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Lupine Becomings — Tracking and Assembling Romanian Wolves through Multi-Sensory Fieldwork

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Abstract

This paper outlines the fieldwork methods utilized by ecologists in (re)presenting wolves in Romania. By revealing the processes and performances of this aspect of wildlife conservation, the paper highlights the complex more-than-human assemblages that make up wolf ecology. It briefly discusses the ways HAS (Human-Animal Studies) and the social sciences have addressed conservation and unpacked the oft obscured hinterland of bodies and technologies. It then blends field stories and ethnographic narrative to emphasize the multi-sensory techniques employed in non-invasive wolf research. By using this novel case, the paper contextualizes the significance of concepts such as becoming, affect, and attunement in creating partial affinities between researchers and wildlife. It argues that these contribute to an emplaced knowledge that allows practices to adapt to contingencies in field. This is important when modern, remote technologies aimed at minimizing effort in the field are seen to be a panacea for monitoring elusive wildlife.

Keywords

wildlife conservation; ecological fieldwork; animal geography; wolves; multi-species studies; affective logic

> It is cool, the evening heat quickly dropping off towards summer's end. We're standing in complete darkness and near silence, our headtorches turned off. It feels ridiculous to be here, on this forested crest in the middle of the night. I am, honestly, terrified. My stomach muscles are tight, my jaw clenched. We have been through here in daylight and seen the prints of wolves, bears, sheepdogs — things are around.
>
> Somewhere in the valley below, or perhaps in another one nearby, where the vegetation is dense, we think there might be a family of wolves. In darkness, everything seems to slow, but I think we have waited long enough to try to howl. I sense my colleague looking at me, and then he presses play.
>
> The sound flows from the speaker, slightly distorted, into the night, filling the forest. The recording stops. We pause, ears cupped, anticipating, hoping for something. My body is rigid, a nervous movement might alter my concentration. After the third attempt, we keep waiting. And waiting. Optimism slowly ebbs away. Nothing. Just mountain silence.
>
> (Story from the field-1)

Introduction

Over recent decades, social, economic, and political shifts in Europe have facilitated a continental-scale lupine flourishing (Chapron, Kaczensky, Linnell, Von Arx, Huber, Andrén, & Balčiauskas, 2014). Arching through Eastern and Central Europe, the Carpathian

Mountains are an essential biogeographical corridor for European wolves, with official EC reports suggesting Romania has the largest population on the continent, estimated at 2,300 to 2,700 individuals (Kaczensky, Chapron, von Arx, Huber, Andrén, & Linnell, 2012). However, within Romania itself, the methodologies informing this official representation are disputed (Popescu, Artelle, Pop, Manolache, & Rozylowicz, 2016), leading to pilot studies applying a range of techniques to make monitoring more accurate. It is one of these projects that this paper introduces (Figure 1).

However, as the opening field story suggests, rather than offering a tale of visual observations and direct counts, this paper is about one of the non-invasive methods (Long, MacKay, Ray, & Zielinski, 2012) through which field scientists "learn to be affected" (Latour, 2004, p. 205) by wolves without shared encounters. It tells a story that weaves through different topologies, tracks and traces, technologies and bodies. This reveals how lives and knowledges unfold through techniques that attune to the textures, sights, scents, and sounds that co-constitute assemblages, or assemblings, of Romanian wolves. It thus applies a praxiographic approach (Latour, 2005; Lien, 2015) by focusing on the practices of fieldwork that seek to re-present wolves in politics. This interest in processes leads to thinking in "becomings," with life understood as ongoing and emergent from the multiple relations of a fluid world (Deleuze & Guattari, 1988; Haraway, 2008; Ingold, 2000).

The paper plays with the ambiguous moniker "lupine becomings" in multifarious ways. Firstly, it is understood as the fleshy, social wolves themselves, constantly becoming in the Carpathian Mountains. It also refers to the researchers' becomings as they continually learn and gather knowledge of wolves through different field practices. Here, it should be noted, lupine becoming, a kind of "becoming animal" (p. 272), is not the absolute imitation or

mimicking of wolves, but is one of fragmented, molecular relations that allow sensibilities and feelings of proximity to form (Deleuze & Guattari, 1988). In utilizing multi-sensory techniques that offer different connections, or "partial affinities" (Despret, 2013), researchers become incrementally attuned to diverse aspects of wolf-ness. Finally, at a different scale, the changing social-political status of wolves in the EU and Romania reflects broader normative becomings (Buller, 2008; Lopez, 1978), though this will not be expanded upon due to space.

