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Managing wild minds: From control by numbers to a multinatural approach in wild boar management in the Veluwe, the Netherlands

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Current wildlife management practices rely largely on quantitative data to legitimise decisions, manage human–wildlife conflicts and control wildlife populations. This paper draws attention to the affective relationships between humans and animals inevitably formed in the practice of producing these data. Based on fieldwork that explores wild boar management in the Veluwe, the Netherlands, we demonstrate the significance of these affective encounters. Specifically, we develop an understanding of mindedness that draws on processes of affective learning in wildlife management practices. To understand this mindedness and how it emerges in wild boar management practices, we use the concepts of affect, attunement and animal subjectivities. First, we show how the numero-politics involved in wildlife management presumes animal minds to be static and generically defined by species, and their presence and behaviour to be context independent. Subsequently, we describe the entanglements of humans, wild animals and the landscape, aiming to produce an appreciation of the mutuality that is involved in knowing and conserving wildlife. This, we propose, helps to demonstrate how various – individual or collective – forms of human and non-human mindedness are implicated in management practices but remain invisible and underappreciated in formal accounts. We conclude by explicating a multinatural approach to the management of wildlife that explicitly builds on an acknowledgment of mindedness as a feature of individuals, collectives and landscapes.

KEYWORDS
affective relations, human–wildlife relations, mindedness, Veluwe, wild boar, wildlife management

1 | INTRODUCTION

We are at a farm in the Veluwe, the Netherlands, where a farmer[1] shows a photograph of uprooted grassland.[2] "This is done by wild boars. Because of this damage I can forget the plan I made for this season. I can never flatten this field in time and when cutting the grass, the grass will be full of soil and will be of low quality, which causes me economic loss." This example is illustrative of the (perceived) worldwide increase in conflicts between humans and wild animals (WWF, 2006; Yeo & Neo, 2010). Such conflicts occur not only in remote areas or in developing countries where dangerous megafauna compete for (rural) space with humans (Knight, 2000), but increasingly also in affluent and (sub)urban areas. Popular media reports describe

this development using phrases such as "beavers are felling ornamental trees," "black bears prowling near the premises," "wandering tigers […] come into conflict with people," "wild boar marauding Berlin" and "hogs are digging through garbage, rooting for acorns in city parks and plowing up golf courses" (Deutsche Welle, 2017; Mazoomdaar, 2014; Von Drehle, 2013). Many of these media reports argue that the appearance of these animals in villages or (sub)urban areas and the substantial damage they cause results from the fact that there are "too many wild animals" (Von Drehle, 2013).

Throughout the world, wildlife that is considered to be harmful is commonly managed by being counted and culled to a pre-set number. In this paper, we demonstrate how the seemingly rational and objective models used in wildlife management[3] practices to legitimise interventions are not only subject to and the outcome of political struggles, but also obscure the importance of the characteristics of individual as well as groups of wild animals and the local landscape in which they live. As a starting point we examine the counting methods that were employed in wild boar management, including the manipulations to categorise and standardise these counts (Boonman-Berson & Turnhout, 2012; Bowker & Star, 2000; Stone, 2002). In our account of the numero-politics involved in wild boar management practices (cf. Martin & Lynch, 2009), we demonstrate that the interplay between various humans, wild animals and the landscape[4] are crucial to the process of obtaining the necessary field data to fill the prevailing population and habitat models (Eden, 2012). These interplays involve affective relationships. As has been illustrated for water voles in Birmingham, UK (Hinchliffe et al., 2005), corncrakes in the Hebrides, UK (Lorimer, 2008), bats in Hampshire, UK (Mason & Hope, 2014), Siberian flying squirrels in Finland (Nygren & Jokinen, 2013) and a reindeer herd in the Cairngorm mountain range, Scotland, UK (Lorimer, 2006), such affective relationships are a crucial element of knowing as well as managing wild animals. Specifically, scholarly work using this notion of affect has helped to bring into view the various ways in which bodies (whether an individual or collective of humans, or wild animals) act on each other and how they are moved and transformed in the process (Anderson, 2006; Latimer & Miele, 2013; Pile, 2010). It has also highlighted the importance of multiple senses and sensitivities, including not just material forces, but also, for example, changes in atmospheres, which are not expressed, or hard to express, in language and thus difficult to represent (Hynes & Sharpe, 2015; Lorimer et al., 2017). To denote the process of tuning in to these sensitivities, we draw on the notion of attunement: "an embodied sensitivity to particular non-human differences" (Mason & Hope, 2014, p. 108). To attune implies to open up to other sensitivities, to be moved and affected. This requires passionate engagement on the part of the humans, instead of a dispassionate or objective attitude to the human–animal–landscape relations in wildlife management practices (Bradshaw, 2017; Lorimer, 2008; Tsing, 2010). Learning to attune to (wild) animals is often phrased in terms of learning to "think like" a particular species. Recent work (e.g., Bear & Eden, 2011) has emphasised the difficulties associated with this form of learning, which should not be understood as attempts at "simply" taking the perspective of another animal, but rather as developing a complex set of skills and empathic sensitivity through extensive interacting. Such affective attunement to wildlife does not imply a solely individualistic perspective. With Aldo Leopold's phrase "thinking like a mountain" (Leopold, 1949, pp. 129–131), affective attunement to wolves and deer extends into an ecological experience of the interconnectedness of life in a landscape. This interconnectedness also applies to knowledge. Recent literature concerning affective relationships has focused on the importance of affect in getting to know, or even spot, the animals in question, such as counting – only distinguishable by sound – corn crakes (Lorimer, 2008), surveying – nocturnal and to an untrained eye nearly invisible – flying squirrels (Nygren & Jokinen, 2013) and detecting numbers and species of bats (Mason & Hope, 2014).

