompson 2014). The frozen moment envisions humanity as a metaphorical glacier, as it sweeps across the globe the animals and plants behind it become frozen. Where they find themselves at this time is where they are 'meant' to be. This vision of the world forever compels other living things to reside in the time and space that we have allotted for them.

The notion that there is a right or wrong place for living things to be in is highly questionable, given both our knowledge of the Earth's history and in light of what may happen in the future. Since Alfred Wegener published *The Origins of Continents and Oceans* in 1915, geologists have gathered ample proof that the Earth's continents move over time. Continental drift explains why fossils, such as that of the long extinct fern *Glossopteris*, have been discovered across modern day South America, Antarctica, Africa, India and Australia (UC Berkeley 2015). Animals and plants have been moving across oceans and continents for practically as long as life has existed, sometimes they move because of changes in

climate and geography; some perform annual migrations to feed and breed; seeds, larvae and newborn sea creatures are often carried across oceans on the whims of the currents and the winds. Not only is this true of Earth's past, it happens today and it is certain to continue, indeed, it may even accelerate if the effects of global warming become more manifest (Chen et al. 2011). The movement of living things over the Earth is nothing new and indeed nothing special in-and-of-itself. Humans have, in many cases, accelerated the rate at which species can move around and there may be an argument to say that we should do something to slow the rate of change down. This though is a very different argument from that which states that species should remain within the confines of certain boundaries.

Because it is built on such questionable foundations it is very difficult, if not impossible, to form any coherent conservation policy around the notion of the 'frozen moment'. What follows is a case in point: in the UK, any species which appear to have been in Britain when humans arrived at the end of the last ice age, roughly 8000–12,000 years ago, is considered native. However, we simply cannot say with any certainty which other living beings were here at that time, our ancestors did not document them, fossil records are incomplete and to this day we do not have a full catalogue of all the living things inhabiting this island. Many species are either very rare or inconspicuous, Attenborough's hawkweed (Hieracium attenboroughianum) for example, was first discovered in 2004. It wasn't until 2014 though that botanists were able to declare that the plant is both a newly discovered, distinct species and that it was also a 'native', having probably been around since the last ice-age (Rich 2014). If we cannot say with any certainty which species arrived when, then the whole concept of nativeness already seems to be built on shaky ground.

But this example only reveals a relatively minor practical problem, a more complex hypothetical example can here be considered to show us why defining 'invasive' species in this anthropocentric way is logically incoherent. Homo Sapiens spread across the globe from Africa, gradually, beginning approximately 60,000 years ago and continuing until around 1200 years ago when we reached remote places such as New Zealand and Iceland. So, if we wish to use the 'frozen moment' definition of nativeness, we have to accept that living things 'froze' and became natives at radically different points in time. A short thought experiment will show us why this is problematic. Imagine two bird species, A and B. Both species exist at the same point in time, about 60,000 years ago, but species A lives in Africa while species B lives in the Middle East. Humans are living in Africa but have not yet migrated to the Middle East. So species A is a native of Africa but species B is not *technically* native to anywhere (which in itself seems odd). The global climate warms slightly, species B doesn't fare well in the heat but is able to spread out and inhabit more northerly lands in Europe. Species B leaves the Middle East almost completely around 50,000 years ago, just as humans arrive there. If the climate were to cool again and species B retreated back to the Middle East, under the frozen moment argument, they could not be considered natives of the Middle East, even though they had been there long before humans.

At first glance perhaps this might not seem too troubling, after all the above example is based on events thousands of years ago. However, the very same type of argument is being used to construct conservation laws today. For example, the

UK laws which deal with invasive species are largely covered by the Wildlife and Countryside Act of 1981 which states that a non-native species is one which "is of a kind which is not ordinarily resident in and is not a regular visitor to Great Britain in a wild state" (UK Government 2015). Schedule 9 of the Act currently lists 54 animal and 32 plant species as non-native and invasive, as such it is illegal to release these species (or any hybrids) into the wild. Under proposed amendments to part 3 of the UK's Infrastructure Bill, native species could be classed as non-native (and thus added to schedule 9) if they become extinct in the UK (Ares and Montgomery 2015). The argument for this is that once a species becomes extinct it is "not ordinarily resident" and so can be classed as non-native. This would prevent, or at least make it extremely difficult, to reintroduce species such as wolves, lynx, wild boar and beavers, all of which had been residents of Britain for as long, if not longer than, humans. The concepts of nativeness and invasiveness are thus quite clearly open to manipulation.

In addition to this, the invasive species narrative is an extremely dangerous conception from an ethical point of view because, as Thom van Dooren argues, it provides people with a justification and a sense of moral comfort about killing those who are deemed not to belong. It renders the lives of non-native species illegitimate and not only accepts the necessity of their death but in fact supports the idea that conservation practice demands it (van Dooren 2011). When the value of individuals' lives are diminished in this way, we do not only open the floodgates to a tide of unnecessary killings, but also to extreme cruelty. Van Dooren illustrates this with the example of foxes in Australia, who over decades have been subjected to programs of steel traps, strychnine and other painful poisons.