Building on stories, field notes, conversations, and memories, this work is the collaborative effort of a social scientist and two experienced ecologists. This interdisciplinary approach (Buller, 2009) resonates with Lien (2015) who suggests, "We tend to think of histories as either their stories, animal stories, as they unfold without human interference, or our stories, with humans cast as the key actors…. *Their* stories find an audience amongst biologists, *our* stories among anthropologists…. But storytelling practices are changing" (p. 1). Thinking in such hybrid terms, the paper firstly summarizes Human-Animal Studies (HAS) and social science engagement with conservation and ecological fieldwork, before discussing the changing status of wolves in Romania and unpacking the novel practices that are "making (wolves) present" (Hinchcliffe & Whatmore, 2006, p. 130) in different ways than before.

Though HAS has long engaged with intimate scientist-wildlife relations in zoos, laboratories, and "contact zones" in the field (Haraway, 2008), the fleshy materialities that constitute ecological fieldwork with elusive animals are under-represented. While providing a novel case through which to address this weakness, this paper also vitalizes conservation science literature by animating the often ignored "hinterland" of fieldwork (Law, 2004) through a focus on the emotions and affective logics present in wolf ecology. Through illuminating the

critical role of experiential knowledge in a non-invasive "methods assemblage" (Law, 2004), it addresses concerns over the proliferation of remote, modern technologies argued to be "divorcing biologists from the field" (Hebblewhite & Haydon, 2010). The paper, therefore, underlines what might be lost if connections between the field, data collection, and analysis erode, and technologies replace, rather than enhance, becomings in the field.

Human-Animal Studies and Conservation

Shifts in the social sciences from representationalism to an interest in performativity have emphasized the importance of how things are "done," rather than what "is" (Abram & Lien, 2011, p. 8). Focusing on performing and doing nature opens us up to the agency of nonhumans, the materialities and practices that help co-produce knowledge (Abram & Lien, 2011; Ingold, 2000; Latour, 2005; Lien, 2015). Doing ecology is thus an engagement with assemblage, a way of understanding the continual, ongoing processes and relations that emerge between things (Anderson, Kearnes, McFarlane, & Swanton, 2012). These initially weak relations are strengthened through habit and are dependent "on the collaboration, cooperation, or interactive interference of many bodies and forces" (Bennett, 2010, p. 21). Thinking along similar lines, Whatmore and Thorne (1998) propose wildlife conservation should be understood as a "relational achievement, spun between people and animals, plants and soils, documents and devices" (p. 437). As this case of wolf research shows, thinking of ecological fieldwork as relational achievements not only reveals complexity and vulnerability, but also the affirmative ways in which fieldworkers adapt and accumulate knowledge to overcome instability and interference.

Thinking of lupine becomings as relational also necessitates an openness to the affective "set of flows moving through the bodies of human and other beings" (Thrift, 2009, p. 88). Thus,

this paper brings the "affective logics" of conservation, described by Lorimer (2015) as "the habituated mode of engaging with, knowing about, and feeling toward wildlife … emergent from bodily encounters" (p. 9) from the hinterland to the foreground. These logics morph with internal emotional states (Pile, 2010) that become an integral part of the field.

By challenging dualistic ontologies through relationality, many HAS studies have sought to reassemble the social-politics of wildlife conservation (Barua, 2014; Bear & Eden, 2011; Collard, 2012; Dempsey, 2010; Gibbs, Atchison & MacFarlane, 2015; Lorimer, 2010; Matless, Merchant, & Watkins, 2005; Rose, 2011; van Dooren, 2014; Whatmore & Thorne, 1998). Elsewhere, scholars have eroded disciplinary borders by knitting together observational methods from the natural and social sciences to develop novel, recombinant methodologies engaging with affective, interspecies interactions between humans and wildlife (for examples, see Brettell, 2016; Fuentes, 2010; Lestel, Brunois, & Gaunet, 2006; Locke, 2013). However, of most interest here are the ways HAS and conservation discourse have engaged with the practices and doings of ecological fieldwork.