In much of this more-than-human work however, the "acts" of the wild animals (presence, absence and movement) in *response* to the presence, absence and movement of the humans in a particular landscape continue to be underrepresented (for some exceptions see: Barua, 2014b; Boonman-Berson et al., 2016). In this paper, we develop a more symmetrical[5] approach that addresses the different ways humans and wild animals respond to each other as they roam the landscape. Thereby we contribute to ongoing efforts to account for non-human animals in the way space is managed (cf. Wolch, 2002) by outlining how taking animals seriously as minded creatures results in novel ways of knowing, learning and hopefully living with non-human difference. Therefore, we introduce an understanding of mindedness that recognises a variety of animals, such as wild boar, as sentient, clever beings that are able to learn as individuals and as collectives (groups, populations, even multiple species collectives), and that actively relate to particular landscapes (Laurier et al., 2006). Importantly, such a relational perspective implies an understanding of agency and subjectivity as emergent and as produced through learning in practice and through interactions between humans, wild animals and the landscape (Anderson, 2006; Deleuze, 1978; Latour, 2004a; Massumi, 2002; McCormack, 2003; Pile, 2010; Thrift, 2004). As such, we emphasise the mutuality or intimately entangled back-and-forth character of affective relationships.

Drawing on the works discussed here, we develop a multinatural approach to wildlife management and research that has the explicit intention to shift both the understanding and practice of human–wildlife relationships. Three important considerations have informed our approach. First, this multinatural approach does not rely on an understanding of nature as separate

from culture and views the distinction between wild and domesticated as blurry. Second, the object of management is not individual animals or populations but human–non-human collectives. Third, management is an essentially open-ended process and does not seek to fix the present or return to the past (Brettell, 2016; Lorimer, 2012).

As a case study, we use wild boar management in the Veluwe, the Netherlands. Wild boars are unruly animals that are not always easy to live with due to their potential social, ecological and economic impact. This case is therefore also relevant to other "keystone" species that are subject to being counted, culled and protected, such as wolves, beavers and deer. The management practices we describe involve wild boars, wildlife managers, policy makers, local residents, wildlife researchers, as well as landscape characteristics including vegetation, soil, fences and roads. The first author carried out a total of 31 interviews with wildlife managers, policy makers, local residents, wildlife researchers, in addition to organising four focus groups with local permanent residents, performing prolonged participant-observation of wild boar counting in the Veluwe area in 2010 and 2011, and participant-observation of wild boar hunting. Charting the formal modes of management and generating an account of the affective relations and the emergence of animal subjectivities implicated in these formal modes of management is methodologically challenging (Hodgetts & Lorimer, 2015). To analyse how wild boars are known, we had to read between the lines of the written forms and understand how the numbers that these forms include came about. This required closely attending to the process in which elusively present and constantly moving boars were being counted or their presence estimated. With a training in sociology, ecology and the basics of ethology, the first author, who undertook the interviews and the fieldwork, sought to move between the formal scientific approaches of investigating humans and animals on one hand and an open approach that is sensitive to the subjective or "affective experiences" on the other (Barua & Sinha, 2017). This involved contrasting her own experiences and observations with those of the human informants in the field, and with formal ecological and ethological accounts of wild boar behaviour (Buller, 2015). Additionally, she had to learn to be affected by the wild boars as they emerged "multinaturally," in response to the processes in which they are known, managed and drawn to places while avoiding humans. This generated a sense of the various intuitive knowledges present in wildlife management practices (Kirksey & Helmreich, 2010).

The results of this methodological approach are presented in two sections that document different elements of the wildlife management practices under study. The first discusses the production and use of numbers. Here, we discuss the more formal aspects of wildlife management: we offer an empirical account of how these numbers came about and we connect this with relevant literature to develop and illustrate the concept of numero-politics. This provides the basis for the second section, in which we highlight the affective and learning dimensions of wildlife management that both inform and are prerequisites for this numero-politics to take place. Moreover, we juxtapose our findings with relevant literature to develop and illustrate the concept of mindedness. We conclude our paper by proposing a multinatural approach to wildlife management that emphasises the continually changing and affective interactions between humans, wild animals and landscapes, thus exploring the potential of non-routine and non-standardised ways of knowing and managing wildlife.

