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REVIEW ARTICLE

Boundaries of the wolf and the wild: a conceptual examination of the relationship between rewilding and animal reintroduction

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Animal reintroduction and rewilding are two widely appealing and frequently connected forms of ecological restoration. However, the critical assumption that animal reintroduction automatically helps to restore formerly wild places is under-theorized. To fill this void, we identified three common rewilding elements from the literature—ecological functioning, wilderness experience, and natural autonomy—and screened these against a hypothetical wolf reintroduction to Scotland. Each of the rewilding elements was likely to be positively impacted by a wolf reintroduction. Yet, there is a key conceptual difficulty in that the different rewilding elements do not necessarily enforce each other, and at times may even collide. Thus, a reintroduced species like the wolf may obfuscate the clear-cut, purified nature category to which rewilding often aspires. As a way forward, we suggest that there is merit in actively engaging with the tensions created by rewilding and reintroductions. A reconceptualisation of the nature–culture spectrum as consisting of multiple layers (e.g. ecological functioning, wilderness experience, and natural autonomy) may help to interpret ecological restoration as a tentative, deliberative, and gradual enterprise. This bears some resemblance to the notion of approaching a landscape like a 'palimpsest' (i.e. a text built up of different layers written on top of each other), which may support the reconciliation of conflicting views without necessarily making those disappear. When viewed as feeding into a multilayered nature–culture spectrum, animal reintroduction and rewilding can be promoted as inspiring and essentially non-controlling forms of ecological restoration and human interaction with nature.

Key words: control, ecological restoration, grey wolf (*Canis lupus*), Scotland, wild

Conceptual Implications

- Ecological restoration interpretations—particularly those concerned with rewilding—are little helped by leaning on either the nature–culture spectrum or the unspecific notion of hybrid natures.
- A reconceptualisation of the nature–culture spectrum as built up of multiple layers may prove to be a more productive conceptual basis.

Rewilding and Animal Reintroduction

An increasingly popular form of ecological restoration, rewilding has been described as a "proactive idea" that could "galvanize the conservation community out of its helplessness" (Caro 2007, p 283). At the core of rewilding often stands the reintroduction of large herbivores or apex predators. The traditional, ecology-based logic for this is that many of such species have a disproportionate influence in ecosystems as ecological keystones (Simberloff 1998; Soulé & Noss 1998). This makes the link between rewilding and reintroduction straightforward: the last of the three Cs of ecological rewilding—Cores (large protected areas), Corridors (connectivity between cores), and Carnivores (keystone species in cores) (Soulé & Noss 1998)—thus denotes the requisite for animal reintroduction where keystones have been lost. The three Cs reduce the argumentation for animal reintroduction and rewilding to a solely ecological understanding. However, in the reality of conflicting interests and discursive disagreement between stakeholders, the argumentation for animal reintroduction is often multifaceted and complicated (Arts et al. 2012*a*, 2012*b*). Similarly, support for rewilding often also involves ethical and economic arguments, and the societal interest that reintroduced animals generate (Fiedeldey 1994; MacDonald et al. 2000; Knight 2003; Curtin 2005) seems an integral part of rewilding; it is often concerned with cultural keystone species too (Garibaldi &

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Turner 2004) (Box S1, Supporting Information). We suggest that the relationship between rewilding and animal reintroduction is more complex than the eminent ecological narrative that reintroduced animals positively contribute to rewilding aims (Foreman 1998, 2004; Soulé & Noss 1998; Taylor 2007). This important link is moreover strongly under-theorized. In this study, we take a theoretical approach in reviewing the relationship between reintroduction and rewilding, and aim to identify and conceptualize the various ways in which the two relate. To this end, we first identify, from relevant literatures, common elements of rewilding (Boxes S2 and S3; Table S1; Fig. S1). We then take as a case study the grey wolf (*Canis lupus*) and its hypothetical future reintroduction to Scotland. This species was chosen because it is often seen as the epitome of a wild animal, and its reintroduction deemed one of the most challenging conservation interventions. In light of this reintroduction scenario, we analyze the specific contributions and tensions for each of the identified rewilding elements, that is: ecological functioning, wilderness experience, and natural autonomy.