In the latter half of the 20th century, as conservation biology evolved in response to species loss and environmental degradation (Soule, 1985), it was aided by the availability of modern technologies. From the 1960s onward, radio tracking increasingly offered new insights for ecologists, including into wolf population dynamics and behavior (Fuller, Mech, & Cochrane, 2010). Over the last twenty years, further advances in electronics, biosensors and GPS technologies have provided an even greater abundance of data (Fuller & Fuller, 2012), making most wildlife ever more trackable and quantifiable (Benson, 2016). For some ecologists, this capability is seen as vital to protect "biodiversity" (Takacs, 1996) which

promotes taxonomic species as the fundamental biological, or ontological (Lorimer, 2015), unit critical to understanding complex ecosystems (Wilson, 1999).

Though modern advances offer many benefits and help inform conservation (Verma, van der Wal, & Fischer, 2016), the focus on species, population and technological surveillance has been increasingly critiqued (see Lorimer, 2015, for further discussion). However, there are also concerns within conservation practice that modern devices are used inappropriately and without care (Cagnacci, Boitani, Powell, & Boyce, 2010), something progressively dislocating researchers from the field and their nonhuman animal subjects (Hebblewhite & Haydon, 2010). In particular, whereas older radio-tracking technologies require researchers to have an intimacy with the atmospheres of the field and nonhuman subjects (Benson, 2010), GPS devices no longer require such connection (Cagnacci, Boitani, Powell, & Boyce, 2010).

These concerns chime with HAS research exploring the social-technological constitution of in-situ conservation. Among studies addressing this, some have focused primarily on bodies and corporeality, challenging representations of scientific fieldworkers as "rational, detached and distant" (Candea, 2010, p. 253) and describing how bodies and environments in the field become "suffused with meaning" (Alcayna-Stevens, 2016, p. 850) rather than neutrality. Elsewhere, Hinchcliffe and Lavau (2013) have shown how bodies and technologies used in diverse "affective orientations" (p. 10) of monitoring are assembled together in practices of biosecurity, while Whitney (2014) discusses the ways wildlife bureaucracies effectively blend new and old modes of fieldwork and technology to protect endangered species. Others are more critical, however; for example, Roth and Bowen (1999) suggest technology has begun to dominate more intuitive, embodied forms of knowledge, leading to a domesticating "instrumental topology" in species monitoring (p. 722). These offer examples of the need for

specificity in research; in some cases, bodies and technologies work well together, and elsewhere there is tension.

Particularly relevant to this paper is research that seeks to understand the less visible animals who challenge monitoring practices and ask questions of representation. With a focus on the contingencies of the field and the inflexibility of established protocols, Hinchcliffe, Kearnes, Degen, and Whatmore (2005) found water vole monitoring highlighted problematic assumptions about nonhuman difference and knowledge, while Hinchcliffe and Whatmore's (2006) research on urban black redstarts and peregrine falcons similarly found that ecology in practice requires a looser understanding of presence, absence, and protective space than texts and policies suggest.

This focus on unspoken interactions, knowledge, values and contingency, extends to work emphasizing the intra- and inter-bodily forces enrolled in practice. Work on corncrake monitoring unveiled embodied skills, emotions, and affective logics (Lorimer, 2008) and brought attention to the critical role that ecological, aesthetic, and corporeal charisma play in wildlife conservation (Lorimer, 2007). In other work, Nygren and Jokinen (2013) have discussed the important role of knowing and becoming affected by nonhuman place when locating arboreal flying squirrels, while Mason and Hope's (2014) study of bat surveying emphasized how enchantment with nonhumans can be found through, rather than despite, technology, once more probing bodily-technological tensions.

Focusing on the multiplicity of interactions in the field shows how complex and diverse fieldwork is. However, rather than emphasize one thing over another — bodies over technology, data over intuition, proximity over distance — the example of wolf research

stresses the ways in which all these things are brought together to play equally important, though diverse, roles in knowing elusive animals. Moreover, by utilizing different techniques, it shows how the partialness of different sensory affinities combine to inform fieldwork and assemble nonhuman lives.