2 | THE NUMERO-POLITICS OF WILD BOAR MANAGEMENT

The Veluwe is the largest terrestrial natural area of the Netherlands and one of the largest of Northwest Europe (see Figure 1). Its 91,200 hectares is characterised by forests, heathlands, drift sands, many roads, some agriculture and several villages. The area is subdivided into segments, which are managed by a variety of owners. The area is therefore far from a single site; some parts are connected and others fenced off – to include or exclude particular animal species – and the management regimes for these species vary as well. The presence of wildlife (red deer, roe deer, wild boar) is a key feature, attracting many recreationists. Simultaneously, these wild animals, especially wild boars in our case, also feature in public debates about wildlife problems, such as the dozens of car collisions involving wild boars, and wild boars that destroy hundreds of hectares of crops (Dusseldorp, 2017; Frijters, 2011; Gruben, 2017; Guldemond et al., 2015; Omroep Gelderland, 2016). According to national policy, wild boars are not allowed to roam around outside the Veluwe, and within the Veluwe they are not allowed to enter villages and agricultural zones (Klashorst et al., 2009; Spek, 2014). These areas are designated as zero-tolerance zones, indicating "non-accessibility" for wild boars, and are sometimes physically demarcated by (wild boar resistant) fences. Wild boars that enter zero-tolerance areas are to be shot immediately by licensed hunters. To prevent wild boars from becoming too burdensome to human activities, including traffic, gardening and farming, as well as to prevent what is considered ecological damage in natural areas, current wild boar management relies on controlling the total number of wild boars in the Veluwe.

Counting wild boars in the Veluwe is a legal prerequisite to initiate population control, which constitutes the culling of wild boars so that the population is reduced to the desired maximum allowance of wild boars (Koninkrijksrelaties, 2012,

FIGURE 1 Location of the research area "Veluwe" in the Netherlands.

2017). This maximum allowance is derived from an ecological model for the Veluwe that is based on food availability, population size and what is called the "ecological carrying capacity" of the area, on the assumption that wild boars have access to the whole area (Groot Bruinderink & Hazebroek, 1995; Groot Bruinderink et al., 1999). In 2009, due to a change in policy, a numerical fluctuation in maximum wild boar allowance per year and per subsection or "Fauna Management Unit" (FMU) was authorised, instead of one fixed number for the entire Veluwe. Depending on available natural resources and in anticipation of possible wild boar nuisance, the pre-set maximum allowance of wild boars across the Veluwe, set in springtime, was permitted to fluctuate, between 1,080 (in years with low available nutrition) up to 1,580 (in years with high available nutrition) (Gedeputeerde Staten van Gelderland, 2009; Klashorst et al., 2009). This was based on the assumption that in years of low food availability (especially acorns and beech-nuts) wild boars tend to move a lot in search of food and in years of high food availability they tend to move less, resulting in a relatively low probability of wild boars venturing into human surroundings (Boitani et al., 1994; Keuling et al., 2009).

The projected maximum allowances are highly contested in the Veluwe. A wildlife researcher[1] summarises the debate by stating that although policy makers and wildlife managers will argue that they rely on an ecological model, the maximum allowances that are derived from this model are actually choices for a specific number of boars which can fluctuate around a median number. Her researcher colleague adds that wild boar management "pretends" to employ objective scientific research in their management and in the determination of the maximum allowances, but that the assumptions in the model might not be correct. For instance, Keuling et al. (2009) assume that wild boars might also move less in years of poor food availability. Their movement, these authors suggest, is the result of "a high individual flexibility in spatial behaviour" (Keuling et al., 2009). This shows that the determination of the maximum allowances and the distribution of boars per FMU and per year is not unequivocally accepted as objective or scientifically valid. Rather, it is a compromise negotiated by the different owners, wildlife managers, policy makers and local residents. This compromise is based on a blend of political, social and ecological factors, of which the most prominent are: (natural) food availability, sufficient visibility of wild boars for recreationist/humans and the likelihood of nuisance to humans caused by wild boars (Klashorst et al., 2009).

Annual wild boar counts are organised during two evenings in seven districts of the Veluwe. Depending on the district, between 28 and 180 people, including wildlife managers, hunters and guest-counters, will be involved in counting in pairs or individually at early evening until dusk. Experienced counters who know the area are teamed up with counters from

other areas to double-check their counts. Counts are recorded on a form that incorporates location details as well as distinct categories to be filled in: time and direction of arrival of the wild boar, time and direction of leaving, how many sows (female), boars (male), young adults (one to two years old) and piglets are counted and, in addition, some characteristics of the individual or group. This information is considered important to determine whether any double counts have occurred, since the same group could have moved to neighbouring areas. As the example below illustrates, wildlife managers engage in discussions about how to integrate separate counting events to come up with the final numbers:

> 'On the first evening 39 boars are counted here, on the second 24. How many double counts do we incorporate?' [colleague wildlife manager answers:] 'Those 24 are right, they were around the whole evening. I was there too. The others are double counts plus a few more, we have to decide how many.' 'So, how many does that leave?' [colleague:] 'One count is wrong, leave that. Those are double and those three are young adults.' 'So we add three young adults, then we are correct?' [colleague:] 'Yes, we have to stop here.'