Theoretical Context

The structuralist argument developed by Douglas (1991) explores the function of fundamental cultural distinctions. She observes that cultures rely on the classification of order (purity) and the maintenance of clear-cut categories. But, as with any system of classification, a culture inevitably gives rise to anomalies, which defy the culture's very assumptions. These anomalies are also described as "social pollution" or "matter out of place," and some cultures' survival, she suggests, may depend on their ability to deal with those anomalies (Douglas 1991, p 40). On the basis of this framework, Milton (2000) argues that nature conservation is primarily concerned with the maintenance of categories. She contends that without boundary maintenance, conservation as it is understood today would become meaningless. The main boundaries in conservation discerned by Milton are the separation of species, the distinction between native and non-native, and—importantly for this study—the duality between nature and culture (Anderson 1997; O'Rourke 2000; Thomson 2007; Maskit 2008; Scotney 2014).

The protection (and restoration) of wilderness has been criticized by many scholars precisely on the grounds that it seeks to maintain the dualistic distinction between nature and culture (Cronon 1996; Hobbs et al. 2009; Marris 2011). The preservation of wilderness has led to the incarceration of wilderness in reserves (Birch 1990), the persecution and exclusion of native people from their land (Neuman 1998; Sarkar 1999; Diegues 2008) and other harmful social and biophysical consequences (Cronon 1996; Callicott 1998, 2008). The quest for purity of wild spaces, or nature more broadly, has also been rejected for a more practical reason, that is: nature simply has been altered by modern humans on a global scale (Kareiva et al. 2007; Seitz 2014). McKibben (2003) has called this "the end of nature," implying that nature as a pure category is irreversibly lost.

Although today's rewilding interpretations might denote more awareness of social injustices potentially induced by the intervention, they still tend to rely heavily on the nature–culture distinction. Against a backdrop of the so-called 'hybridity' of many landscapes (Plumwood 1998; White 2004), an implicit rationale of rewilding activities is 'seemingly' to recreate nature as a purer category, as a form of human control that, paradoxically, requires the abandonment of human control (Drenthen 1999, 2005; Rinfret 2009; Arts et al. 2012*a*). With this theoretical context in mind, we explore the boundaries of rewilding and reintroduction by looking not only at the *contributions* but also at the *tensions* created when the two conservation interventions come together.

Following our literature review (see Supporting Information), we distinguish three common elements of rewilding: restoring ecological functioning, wilderness experience, and natural autonomy (Box S1). *Ecological functioning* refers to the enhancement of biophysical wilderness attributes. It leans on the assumption that the enhancement of these attributes will positively impact on the ecological functioning of the area. *Wilderness experience* is concerned with the human (interpretational) dimension of biophysical attributes. Three more specific strands of wilderness experience can be distinguished: (1) an off-site, symbolical (or virtual) wilderness experience; (2) the accessibility or 'participatory scale' of wilderness; and (3) the context or sphere in which 'the wild' can be understood and perceived as such. The third common element of rewilding, *natural autonomy*, relates to the enhancement or continuation of a natural process, which was held back by humans. This element is essentially about reducing the human influence as much as possible (Box S1).

A Scottish Wolf Reintroduction?

This study aims to identify and conceptualize the various ways in which rewilding and animal reintroduction are related. As a case study for the latter, we investigate the potential reintroduction of the wolf to Scotland. For many, the wolf epitomizes the wild animal (Knight 2003; Buller 2008; Brown et al. 2011; Kowalsky 2014). But it is only in recent decades that the wolf's absence in many parts of its historical range is seen as a loss. Reintroduction of red wolves (*Canis lupus rufus*) to the south-eastern United States in 1989, and grey wolves to Yellowstone National Park in 1995 (Berger 2008; Mazur & Asah 2013) marked the beginning of a global "wolf boom" (Knight 2003, p 4), with assisted recolonization in Scandinavia (Skogen & Krange 2003), and discussion about the potential for reintroduction, for example, in Japan (Knight 2003) and Mexico (Martínez-Meyer et al. 2006).