Re-Assembling Romanian Wolves

Within conservation, increasing ecological knowledge has helped recast wolves as a keystone species critical to the successful functioning of trophic cascades and ecosystems (Eisenberg, 2010). Studies have emphasized their complex interspecies relations with deer, trees, and water (Ripple & Beschta, 2012), as well as coyotes and foxes (Levi & Wilmers, 2012). These may form through bloody, corporeal encounters and diffuse throughout an affective "landscape of fear" (Kuijper, De Kleine, Churski, Van Hooft, Bubnicki, & Jędrzejewska, 2013). Such knowledge, alongside long-standing shifts in societal values, has shifted perceptions of wolves throughout much of Europe, leading to hopes of re-integrating wolves "into the fabric of the European Countryside" (Boitani, Alvarez, Anders, Anren, Avanzinelli, Balys, & Dutsov, 2015, p. 8).

Romanian accession to the European Union in 2007 and, therefore, becoming a new signatory to the Bern Convention led to the implementation of EU conservation values and legislation. By making such commitments, wolves became protected, though special hunting derogations were allowed due to supposed abundance (Kaczsensky et al, 2012). The European Commission endorsed wolf Action Plan aims to standardize surveying and monitoring techniques to improve understandings of meta-populations and ecologies, and to help human-wolf co-existence accordingly (Boitani et al, 2015). Currently in Romania, individual game management units survey wildlife populations at the end of spring

(Kaczsensky et al., 2012; Popescu et al., 2016). However, this strategy is potentially compromised by both negative, long-standing hunter perceptions of wolves (Popescu et al., 2016), as well as inappropriate spatial and temporal scales for monitoring. Therefore, conservationists in both Romania and Europe are seeking more rigorous, scientific monitoring methodologies.

Whatever the approach, making wolves present relies on the coming together of animate bodies, inanimate materials, and technologies. Numerous studies, generously financed and often in the vast, open landscapes of North America, have used radio and GPS devices for detailed ethological studies, tracking packs and individuals, and aerial population surveys (see Mech & Boitani, 2010, for detailed discussion on these). However, despite conservation science's enthusiasm for new technologies, early research studies pre-dating these developments still endure, particularly those monitoring populations and abundance (Boitani & Powell, 2012). Influenced by such work, since the 1990s, non-invasive approaches that assemble long-standing, traditional techniques and less intrusive modern advances have blossomed (MacKay, Zielinski, Long, & Ray, 2008). By non-invasive, researchers mean "the gathering of data without capturing, handling, or otherwise physically restraining individual animals" (Kelly, Betsch, Wultsch, Mesa, & Mills, 2012). Therefore, not only do non-invasive methods offer practical advantages when studying populations of elusive animals, but they also offer a greater respect for nonhuman bodies.

By revealing how these non-invasive methods "unfold in practice" (Lien, 2015, p. 18), this paper emphasizes the fieldworker as a critical "tool of research" rather than a "disembodied" (Despret, 2013, p. 52) hinterland absence. The body as a tool, or "an interface" (Latour, 2004, p. 207), requires researchers to make themselves "available" to affects through the "miracle

of *attunement"* (Despret, 2004, p. 125). This may be ocular, olfactory, aural, or tactile. Attunement in wolf fieldwork, however, is not merely a process of embodiment but more of an "emplacement" (Howes, 2000, p. 7) sensitive to the interconnectedness of bodies, minds and their wider environmental milieu.

Imagining the field: Cartographical becomings

The field is first encountered through a map, "an immutable mobile" (Latour, 2005) translating the material world. It is a "pragmatic, political, technological and material" (Dewsbury & Naylor, 2002, p. 255) way of imagining wildlife (Verma, van der Waal, & Fischer, 2016), imagining the intersections between human-nonhuman bodies and the territories of researchers and wolves. This first stage shows the boundaries of research to be blurred and permeable (Kohler, 2002), where the excitement and anticipation of planning flow from the field station into the field.

Emplacing oneself in the map, the researcher performs a translocated empathy, an *a priori* projection based on past research experience, general knowledge, and cartographic interpretations. It is, to paraphrase Bear and Eden (2011), an attempt at "thinking like a wolf." Open areas such as pastures, clear-cut forest stands, and agriculture become places of possible predatory encounter, while dense and dark forest might offer safety. Orography influences movement, occupancy, and access. Main and secondary mountain ridges, valleys, and forestry tracks score possible routes through inhospitable terrain. Landscapes become both wolf-scapes and field-scapes, evaluated according to the physical possibilities of multi-species mobilities. Moreover, imagined on the map are the un-depicted, dynamic others of this co-constituted place — bears, sheepdogs, livestock, foresters, shepherds, and hunters. A static representation thus becomes a fluid "cognitive map" (Peters, 1973), one continually

thickened by experiences and “direct perceptual engagement with (our) environment” (Ingold, 2000, p. 21).