After the actual counts are decided upon, a so-called correction factor is applied, which is based on food availability and health of the wild boar population (Vereniging Wildbeheer Veluwe, 2015). As explained by a wildlife manager: "The numbers of piglets have been underestimated every year, so we added a correction factor for the growth of the wild boar population to better assess the existing population size of wild boars." He adds: "Less mast in a particular year means that sows have hardly any offspring, that boars frequently die due to malnutrition. If there is plenty of mast [a good mast year], sows – often – have two or more litters in a year, and relatively large numbers of boars survive the winter season."

So, while ostensibly management is purely a matter of counting, in the process of counting itself and in the calculations that lead to the eventual numbers, other modes of knowing boars and the landscape play a role. As explained by a wildlife manager while driving around in the Veluwe, correction factors are determined based on nutritional conditions which vary from year to year: "I estimate the available mast production for wild boars by looking at the blooming of the trees in spring." This wildlife manager points to some oak trees in the distance and says: "Those oak trees have been eaten bare by caterpillars [the Oak processionary]. These trees won't produce any mast this year. I'll take that into account in my assessment." As with the determination of the maximum allowances per FMU, the correction factors are not based on specific mathematical calculations or particular ecological models. They are based on the field experience of local wildlife managers and on the data collected in previous years. Ultimately, wildlife managers can calculate how many boars they need to cull when both the maximum allowances and the number of wild boars in a particular year are determined. Since 2001, hunting quotas (specified by numbers of males, females, young adults and piglets) were within a range of approximately 2,500–5,000 wild boars per year for the Veluwe (Schoon & Schrauwen, 2016). This means each year between 70% and 82% of the wild boars living in the area are to be culled.

This section has shown that wildlife management "by numbers," as observed in the Veluwe, tends to make use of ecological models such as population models and habitat models (Bear, 2006; Martin, 2015; Nowak, 2015). These numbers produce a certain "object stability" and this promotes a sense of order and control. Bowker and Star (2000) call this process "naturalization": "stripping away the contingencies of an object's creation and its situated nature." In the Veluwe, wild boars are treated as objects to be counted, calculated and, ultimately, to be culled. However, representing individual animals as numbers and calculations is problematic. It presumes that species identity is the only relevant attribute of wildlife and that species presence is context independent (Bear, 2006; Bowker & Star, 2000; Roth & Bowen, 1999). So, in the translation from animals to numbers, the specifics of the animals, the relations between counted and counters and the landscape in which these relations are situated disappear from view and get lost. As Roth and Bowen explain for the case of lizards: "The transformation we observe here is that from a physical, three-dimensional animal into, … a zero-dimensional number" (1999, p. 746). Indeed, with respect to wild boar management, the reasoning behind the numbers – including the more intuitive methods based on site-specific estimates and personal inferences – is often obscured. In the following section, we will foreground those and take them as a starting point for an alternative account of wildlife management. Specifically, we will highlight the affective relations between human, wild boar and landscape, the multi-sensory processes that are deployed, and the mindedness and subjectivities that emerge.

3 | AFFECTIVE RELATIONS AND MINDEDNESS

Research has recognised the individuality and learning capacity of a number of animal species, including primates and elephants. For instance, Smuts (1999) describes how she quickly learned about baboon individuality when she went to the

highlands of Kenya to study baboon behaviour: "Each one approached his or her relationship with me in a slightly different way." One came close to her very slowly, another marched over to her and touched her, another stared but didn't touch her, etc. And she describes that between baboons, a variety of friendships arise in their lifetime in which individual characteristics, "such as experience and calm disposition" (p. 155) play a role. Barua (2014a) argues in his research on crop raiding behaviour of elephants that individual elephant behaviours, elephant personalities, herd behaviour and landscape characteristics all impact elephant management practices and inform the prevention of human–elephant conflicts. In this paper, we introduce the notion of mindedness to capture this intelligence in a way that does not situate it exclusively in a "brain" envisioned as independent from bodies, conspecifics and the wider environment, rather this notion recognises it as relational; constituted in the interactions between human, wild animal and landscape (also see Laurier et al., 2006 for a similar conception of mind as distributed and decentred). Put differently, mindedness involves dynamic processes of shared learning, thinking with, remembering and mutual adaptation.