In Scotland, and thereby the United Kingdom, the wolf allegedly went extinct around 1700 AD (Yalden 2003). From the late 1970s onwards, discussion on a potential wolf reintroduction emerged occasionally in written sources (Nevard & Penfold 1978; Yalden 1986), but it is notably from the mid-1990s that the idea has become more prominent (Donaldson-Webster 1995; Macnally 1995; Panaman 1995, 2002; Watson

Featherstone 1997; Dennis 2003; Wilson 2004; Cairns & Hamblin 2007). This is also visible in the increased scientific interest in the topic (Gorman 2007; Nilsen et al. 2007; Manning et al. 2009; Sandom et al. 2012).

Despite a growing support of the general public for reintroduction (Market Research Partners 2008; Granville & Primrose 2011), many animal reintroductions to Scotland remain contentious from a socio-political standpoint (Arts et al. 2012*b*, 2013). The wolf is arguably the most controversial candidate imaginable (Wilson 2004; Nilsen et al. 2007), and therefore a potentially insightful focal species for our purpose here. This contentiousness is partly due to the "entrenched positions" (Thirgood & Redpath 2008, p 1552) of stakeholders that are potentially negatively affected by a wolf reintroduction (Brown et al. 2011). Scotland has a long history of conflict over land, and relatively well-defined stakeholder groups such as farmers, gamekeepers, and conservationists often reproduce specific narratives and discourses about Scottish landscapes (Lorimer 1999, 2000; Arts et al. 2012*b*; Dinnie et al. 2015). Importantly, (conflicting) viewpoints are sustained by perceptions of external (i.e. governmental or 'urban') interference in landscape governance (Maffey et al. 2013; Dinnie et al. 2015). Studies on people's attitudes toward wolves show that it is often tourists, ecologists, and members of the general public with no particular interest in the topic, who are in support of a potential wolf reintroduction. Conversely, local residents whose interests may be directly affected by the presence of wolves in their area, such as hunters, farmers, and landowners, tend to be more cautious (Wilson 2004; Nilsen et al. 2007). Furthermore, a positive attitude toward wolves is commonly linked to urban residency, younger age, and higher education. A negative attitude is more likely to be found among rural residents, elderly people, and women (Kellert in Kleiven et al. 2004; Skogen et al. 2008; Dressel et al. 2015). However, a study in Sweden shows that attitudes among the general public toward wolves are not strong and can easily change as a result of a single publicized event (Ericsson & Heberlein 2003). It is also pointed out in the literature that conflict is not necessarily solely fuelled by the presence of the wolf itself; it is often also the result of social differences, and (as such perceived) skewed power relations (Skogen & Krange 2003; Linnell et al. 2005; Skogen et al. 2008; Vaccaro & Beltran 2009; Van der Windt 2009).

Contributions and Tensions Related to Ecological Functioning

Contributions

Cases made in favor of a wolf reintroduction to Scotland encompass different types of arguments, such as moral, aesthetic, and economic ones (Panaman 1995; Watson Featherstone 1997). But the main focus has been on the ecological impact of the wolf on the Scottish red deer population (Nevard & Penfold 1978; Yalden 1986; Wilson 2004; Gorman 2007; Nilsen et al. 2007). Of late, attention has shifted from a focus on the top-down regulation mechanisms through wolf predation of deer, toward the non-lethal effects created by a 'landscape of fear' (cf. Laundré et al. 2010). Such a landscape implies a change in herbivore grazing patterns that is believed to be conducive to ecosystem recovery from overgrazing (Manning et al. 2009). This has potentially many other consequences on various levels of an ecosystem through the addition of a trophic level and subsequent potential trophic cascades. Sandom et al. (2012) showed that, once released, an enclosed wolf population would be able to survive on the basis of current prey density and habitat availability in Scotland. Besides, according to proponents, the current situation in eastern Germany shows that grey wolves are capable of surviving in semi-natural environments that are not traditionally deemed ideal for the wolf (Reinhardt & Kluth 2004; Cairns & Hamblin 2007). This holds true for many other parts of Europe too (Chapron et al. 2014). It should be questioned how wolf prey in Scotland would respond to a suddenly instigated 'landscape of fear' (Bullock 2007). Research on the reintroduced wolves in Yellowstone National Park, however, showed that a prey species like moose (*Alces alces*) adapts within a matter of years to such a new situation (Berger 2008) thus countering this animal welfare argument. In several Dutch rewilded areas, the numbers of de-domesticated cattle are regulated by selective culling by humans through 'the eyes of the wolf' (Klaver et al. 2002; Lorimer & Driessen 2011). Still, such management does not compare to the regulating effect of an actual wolf pack, for one because the prey does not observe wolves. Fear of the wolf and associated behavioral responses of prey leading to changes in habitat use (Manning et al. 2009) are thus not induced in that scenario.