Tracks and traces: Becomings on the ground

The day started with a high winter sun warming my fleece, fresh air stinging my nose. I started following wolf tracks almost as soon as I stepped out of the car. Incredible. First, this was just a few confusing paw prints on old snow. After walking a few hundred meters, however, the presence of the pack was in no doubt. From the first kilometer, the wolves’ behavior seemed peculiar. They appeared to be moving nervously, with care. They were ‘obviously’ hunting, but they were going back and forth. Something must have happened.

The wind was blowing in my face and I expected to smell a carcass, or whatever was left. My eyes followed visual cues, nostrils inhaling the cold air. The forest path I was walking on finished and the wolf tracks continued up the steep slope, but the kill was unlikely to be there. I went back to the last intersection in the forestry path, looking for deviations. The wolves had been there, and left a couple of scats. Still no smell of death, but the valley, down, felt like the place where the scattered wolf tracks might converge.

My eyes widened at fur on the icy road — deer. Just before collecting it, I caught a strong scent, widening my nostrils. The signs and tracks were no longer a coincidence. It began making sense. Five hundred meters on, and there it was, the strewn, scattered remains of red deer, lying in scarlet red snow stained for meters by blood. And revealing a further entangling of life, the remains of a red fox.

(Story from the field-2)

In winter, wolves tend to be more mobile, moving and hunting around home ranges untied from summer dens and rendezvous sites (Mech & Boitani, 2010). Their cohesion is fluid, shifting upon personality and pack, individual behaviors and ecological factors (Benson & Patterson, 2015). Some packs appear more intimate, while others splinter into subgroups for hunting (Krebs & Davies, 1993). As spring arrives, newborn deer, boar, and other co-inhabitants offer easier food sources for individuals or small groups. Individual wolves are always in relation — to the pack, to the climate, to their environment, to the other species around them.

The researcher seeks tracks and then follows these as far as possible, until the clues end, the day begins to draw in, or the terrain becomes inhospitable. Encountering tracks brings a surge of adrenaline, an immediate sense of proximity even though the lupine bodies might be far. As the tracks lead ahead along the ground, the researcher might imagine being the last wolf in the line, hanging on to keep up.

These tracks are recorded by GPS, a typical "inscription device" (Latour, 2005) that attends to the "making of relations" within the assemblage (Law, 2004). The imprints of tracks become narratives that both affect the researcher and speak of wolves themselves being affected. They may be uniform, linear processions of paw prints through sheets of white snow, diverging prints arching around trees and forest, or prints haphazardly spread near droplets of blood. They tell of numbers, habits, feeding, encounters. For fieldworkers, "knowledge-in-practice" becomes through the bodily experience of "knowledge-on-the-ground" (Lorimer, 2006, p. 499), an addictive, compelling, and at times exhausting process.

Mid-winter offers defined tracks and long days in the open (Figure 2). However, as temperatures warm and snows melt, identification becomes harder. Paw and hoof prints are less crisp, turning into slushy craters lacking character. Walking long distances is arduous and unpleasant. Boots become wet and soften. Feet turn to cold, puffy appendages. Balance is less certain as snow deliquesces. Tiredness ebbs and flows, testing attunement to the ground, to the surroundings, to internal human and external more-than-human forces.

These transects become like a "choreography … an orchestration of bodies in motion" (Foster, 2011, p. 5). The practice of doing wolf research becomes one of ritual, a synchronous walking, looking, smelling, listening, carried out in relation to the material environment and physical capabilities of the researcher. However, this emplaced practice is always reliant on the agency of elusive wolves, for they and their spectral traces may or may not become present, though that is not to say they are absent. The inherent uncertainty of the field, the physical environment, devices, and primarily the agency of animal others can interfere and disrupt. The field is constantly becoming, in-the-making, produced by bodies that move and only occasionally intersect. But following tracks allows researchers to witness waste.