The notion of mindedness helps understanding of the affective relationships that emerge in wildlife management, including the embodiment, and multi-sensory exchanges between humans, wild boars and the landscape, as well as how animals respond to and participate in management interventions (Alcayna-Stevens, 2016; Barua, 2014b; Boonman-Berson et al., 2016; Despret, 2016; Haraway, 2008; Mason & Hope, 2014). This includes counting, hunting and the production of wild boar knowledge, knowledge of which it is no longer meaningful to say is exclusive to humans, as perhaps can be said of the ecological models running on office computers, far removed from the grunting of a stressed sow and the mixed smells of ripening corn in the morning. Also wild boars are learning to be affected in relation to humans and the landscape, they too are "becoming with" rather than merely performing a universal and static mode of "being boar" (Castree, 2003; Despret, 2004). Additionally, the landscape can be seen as a participant, as it is constitutive of wild boar–human relations; by being situated in a landscape, wild boars and humans assume certain behaviours and, in a sense, become who they are. These relations are illustrated by the following counting experiences:

> We [a wildlife manager and I^2] drive to an open spot to see if we can count any wild boars. He, says: 'a [large male] pig comes here at 21:15. We know them!' However, he didn't show up until 22:15. He guessed that maybe the pig was late due to the heavy rainfall late afternoon.

To illustrate the more intuitive ways of knowing in wild boar management through multi-sensory exchanges, we turn to an occasion when we (a wildlife manager and I) are planning to leave our observation post after having counted the entire evening:

> Wild boars entered the spot near dusk (22:15). We observed the wild boars and noted their characteristics. It was about time to leave, but the wild boars were still roaming around. Then the wildlife manager started making a short farting sound. Later, he said he sometimes uses a roaring sound and explained that he decides on the spot which of these sounds to use to communicate with the wild boars. This time, he used the sound to entice the wild boars to leave the spot. He had to try this several times before, finally, one female wild boar responded and made a short grunt. Subsequently, she and the others walked a few meters to the edge of the feeding area (away from and opposite to our observation post) and continued feeding on the corn that the wildlife manager had thrown there earlier that evening as bait. The female boar who had grunted was still alert, with head and ears lifted. After he repeated the farting sound one more time, this female turned around and walked away and subsequently, all the wild boars left the spot, walking quietly into the forest, away from us.

This example shows that to count and manage wild boars in the Veluwe, this wildlife manager needed to actively tune in on the wild boars and the wider ecology of the landscape. He had to learn to be affected by wild boars and this enabled him to communicate with the female leader of the group. This for him involved recurring periods of observing wild boars and experimenting with multisensory forms of communication, which in the case of wild boars, are principally non-visual. As the way in which the female wild boar responded to his signalling exemplifies, wild boars also actively relate to their surroundings, learning to interpret previously unknown features (Morelle et al., 2014). For instance, it is generally known that wild boar movement is affected by various landscape characteristics: weather conditions, seasonal changes, seasonal cycle of tree-life, presence of soil fauna, food distribution, availability of resting and farrowing sites (Graves, 1984; Morelle et al., 2014). Studies have also indicated that wild boars may reduce or expand their movements as a response to hunting or other disturbances in their home range (Keuling et al., 2008). In this case, we might suggest that the female wild boar

identified the particular sound made by this wildlife manager as unfamiliar, but not (acutely) threatening and it thereby initiated the boars' unhurried leave-taking. However, not all responses of wild boars can be understood based on our human mind and senses. For instance, animal ecologists and ethologists have argued that wild boars are able to record and use information from their own movements, such as speed, distance, direction, by means of their vestibular system, muscles, joint receptors or optic flow (Morelle et al., 2014). Wild boars use these so-called "self-motion cues" in a strategy called dead-reckoning or route-based navigation. In this sort of navigation wild boars are also assumed to make use of the Earth's magnetic field and the position of the sun or stars. This navigational activity of wild boars doesn't occur randomly, but is a memory-based movement (Morelle et al., 2014). These studies suggest that wild boars equally have the capacity to learn to be affected by and "tune in" on their environment, as they are affected by humans. Thus, wild boars moving around in social bonds, constantly communicating with each other, uprooting fields and rerouting tracks, navigate and (co-)create landscapes made up of traces, signals and memories.

These human–wild boar–landscape – mutual – affective relationships in wild boar management practices are of particular importance to prevent scaring the wild boars from such locations as the wildlife observation post in the previous example. The wildlife manager later explained that if we had left the observation post while the wild boars were still roaming around, we would have interrupted their activities and made them run away; the boars would not just have been frightened but could have developed a negative association with this particular feeding area. Preventing a negative association is important, because the same spot is also used for hunting them. Indeed, ecological research conducted by Morelle et al. (2014) supports the idea that wild boars have a site-specific awareness. They argue that wild boars select activity zones not randomly but "by means of directed or memory-based movement between familiar environments" (p. 19). In our example, the wildlife manager relies on his (affective) knowledge of wild boars, the specificities of the site and his ability to tune in and be sensitive to the behaviour of the wild boars to decide on a strategy to prevent them from developing a negative association with a specific location. The wild boars' subsequent response demonstrates the two-directional character of this affective relationship.