A final problem with the biological invasion narrative is that it overlooks the role that humans have played in harming other animals and in causing environmental degradation. An excellent example of this can be found in the UK's policies concerning red and grey squirrels. It is considered common knowledge that 'invasive' grey squirrels caused sharp declines in the UK's population of 'native' reds by competing with them for resources. As a result, there is widespread public animosity towards the grey squirrel, with many people considering them vermin. The only legal protection the grey receives is against inhumane treatment. However, humane treatment can include such practices as catching grey squirrels in a bag and clubbing them on the head (BBC 2015).

Putting aside for one moment the horrific treatment that the squirrels may be subjected to, the evidence which connects the grey squirrel's introduction to the red squirrel's decline must be seen in the context of other factors. For example, the first documented red squirrel decline took place in the 18th century, long before the arrival of the grey. This decline was due to the destruction, by humans, of the red squirrel's woodland habitat. In a rather ironic twist, the places where red squirrels are now thriving are in new forests which have been heavily populated by non-native plants such as the Sitka spruce (Humphrey 2005).

Another fact that is largely ignored is that red squirrels themselves were considered vermin before they became endangered. Between 1903 and 1933 approximately 82,000 red squirrels were culled by the Highland Squirrel Club, who accused the squirrel of stripping tree bark and wreaking environmental destruction (Save Our

Squirrels n.d). This is a charge which is now levied at the grey squirrel, but typically not the red. This reveals a double standard in the way lethal policies have been directed against these animals.

Such double standards are evident in other policies which concern native and non-native species. For example, the hen harrier is a bird of prey which is considered native to Britain, yet it has been continually persecuted by gamekeepers because it preys on young grouse, a non-native but economically very valuable species. Although it is illegal to kill hen harriers, enforcement of the law has been extremely poor in this area. There have been no prosecutions for crimes even relating to hen harrier deaths since 2001, despite the fact that many are found shot dead each year and that the last available data shows that only 4 breeding pairs remain in England (Merrill 2015).

The squirrel and hen harrier examples both illustrate an important point: holding 'non-native' species responsible for the declines of other animals is specious when it is humans who have enabled the non-natives to establish themselves. Species, whether native or non-native, will only flourish where the environment is suitable. If we had not culled red squirrels and decimated their habitat, the grey squirrel may never have been able to establish such a strong foothold in the UK. As Ken Thompson points out, if introduced species thrive in their new home, or if species migrate because of climate change, we really have no one to blame but ourselves (Thompson 2014).

In summary of this section, four main issues have been covered: the first is the invasive species discourse is highly anthropocentric, which ties into the second point, which is that this anthropocentric viewpoint is not backed up by our scientific understanding how species move across the planet over time. These first two points explain the logical incoherence of the invasive species narrative. The third point moved on to the ethical impacts of this narrative and the violence that is excused by it. Such violence is not only unethical because the justifications for it are rather illogical but, as point four illustrated, in targeting animals for causing environmental problems, we too easily overlook the possibility that these problems could in fact have been caused by humans. Considered together, I assert that these issues provide further reasons for calling for an end to the use of the term 'invasive species' and the other derogatory terms like 'alien' that accompany it.

Part (3) Valuing Invasive Species

Thus far in this article I have argued that the native-non-native distinction is: (1) scientifically problematic (fundamentally and in its application); (2) is used to excuse/justify behaviour that we would otherwise consider unethical; (3) is used to scapegoat 'non-native' species for problems that humans have caused. This final, shorter, section will turn from looking at the past harms we have caused these animals and look towards a potentially positive future in which we may in fact see value in the animals which have up until now been labelled 'invasive'. While I do not believe that animals are always benign, or that we should never take *any* form of action when they are causing serious harm to others, I do believe that our attitude towards them

needs to be better informed. To that end, I advocate discarding the term invasive species (and all the baggage that comes with it) and instead using the term 'potential problem species' to describe species which are causing harm in a given time and place. Whether or not these species are new to an area or not would be irrelevant because, as we have seen and will continue to see, the native/non-native distinction is simply not useful and in some cases it is actively misleading.

Earlier in this essay I noted that the Earth and its inhabitants are constantly changing, moving and adapting. Life on Earth does not stand still. At this juncture I will argue two points: the first is that non-native species have been valuable in creating the ecosystems present in the world today. Strongly linked to this, the second point is that it is these same, so-called 'invaders' that stand the best chance of creating resilient ecosystems in a future inescapably affected by man-made climate change.

With regards to the usefulness of non-native animals, there are a number of examples that have been cited in recent years. For example, when the islands of Mauritius lost their native giant tortoises, the government introduced the Aldabra tortoise from the Seychelles. If the tortoises had not been introduced many native fruit-bearing plants (whose seeds are dispersed by the animals) are likely to have also become extinct (Marris 2014).