Witnessing waste: Scatological becomings

> We arrive at another point where tracks cross, high on the main ridge. Sheep obviously pass through here — the hard ground dusty and crumbling from repeated hoof-fall, the dulled aroma of lanolin-waxed wool.
>
> We fan out, three of us, scanning the tussocks of grass on the tree fringe, expecting to find something. I am not sure if I sweep through too fast, or too slow. I am tired. I

slept badly. The sun is hot. A gentle breeze circulates, percolating air and fragrances, amongst which is the unmistakable, potent smell of shit. It is strong, over-powering, a concoction of rotten, semi-digested flesh, and other discarded bodily omissions. My colleagues find it, near where I had first looked, prominently nestled among tall grasses, a shining, glistening, soft coil of bone, hair and muscle. The hairs appear whitish grey and tightly bound — sheep?

We unpack a kit. It is my turn. I try to remember the process, for I am still learning. This is fresh, a sample for diet and genetics. Gloves on; bottle labelled; prizing off a sticky, fetid, moist end, and smearing it into the tube; pouring in ethanol; paratape sealing the top; lid on; tape around lid. Step by step. Recoiling from the aroma permeating my nasal cavities. We then label the bag; turn it inside out; stuff a handful inside the bag; turn it outside in; tie it, tightly; and finally, put it in the carrier bag with the others.

(Story from the field-3)

Wolves partially become through their excreta, both feces and urine, found tracking. In the field, bodily expulsions of ordure reveal behavioral traits, recent interspecies encounters, fertility, or territorial boundaries, offering a wider narrative of wolf place-making. However, more than this, along with hair and fur samples, fresh scatological collections can be genetically analyzed, offering knowledge of historic and ancestral movements, and revealing kinship, sex, and relationships (Kelly et al., 2012). Translocating scat allows wolves of a kind to become individuals, to retrace their stories through material remains.

Knowing where to look is important. Effectiveness is learned. Upon arriving at key places such as mountain passes, crossing forestry tracks and ridges, the scale and register of attunement shifts, from general scanning to a focused ocular and olfactory inspection. Locating excrement involves scouring eyes, twitching noses, partings of vegetation and grass, an absorption in "the immediacy of the now" (Thrift, 2003, p. 2020). Scat is an affective, "vibrant matter" (Bennett, 2010), sometimes inciting instantaneous revulsion and disgust, sometimes intrigue and surprise. Finding scat brings a sense of relief, a satisfaction, that translations between map and field have been successful. However, like tracks, the vitality of scat is transient. In winter, excrement freezes, the scent becoming less pungent, and scat is potentially hidden by fresh snowfall or snow-slip from trees. In summer, the powerful, rank aroma of scat can be overpowering, but hot weather also dries the excrement, active invertebrates digest it, and warm weather rains accelerate disintegration. And, after walking long transects, returning without a find is disappointing, early hopes torched by doubt. Perhaps there were signs, but they were missed.

As the field story illustrates, researchers increasingly "amplify responsiveness" (Thrift, 2004, p. 127) by attuning to the material interconnectedness of mountains, elements and wolf bodies. This extends from locating scat to carefully collecting it (Figure 3). Sterilization is critical to protect fresh genetic samples and as a personal, biosecurity measure. *Echinoccocus granulosus* and *trichinella spiralis,* parasitic canid tapeworms who can use humans as intermediary hosts (Moro & Schantz, 2009), are genuine biorisks. At this stage, learning to know wild bodies continues through to the microbiome and bodily assemblage to prevent microscopic bodies from circulating from wolves, through feces, to humans.

Howling: Becomings through sound

As the year moves on, rising daytime temperatures melt snow. The valley tracks where water drains turn spongy and sloppy. Elsewhere, the soil bakes and hardens. Prints and markings have less vibrancy, only surviving where pools and puddles form in shallow scrapes or under the shade of trees. In response, the process of assembling wolves moves from highly active and effective transects relying on visual and olfactory cues, to hopeful, auditory encounters, as described in *field story 1*.

In summer, wolf movement becomes less transient, more closely tied to rendezvous sites where pups and parents convene (Mech & Boitani, 2010). Typically, these are areas of dense vegetation and shrubs, strategically located for good communication, access to prey, and with easy escape routes. Wolf howling can bring the printed and scatological traces together, building a narrative of family, sociality and place, to locate families and young (Gazzola, Avanzinelli, Mauri, Scandura, & Apollonio, 2002). Whereas the other practices rely on encountering traces of wolf past, affinities shift to directly affect wolves and incite response to pre-recorded howls, strange "biophonic" and "anthrophonic" (Krause, 2012) manglings of lupine calls.