We now turn to an example of a counting evening with a different wildlife manager that illustrates collectives of wild animals as affective beings that learn, remember, adapt and tune in to their direct environment:

> After waiting a while, a family (one female, one young adult, six piglets) – family A – entered the observation area at 19:30 where the wildlife manager had thrown corn as bait earlier that evening. Family A started feeding on the corn. A few minutes later another family (one female, three piglets) – family B – also entered the area. Female B's behaviour was described by this wildlife manager as 'nervous': she walked back and forth on the spot, didn't feed on the corn, and frequently walked to female A and young adult A while making a grunting noise. Female A and young adult A responded by moving away a few meters from female B. At 19.50 female A and young adult A left the spot, leaving the piglets behind, feeding on the corn. The wildlife manager stated that we would soon hear a grunt from female A from the woods to call the six piglets. Indeed, after 10 minutes we heard a grunt, but we couldn't observe the boars in the woods. The six piglets left the spot. After the piglets left, the 'nervous' female B displayed even more intense 'nervous behaviour' by moving and looking up more frequently, and still not feeding. At 20:20 another family (one female, two young adults and two piglets) – family C – entered the area and started feeding on the corn. Their presence resulted in female B provoking all newcomers by grunting, moving towards them and occasionally pushing them. After 10 minutes of observing this interplay between female B and the newcomers, female C had moved relatively close to our observation post and we heard her cry out, a loud grunt, after which family C rushed away from the area. About a minute later family B also left the spot. The wildlife manager told me later that the grunt by female C was probably a warning sign as she might have sensed us nearby. He also indicated that the 'nervous female' was probably an old female based on his observation of her relatively long tusks in comparison with those of females A and C.

This example emphasises that wild boars can be observed to move in ways affected by individuals as well as collectives, in this case other wild boar families. The displayed wild boar interactions suggest that female B had been affected by family A and family C in different ways, which was observable by the frequency and intensity of her behaviour in response to each family's presence. The other wild boars (families A and C) were also affected by the behaviour of female B, and as a result they moved around the area or left. What made female B behave "nervously" and "provoke" the other boars at the observation area remains elusive. Another wildlife manager suggested later, based on his field experience in counting wild boars, that sometimes families of wild boars are chased away from counting spots by other wild boar families because of

the corn on these spots which contribute to the survival of piglets, as it is an extra food source. This might have been the case in this example. In fact, the use of corn as bait to count (and later hunt) the wild boars seems to have contributed to creative and non-predetermined responses by the involved wild boars. For instance, as explained in the former example, family C might have – previously unforeseen – developed a negative association with this particular spot.

That also wild animals, and not merely humans, continually adapt and respond to constantly changing, complex environments is also recognised by a wildlife policy maker in explaining that it is difficult to manage so-called "city boars": those wild boars that are born, raised and remain in suburban or city centres. He explains: "those wild boars that know the built area, they only want to live there …, and piglets born in city centres don't know their way to the forest." To manage these boars and remove them from a town centre, a wildlife manager explains, is to "shoot out their memory." Also local residents observe that wild boars actively relate to their surroundings and inventively respond to being managed, such as a resident telling that she sees wild boars sleeping near her house, just across the road, when she hears hunters shooting in the nearby nature area (shots can be easily heard): "because they know it is safe here," as shooting in residential areas is prohibited. Indeed, boar behaviour scholars have also argued that wild boars cooperate within groups, have a sophisticated level of social organisation that includes learning to respond to signals from conspecifics, and learn even across generations (Boitani et al., 1994; Focardi et al., 2015; Gabor et al., 1999; Graves, 1984; Keuling et al., 2009; Morelle et al., 2014; Poteaux et al., 2009; Vetter et al., 2016). Non-human knowledge is therefore not just a matter of individual brains but is distributed in collectives and situated in landscapes.

Some management practices usefully illustrate the ability of wild boars to tune in to and learn from their environment. For instance, a wildlife manager conducted an experiment to get wild boars across a gate, despite scepticism of colleagues:

> He showed me a gate through which wild boars could pass from one area to another. Initially, the boars did not use this gate and seemed unaware of the possibility to move to the adjacent [resource rich] area. He decided to instruct the boars to use this gate. First, he looked around for wild boar signs near the gate. He showed me the trail he had found and pointed to a small tree which was rubbed by wild boars and contained some wild boar hairs. He explained that he had put some corn on the trail between this tree extending beyond the gate. He did that day after day. After a few weeks he noticed that he had succeeded: he found wild boar hair on both sides of the gate, which indicated that the boars had started to use the gate.

The example shows that the wildlife manager experimented with pro-active strategies with the idea that humans and wild boars could share the same landscape and he spoke enthusiastically and with a gleam in his eyes about this experiment. However, such experimentation in wild boar management with different ways of "being with," is – yet – underdeveloped. Rather, current – experimental – attempts in the Veluwe in finding ways of "living with" or cohabitation have been expressed by adaptations in landscape characteristics, especially the availability of nutrition on wild boar movement (e.g., topsoil stripping at roadsides), and by adaptations in their hunting methods, especially alternating more intense hunting in potential conflict areas with areas with no hunting with the assumption that the remaining wild boars will avoid the conflict area. While potentially valuable, these interventions are not based on a multinatural understanding of wildlife management, to which we turn in the next section.