Tensions

There is uncertainty as to the precise ecological effects of wolves on present-day Scottish ecosystems. Some of these effects can be predicted based on general (grey) wolf biology, inferred from wolf reintroduction elsewhere (cf. 'landscape of fear' in Yellowstone National Park—Ripple & Beschta 2007), or modeled for a Scottish context (Nilsen et al. 2007; Sandom et al. 2012). But insights from analogous ecosystems also show that "unforeseen, yet important, ecological ramifications" of wolf reintroduction are likely to occur (Manning et al. 2009, p 2318). This reflects an observation by the ecologist Paine (1966) about the difficulty of comparisons of faunas on a zoogeographic scale without studying the actual local situation, or without sufficient insight into the complexities of ecosystems and trophic cascades (Lindeman 1942; Estes et al. 1998; Beschta & Ripple 2006). One of the compelling issues is how rewilders themselves deal with this ecological uncertainty, and to what extent they project an ecosystem 'ideal-type' of what the rewilded landscape should look like (cf. Vera 2000; Fenton 2008; Monbiot 2013, see also Drenthen 2013, and Discussion and Conclusion). Given the magnitude of modern anthropogenic changes to the Scottish and global environment (Warren 2009), it seems likely that a wolf reintroduction would not so much help recreating an old wilderness, but become part of a 'novel ecosystem' (Hobbs et al. 2009; cf. Lorimer & Driessen 2014).

Contributions and Tensions Related to Wilderness Experience

Contributions

With regard to the symbolic side of a wilderness experience, Watson Featherstone (1997) and Cairns and Hamblin (2007) have pointed out that a wolf reintroduction is potentially of much value. A return of the wolf, they argue, would illustrate the enlightened attitude of present-day humans toward a species that has traditionally been feared and loathed. Additionally, the wolf would be a symbol for a harmonious, sustainable Scotland in which proponents and opponents have together found ways of accepting the wolf's place in the landscape and society (Watson Featherstone 1997; Cairns & Hamblin 2007; Ellis 2007). For some, a wolf reintroduction would also contribute to off-site symbolic wilderness experiences; realizing that few people would actually see wolves in the wild, the knowledge that they exist in Scotland could be regarded as a valuable wild experience in itself (Panaman 1995; Watson Featherstone 1997; Cairns & Hamblin 2007). The reintroduction of the wolf could also contribute to both the accessibility and the contextual aspect of a wilderness experience. First, it can be argued that the presence of wolves will enhance the wilderness experience because human activity (cf. the notion of participatory scale) in a natural area that coincides with the wolves' home range will then by many be considered to take place in a wilder space than before (Watson Featherstone 1997; Taylor 2007). Second, a wolf reintroduction may also impact on spaces that would often be disputed as 'wilderness' in terms of their biophysical characteristics (like much of the Scottish Highlands—cf. Warren 2009). Indeed, reintroduced wolves may occupy semi-natural, agricultural, or even urban environments (Chapron et al. 2014). For some, this will add wildness in the positive sense of 'rewilding' to these areas.