Best practice suggests howling should be located at 3-km intervals, in prominent and strategic locations, and undertaken at night (Fuller & Sampson, 1988). A map could be used to plot and plan points, but the emplaced knowledge acquired through practice offers a more attuned process of selection. Areas where prints have been spotted and scat are densely distributed suggest activity and presence. Definite knowledge-on-the-ground informs potential knowledge-through-the-air. And from dusk onwards, pairs or small teams walk or drive to pre-designated points, waiting for the sun to set and forest life to transform.

The field story highlights the ways researchers become physically and emotionally affected by the forest at night. Shadows, rustling leaves or wavering tree limbs shift from the benign to the malignant, triggering fleeting head turns, sudden pauses on foot, nervousness. Headtorches shining through trees cast monochrome, umbral webs. The sensory dominance of vision shifts to a reliance on sound, bringing a fatigue heightened by the disrupted circadian rhythms of night work, and the rarity of wolves responding. Yet, despite the likelihood that wolves won't reply, there is always a chance, the possibility of entering their worlds as they are, rather than through past traces. This potential to interact, to hear wolves howling, slows bodies in anticipation. And if they respond, in the night, through the silence, anticipation turns to shock and the indescribable feeling of interspecies communication, of becoming closer, if not quite with.

Capturing images: Photographic becomings

The final true field technique is that of camera trapping, applied to witness wolves in their fleshy, corporeal entirety. Remote-sensing cameras placed and left in the field can capture and freeze past movements at-a-distance from the researcher, placing "a new set of 'eyes'" (Porter, Nagy, Kratz, Hanson, Collins & Arzberger, 2009, p. 385) on the world. Their lenses offer a disembodied extension of the researchers' bodies, connecting the pawprints, scat, and howls to a lupine body. And when checking the cameras back in the field station, captured images bring a joy, a palpable shared excitement between researchers as they finally see the animals whom they have been following, thinking through, calling to, and partially becoming with.

Placing the camera requires not only a sensibility to the modes, velocities, and directions of wolf movement through a forest, but through this place in this forest. It requires, once more, the emplaced knowledge of the field to guide a process of imagining, or thinking-like-a-wolf.

Will they be running, pausing, turning, or marking territory? As the camera only overlooks a small tract of an ever-extending space, it must be the correct height, the correct angle and facing in the correct direction. Frequently, cameras are placed, and re-placed, and re-placed again, perhaps at a mountain pass or a forest crossroads.

Once in-situ, the camera becomes mutually associated with the object to which it is attached, most likely a tree. Once its settings and frame of shot are checked, the camera is left perhaps for a few weeks, potentially for a few months. The effectiveness of the camera is reliant on the materials assembled around it. It can be relentlessly triggered by the agency of trees or branches flexing in the mountain wind, by vibrant shoots of vegetation growing in spring, or by thick flurries of winter snowfall. Retrieving a camera with endless photographs, full of forest life but without lupine triggers, is as disheartening as images of wolves are fulfilling (Figure 4).

While the camera images affect researchers in new ways, they can themselves affect the forest. Equipped with LEDs, a wrong setting might initiate a flash, either drawing inquisitive animals to the lens or making nervous ones flee. Similarly, unseen human vapors and artificial scents residual on cameras and lingering around trees can also stimulate animals and spark curiosity or fear. Different bodies in the field, it seems, are mutually affective, in absence as much as presence.

Bringing the field home: Becomings through analysis

From the field station to the field and back, assembling wolves is a multi-sited, topological process. The station acts as “a center of calculation” (Latour, 2005) with computers to log GPS data and create GIS maps, and a small, rudimentary lab acting as an inextricable

extension of the field. Here, excrement samples taken from the field are kept cold and dark, or ideally refrigerated if tubed up for genetics. Some are stored, others analyzed to unravel wolf diets. As with the collecting of samples in the field, analysis is one of habitual processes.