Perhaps the most profound example however is the honeybee. Technically honeybees are native only to Africa, Europe and the Middle East, although evidence suggests they may in fact have originated in Asia (Han et al. 2012). Now found across the globe, honeybees are an integral part of many ecosystems. According to the British Beekeepers Association,

> Bees are pollinators vital to our food chain. One-third of the food we eat would not be available but for bees. […] The harvest from honey bees of honey, pollen, wax and propolis has nutritional, craft, manufacturing, and medical applications. […] In addition, bees pollinate the flowers of many plants which become part of the feed of farm animals. The economic value of honey bees and bumblebees as pollinators of commercially grown insect pollinated crops in the UK has been estimated at over £200 million per year.' (British Beekeepers Association 2019)

When we consider that these figures only relate to bees in the UK we can see that the contribution made by bees across the world is astounding. Bees have not only benefited humans, but in pollinating flowers and crops they are invaluable to an uncountable number of non-human animals too.

The honeybee is perhaps an obvious example, but it brings us to another important point. Bees, like all successful 'non-native' species, adapted to their new environments and survived by developing relationships with other species and by filling in niches in a particular ecosystem. If a non-native animal does nothing but destroy its surroundings, it will soon die out as its resources become depleted. Non-native animals who survive the test of time do so because they can cope with dramatic changes in their surroundings and can adapt accordingly. For this reason, environmental scholars such as Fred Pearce have argued that non-natives should be appreciated (Pearce 2015). Given the rapid pace and the sheer number of environmental changes that are taking place due to climate change and

human activity, in order for life on Earth to continue we will need animals that can keep up and remain resilient.

The 2016 Living Planet Report, compiled by the World Wildlife Fund (WWF), estimated that more than half of the world's vertebrate species have become extinct in just the last 40 years (Anon 2018). Although there may be a tiny minority of non-native species that have contributed to problems such as this, the vast majority are either benign, or may indeed prove to be helpful. A 2011 study found that non-native species can contribute to the survival of other animals by providing habitat or food sources, by serving as substitutes for extinct species (as in the case of the Aldabra tortoise) or by providing other ecosystem services, such as pollination (Schlaepfer et al. 2011). They can also be beneficial in the restoration of habitats which have been degraded by human activity. In a marine habitat on the coast of Chile, for example, an invertebrate called Pyura praeputialis forms large 'mats' in which other invertebrates then make their home. Scientists compared these areas with other nearby rocky shorelines and found 100 additional species in the areas containing Pyura praeputialis (Castilla et al. 2004).

We can see then that the idea that non-native species are inherently destructive is highly questionable. Not only can they provide benefits to other living things, they may well play a vital part in the construction or restoration of future ecosystems. This then provides yet another reason as to why terms such as 'non-native', 'invasive' or 'alien' should no longer be used in wildlife conservation; they cause us to overlook the potential benefits that these animals can bring. The arguments that I have provided here are instrumental reasons to value animals which fill in ecological niches. There are also non-instrumental reasons for valuing them; arguments which suppose that all animals have intrinsic value would reach very similar conclusions to these instrumental arguments. If individuals of other species have intrinsic value then individuals of non-native/invasive species also have intrinsic value *because* their non-native status is morally irrelevant (despite the implicit assumptions of the discourse).

In conclusion, in this article I have shown that the invasive species narrative is fundamentally flawed and as a result I believe that both our attitudes and our public policies should reflect the fact that non-native 'invasive' species are not, by nature, malicious or destructive. The invasive discourse is couched in language which immediately prejudices people against the animals. This leads to the killing of these animals being viewed as both morally acceptable and indeed necessary, when in fact such assertions are extremely controversial.

The incoherence of the invasive species narrative stems from the fact that it contradicts much of what we know about the biogeographical history of the Earth. It asserts that there is a right and wrong place for every species to be when in truth species have, and will continue, to move across the globe in order to cope with changes in climate, food distribution and so forth. This ability to move to new environments and to cope with drastic change is also a part of what makes 'invasive' species potentially valuable. During periods of rapid ecological change, species which can survive and provide stability in an ecosystem offer the best chance the biosphere has of maintaining a diverse range of living things in the future.

This potentially for animals to produce good and bad environmental consequences should be much more strongly reflected in the language that we use to describe them. This is why I advocate discontinuing the use of the term 'invasive' and its synonyms and instead, when it does appear that a group of animals are causing environmental harm, we can put them in the category of 'potentially harmful species'. It will be important to include the word 'potentially' because even in cases where we have identified a problem (e.g. the decline of red squirrels) we should conduct further, deeper, investigations into the causes before even considering killing them. Assessing problems in this manner would also mean the native/non-native term would become redundant because, as I have shown with the agricultural examples of cattle and wheat, where a species has come from has no real bearing on how destructive or useful it can be.

Rather than fixating on where things come from, we need to remember that, in terms of the Earth's history, we are both one of the newest and most 'invasive' species of all. The idea of the frozen moment, that all living things have a time and place in which they are meant to exist is nonsensical, and if we insist on pursuing this myth we are only going to continue destroying our fellow creatures, rather than truly protecting them.

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