Tensions

There is a flip side to both the symbolic and more concrete implications of wolf presence, particularly in a local geographical setting. A study of social representations of the wolf in Norway shows that distinct social groups conceptualize the wolf in similar ways, namely along the archetypes of 'superior,' 'social,' 'wild,' and 'pure' (Figari & Skogen 2011). Yet, importantly, differentiation lies in the classification of the area to which the wolf is thought to belong. For instance, a wolf too close to a settlement conflicts for some social groups with the place associations of a settlement, leading to a symbolic mismatch between wolves and the landscape. As a result, by some social groups the wolves in those spaces are not understood as 'real' or 'pure' wolves but as hybrids. So although the wolf's perceived fundamental nature remains generally uncontested, its presence in a certain space may have an effect on its acceptance (cf. Drenthen 2014; Thorp 2014). This indicates that the degree of societal consensus on the legal and mental designation of 'wild nature' spaces may partly determine the socio-cultural success of a wolf reintroduction. Put differently, for some social groups, anomalies may arise if reintroduced wolves occupy semi-natural, agricultural, or even urban spaces (as they do in, for example, Germany, Romania). Again, it should be borne in mind that although there is some consensus on what and where the wild nature spaces in Scotland are, Scottish landscapes are also frequently conceptualized as specifically cultural, and rooted in frequently troubled histories of suppression and displacement (Lorimer 1999, 2000; McMorran et al. 2008; Dinnie et al. 2015). An important question is thus how rewilders themselves, people directly affected by a reintroduction, as well as other social groups across society, deal with the possibility of 'the wild out of place.' In her studies, Douglas (1991, p 39–40) identifies "alternative interpretation," "control," "labeling," and "avoidance" as some of the social coping mechanisms for dealing with matter out of place. Any of these mechanisms is likely to have an adverse impact on both the reintroduced animals and the rewilding agenda at large. Moreover, the mechanisms sit uncomfortably with some prominently upheld ideas of ecological restoration, such as that restoration is only desirable when it is open to community-based participation, and exercised in a general context of good socio-political practice (Light & Higgs 1996; Hull & Robertson 2000; Jordan 2000; Vining et al. 2000; Light 2006; Throop & Purdom 2006; Monbiot 2013).

Contributions and Tensions Related to Natural Autonomy

Contributions

It has been suggested that any wolf reintroduction to Scotland should be heavily controlled—with the underlying rationale being that short- and mid-term control would feed into long-term sustainability of wolf presence (Macdonald et al. 2000; Taylor 2008; Manning et al. 2009; Sandom et al. 2012). Following experimentation with the banding of wolves with electric shock collars in the United States and Georgia (Badridze 1999; Shivak & Martin 2000), this management tool has also been mentioned in a Scottish context (Sandom et al. 2012). But a more frequently discussed alternative of intense control is the release of wolves in a large fenced area (Macdonald et al. 2000; Taylor 2008; Manning et al. 2009; Sandom et al. 2012). If rewilding is understood as a means to allow continuation of ecological processes that were artificially held back (Adams 1997; Light 2000), then the idea of a full-scale wolf reintroduction into the open Scottish countryside is at first sight a more 'autonomous' option. On the other hand, it is common practice in reintroduction to monitor animals through radio telemetry and Global Positioning System (GPS) technology (Kleiman 1989; Rinfret 2009), which may be used to help intercept 'problem cases.' Intense surveillance of the latter may paradoxically increase the autonomy of the population as a whole. The current practical and political context of any wolf reintroduction to Scotland is likely to come with post-release management schemes, which will impact on the natural autonomy of the wolves and their environment. The degree to which the wolf's natural autonomy is respected in the reintroduction scheme seems an important determinant of the success of the rewilding agenda.

Tensions

In light of the notion that post-release management schemes are likely to impact on the natural autonomy of the wolves and their environment, one of the central conceptual difficulties for rewilders is how to balance a process of control with the aim of the process being to uncontrol. It also shows the shortcoming of the terms 'control' and 'uncontrol.' These are too broad to accommodate the variety of stages and time-spans that are central to the discourses of rewilding and reintroduction. The wolf lived in Scotland for thousands of years. It was then absent for about 300 years, and rewilders are proposing to bring it back again for the long-term future. As such, the time of 'control' is viewed to be relatively short. The same principle applies to what the term 'control' encapsulates. Collection of animals from other in situ or ex situ populations, transportation, quarantine, release, monitoring, removal of problem cases, and establishment of a self-sustaining population—all these distinct stages of a reintroduction work on different time-scales and signify particular intensities of control. The challenge for rewilders is to gradually reduce the moments and intensities of control.

Discussion and Conclusion

We took a theoretical approach in reviewing the relationship between reintroduction and rewilding, and aimed to identify and conceptualize the various ways in which the two relate. In the theoretical context of boundary maintenance, we specifically examined the contributions and tensions of a potential wolf reintroduction to Scotland in relation to the agenda of rewilding.