4 | TOWARDS A MULTINATURAL APPROACH

In this paper, we have presented two interrelated accounts of wild boar management in the Veluwe, the Netherlands. The first of these focused on formal management strategies, their reliance on numbers generated by counts and model projections, and the processes and practices involved to produce these numbers. The second has zoomed in on the affective relations involved in knowing and managing wild boars. Specifically, we focused on the responsive process between humans and non-humans which included remembering and tuning in to the ever changing, complex environment in which they roam (Bekoff & Pierce, 2017). Our analysis has made clear that while current wild boar management is based on and legitimised by control of their numbers, in the practice of wild boar management wild boars are not just known through being counted as passive and generic functional objects, but as active, affective and minded beings. It is precisely through their unruly and sometimes unforeseen responses to being managed that they contribute to the production of – also intuitive and non-representational – knowledge and to the emergence of novel wild boar management practices. In other words, although not formally recognised, management in practice already draws on the mindedness of individuals and collectives of wild

boars. We suggest that these processes of affective learning, and the mutual attunement and understandings of mindedness they involve, can be used to develop a multinatural approach to wild boar management.

A multinatural understanding contrasts with a perception of unity, of "species-thinking," and of the assumption of a singular Nature that can be straightforwardly known (Lorimer, 2012; Van Dooren, 2014). Rather, multinaturalism conveys a sense of living in and with the world that recognises the multiple and unexpected differences between humans, animals and the various other living and non-living parts of the landscape (Hinchliffe, 2007; Latour, 2004b). And, in that, it recognises the active involvement of the various humans and non-humans in processes of learning, remembering and adapting. A multinatural approach to wildlife management that emphasises the continually evolving and affective interactions between humans–wild animals–landscapes requires, and promises, non-routine and non-standardised ways of managing and knowing (Despret, 2016; Latour, 2004a).

What we are proposing is challenging and raises questions about how exactly affective relations can be made to flourish in practice and how a multinatural approach can be cultivated that works with wild boars and draws on their ability to learn, remember and adapt, as individuals, collectives and across generations. For instance, when and where should wildlife managers attune to individual wild boars, when to collectives of wild boars, and how can they take into account the animals' creative ways of responding to being managed? Next, we will discuss four considerations (or implications) for multinatural wildlife management.

The first consideration involves the implications of other (non-representational) ways of knowing in wildlife management. A multinatural approach implies the acceptance of the impossibility of full control and the abandonment of strategies that rely on numerical optimisation of the presence of designated target species that are based on generic abiotic landscape categorisations and on static notions of the nature, ecology and behaviour of wild boar. We are not suggesting that numbers are useless, but that a multinatural approach could produce and employ numbers, as well as other forms of knowledge, not to standardise but to enable diversity and multiplicity in the ways in which we learn to relate to wild boars – and they to us – and to the landscapes we share. Examples of how wildlife management practices (might) deal with non-formal, non-representational forms of knowing are wild experiments, such as in two nature areas in the Netherlands (Oostvaardersplassen and Deelerwoud). Here, managers have experimented with management without counting and population control (Frijns et al., 2016; Lorimer & Driessen, 2014). In the case of Deelerwoud (a section of the Veluwe where since July 2014 counting and culling of wild boars has been abandoned), wild boars are able to freely enter and leave the area. According to a local Deelerwoud wildlife manager, wild boars seem to have become less shy and those born at Deelerwoud seem to stay there, even in seasons when nutrition in the area is low (Frijns et al., 2016). Experiments such as at Deelerwoud enable the creation of new affective relations between humans, wild boars and landscapes, new ways of "becoming with" (Despret, 2004) and articulate new ways of human–wild boar–landscape management.

However, and this is our second consideration, to straightforwardly grasp and systematically represent a multinatural approach to management is invariably difficult, and to some extent impossible. This is partly due to the impossibility to find words to describe affective experiences and the bodily skills and multi-sensory attunements they involve, to account for what is happening in management practices and to justify specific management interventions. To grasp and write about affective accounts in this research, we sought to integrate practical and disciplinary ways of knowing to find an "interdisciplinary middle" (Barua & Sinha, 2017, p. 16). This involved bringing together (affective) learning processes by both the researcher and the research-participants in field practices. The researcher has learned to be affected, to be moved, and to attune to the wild boars and wider ecology of the Veluwe during consecutive field visits. In doing so, we have generated management stories about human–wild animal–landscape encounters. These stories include not merely human affective learning processes, but also the stories generated and experienced – in whatever way – by the animals involved, akin to the making of storied places by penguins and flying foxes (in Van Dooren & Rose, 2012). Collecting and telling these (human and non-human) stories is a multidisciplinary or even transdisciplinary task, since it involves experimenting with new forms of conversations between natural scientists (e.g., ethology, ecology) and social scientists (e.g., geography, sociology) (Barua & Sinha, 2017; Mason & Hope, 2014), as well as between these and wildlife managers. These conversations, in which a variety of affective, ethological, ecological, sociological and field knowledge is shared, encourage creative thinking about how to accomplish multinatural management.