When assessed on their own, each of the identified rewilding elements is likely to be impacted in several ways by a wolf reintroduction, and some of those in a manner that many rewilders would want to see: with a new trophic level creating a landscape of fear, the ecological functioning of part of the Scottish environment would arguably be improved; wilderness experiences may be enhanced symbolically or tangibly for some user groups; and the autonomy of natural processes in the geographical home range of the wolf is likely to improve in the medium and long term, provided that a reintroduction scheme would not be coupled with stringent management mechanisms that curtail the natural autonomy of the released individuals themselves. It is, however, also clear that complex ecological restoration interventions, such as those presented by the wolf, are likely to pose difficulties and challenges. We identify two in particular.

First, rewilding elements are not always necessarily mutually enforcing, and can indeed conflict with each other. For instance, the element of 'natural autonomy' may clash with the 'boundedness' of wilderness experience. Wolves will often ignore human-set boundaries. Some wolves may hunt for domestic animals rather wild prey, some may occupy non-'wild nature' spaces, and some may perhaps succeed in evading all forms of post-release management. The partly uncontrollable and unpredictable natural behavior of the wolf may obfuscate the clear-cut, purified nature category to which rewilding aspires. Put differently, protagonists will have to consider that enhancing the purity of the nature end of the nature–culture dichotomy on one level (e.g. bringing back a lost species) may cloud the dichotomy on another level (e.g. new interactions between current socio-ecological systems and the reintroduced species; cf. Plumwood 1998; Drenthen 2014). This problem, which bears resemblance to the so-called 'participation paradox' (Throop & Purdom 2006), has been engaged with by means of a focus on physical participation by citizens in restoration projects (Higgs 2003; Light 2006). The problem with animal reintroduction is that it offers relatively few windows of opportunity for hands-on participation by a wider public.

Second, and related to 'wilderness experience,' what is constructed or perceived as 'the wild in or out of place' is not a cultural constant, nor is what is constructed or perceived as pure wilderness (Figari & Skogen 2011; Arts et al. 2012*a*; Kirchhoff & Vicenzotti 2014). For this reason, key actors will need to continue to negotiate with other stakeholders the ways in which to purify the nature category (e.g. the amount of post-release management)—especially in an era in which the nature category itself is being reconceptualized (Hobbs et al. 2009). Note though that from this process—and the 'uncomfortable' wildness that wolves might present—new attitudes might arise that could give new meaning to human interaction with nature (Plumwood 1998; Lorimer & Driessen 2014).

As a conceptual way of dealing with the main two identified difficulties and challenges, we suggest that there is merit in actively engaging with the tensions created by reintroduction and rewilding—intellectually and practically. Our examination indicates that ecological restoration interpretations—particularly rewilding—are little helped by the implicit or explicit postulation of the nature–culture spectrum (cf. Anderson 1997; Milton 2000; Maskit 2008), or the unspecific notion of hybrid natures (Plumwood 1998; White 2004). A more productive metaphor is arguably a nature–culture spectrum with several different 'layers' such as 'natural autonomy' and 'ecological functioning.' This idea relates to the notion of a landscape as a 'palimpsest': a text built up of different layers written on top of each other (Drenthen 2013). When a landscape is approached like a palimpsest, it may support the reconciliation of conflicting views on control of nature, but without necessarily making those conflicting views disappear. Given the mobility and process-related nature of (reintroduced) animals, the idea of a multilayered nature–culture spectrum offers a befitting conceptualisation for rewilding as a driver of landscape change. When perceived as such, ecological restoration can subsequently be interpreted as a fickle and gradual enterprise that aims to move some of the benchmarks on those layers toward the 'purer' end of the spectrum. Reintroduction and rewilding can then more easily be understood and implemented in a tentative and deliberative manner, and held as inspiring examples of essentially non-controlling forms of ecological restoration, and of human interaction with nature more broadly.

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Supporting Information

The following information may be found in the online version of this article:

Figure S1. Three common elements of rewilding (in bold) and their conceptual features as identified in the literature.
Table S1. Conceptual features of rewilding and references.
Box S1. Description of three common elements of rewilding.
Box S2. Approach to literature review.
Box S3. Literature cited in supporting information.

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