This brings us to our third consideration about how to legitimise a multinatural approach. A multinatural approach promotes thinking in terms of "problem locations," rather than generic species characterisations (Bekoff & Pierce, 2017). Thinking in such terms not only promotes place-specific management, it also means that in different areas, different management strategies might be deployed. For example, in some areas the focus can be on protecting agricultural land or rare flora against being uprooted by wild boars, while in other areas wild boars can be allowed to enter and roam. It may also be the case that management strategies that are not effective in one area can be effective in another, for example because in

that area the wild boars are not yet familiar with these strategies. As a result, management will vary in different settings, articulating varying human–animal–landscape relations (Van Dooren, 2014), and it will involve the emergence of a multitude and temporally dynamic set of so-called "human–animal living accomplishments" (Laurier et al., 2006). This is particularly important for a diverse area like the Veluwe with its many different humans (counters, hunters, local residents, farmers, recreationists), individuals and groups of wild boars, and varying landscapes (drift sands, heath, forests, roads, agricultural fields, villages). Arguably, the Veluwe provides a unique opportunity to further develop and experiment with a multinatural management approach that draws on already existing ways of knowing and managing wild boars.

Our fourth and final consideration concerns the affective relations involved. A multinatural approach requires not only that managers deploy an affective attitude and willingness to let go of (the ideal of) control over nature, but also that a range of other humans develop affective relations with the boars – involving recreationists, residents, farmers and the wider public. Such an affective attitude and abandonment of control includes allowing wild boars to become with the landscapes and with fellow boars and other animals in unspecified ways. Preferably, management strategies are non-lethal, since these reinforce, rather than disrupt, social relations among wild animals, including their ways of learning and remembering. Examples of such strategies in wildlife management are the use of sheepdogs to protect little penguins from red foxes in Australia (Bekoff & Pierce, 2017), and the use of non-lethal paintballs to scare black bears away from human surroundings (Boonman-Berson et al., 2016). Yet, as part of this management approach, it can be argued (although this may be contested) to be important to also accept that sometimes wild animals, who we got to know in some way as subjects, might starve, or would need to be killed. Killing might still be considered necessary when dealing with a particular conflict situation. However, a multinatural approach will refrain from the idea of making wild animals "killable" based on numbers alone (Despret, 2016; Haraway, 2008; Stone, 2002). Deciding to kill particular animal subjectivities requires managers to become disaffected by the respective wild animal(s). As a result, wildlife managers might be trained to – depending on the situation – observe animals through a parsimonious filter, alternated by an awareness and sensibility of intimate attunement living with these other wild animal(s).

5 | CONCLUSION

The multinatural approach we have developed in this paper involves a general reconception of what management is. Instead of control, management now emerges as an ongoing effort to balance the needs of all the participants while recognising that not all needs can likely be met and as tentative and place-specific, acknowledging that no management decisions are set in stone. It involves not only attunement to one particular animal species in what is assumed to be a timeless and stable ecosystem, but requires seeking to attune and to be affected by a variety of species, including rare species, as well as landscape characteristics, such as the presence of resources for particular animals, that vary, change and impact differently on each locally present organism.

The further promotion and development of this multinatural approach requires, as we have tried to do in this paper, the collection of diverse management stories about human–wild animal–landscape encounters (Brown et al., 2009; Gabriel & Connell, 2010; Sutherland et al., 2004; Van Dooren & Rose, 2016). Sharing such place-based stories among wildlife managers, as well as other actors involved, can catalyse learning from practical field experiences, promote awareness of affective ways of knowing and enable the deployment of affective management strategies. So, it is only fitting that we end our paper with a brief excerpt of one encounter that we felt revealed the new affective relationship between manager and boar. For this encounter, we go back to the section of the Veluwe called Deelerwoud, an area that has been experimenting with "no culling" management:

> Suddenly we[2] discerned a large male wild boar standing in thick brushwood, watching us. After about half a minute, he ran off into the forest, after which the wildlife manager said to the wild boar, but also to himself, and to me: 'You go sort it out yourself now boy.'

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ENDNOTES

[1] Where interviews or notes are quoted, participants are described by their relation to wild boar management (wild boar manager, counter, hunter, policy maker, farmer, researcher, local resident) to ensure anonymity. Genders are arbitrarily chosen. When we write about individual wild boars, they are usually referred to as "(s)he," when gender is not known and "he" or "she" when gender is known.

[2] The empirical research for this paper was done by the lead author, except for the Deelerwoud section of the Veluwe, which has been done by the second author.

[3] In this paper we acknowledge the problematic, anthropocentric use of the term "management." We use this term for clarity, because it is commonly used in practices dealing with human–wildlife issues. Additionally, without aiming to essentialise and dichotomise wild versus domesticated in this paper, "wildlife" or "wild animal" includes animals in various stages of domestication and feralisation (cf. Rutherford, 2018).

[4] In this paper we define landscape as a lived-in physical environment to which both humans and wild animals affectively relate.

[5] We promote a more symmetrical and contextual perspective as the focus for wildlife management and conservation research, without presuming an ideal of full symmetry between human and animal rights or interests.

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