Scats are initially washed in warm water and sieved to separate obvious food signs from the remaining, amorphous fecal matter (Figure 5). The corporeal remnants of feeding are then spread on an aluminum tray, dried, and stored in clear plastic bags according to element. First, hairs are assessed macroscopically, using a 10× hand lens, according to shape, texture, pattern, and then compared to sample hairs collected previously — roe deer, red deer, wild boar, domestic dog, fox, badger, and bear. If results are indecisive, the hairs are identified microscopically according to the shape and structure. At this point, the past encounters of other bodies are revealed through fibers and bones, and analyzed through sight and touch. With every scat coded and associated with GPS marks, once more stories unfold — of wolves, multispecies encounters, and place.

Whereas the external fieldwork brings the excitement and anticipation of kinesthetic discovery, it can be emotionally and physically tiring. Returning to the field station offers a place for bodily and emotional stillness, as well as somewhere to begin piecing stories together, to think through findings and experiences. Sometimes inputting data onto computers, layering tracks on GIS software, washing scats, and filing images feels deflating, tedious: the detached remnants and translations of a vital field. But at other times, these processes offer the excitement of bringing threads together, to connect wolves, other animals, landscapes, and humans, and once again allow fieldwork futures to be imagined. It is a time when the emplaced knowledge of the field feeds into data, when a learned, cognitive map

helps make sense of the cartographic map, and when the materialities and contingencies of the field can be written into consequent plans.

Though the narrative of the field has finished, there is another journey to be made which for a final time expands the spatial topologies of the once elusive wolves. The fresh samples taken from the field are taken beyond the field station, beyond the Carpathian Mountains, and across international borders to be genetically analyzed in Western Europe, a critical stage in understanding lupine becomings. While the wolf howling and camera trapping thicken the story gathered through tracking and scat collecting, it is only the genetic analysis of fresh scat that can condense lupine constellations and identify individual bodies and family ties. And for researchers, such importance brings the fear of letting go, a sense of loss, a concern that these potential wolves will be lost in the ether. Finally, it seems, the presence or absence of individual, Romanian wolves becomes dependent on the successful journey of scat and urine from Romania to other lands.

Conclusion

By bringing HAS and ecological fieldwork together, this paper has shown how conservation develops through different practices, carried out according to the forces and capacities of different bodies and materials. It is constantly "in-the-making" (Hinchcliffe, 2008, p. 88), a looping conglomeration that brings humans, things, and wolves together, the findings of one technique informing another, one period of fieldwork guiding the next in an iterative process of positive and negative feedbacks. The practices, actors, and politics involved are constantly becoming.

The scientific processes described “move, incite, elicit and excite” (Latimer & Miele, 2013, p. 8) in different ways and require an openness to how we understand other forms of life and communication (Hinchcliffe et al., 2005), be it through sight, smell, sound, or other ways. Through different techniques, researchers attempt to attune to different senses, developing different affective relationalities (Lien, 2015) and logics (Lorimer, 2015). Such skills are acquired through emplaced experience, beyond the knowledge of texts and field guides.

Much HAS work has employed ethological approaches to explore mutually shared, intimate encounters through “the world of becoming with” (Haraway, 2006, p. 102). Learning to be affected and to affect in Romanian wolf research, however, does not occur as bodies collide in time and space, but through sensory investigations accumulating fragments of wolf, while the bound, identifiable lupine bodies remain “at-a-distance” (Philo & Wilbert, 2000, p. 2). Thus, rather than researchers becoming with wolves, the paper shows such relationships are more ones where researchers grasp for “partial affinities” (Despret, 2013), shards of molecular proximity, that might emerge through emplacement and a sensorium of congealing experiences.

Within scientific literature, many of the material and bodily interactions that make up ecological fieldwork dissolve into an unreported hinterland of practices. However, revealing the doings of the field helps bring to light the different skills and logics required to make elusive creatures present, as the case of non-invasive wolf monitoring highlights. By bringing senses, affective practices and emotions to the fore, the paper both gives voice to the complexities behind simplified, official representations of wildlife, while highlighting the value of bridging the permeable borders between field and station, bodies and landscape, technology and emplaced knowledge. This becomes vital when negotiating and adapting to

working in the field. The importance of this should not be understated at a time when remote data collection is potentially seen as an alternative, rather than enhancement, to entanglements in the field.

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References

Abram, S., & Lien, M. E. (2011). Performing nature at world's ends. *Ethnos*, *76*(1), 3-18.

Alcayna-Stevens, L. (2016). Habituating field scientists. *Social Studies of Science*, *46*(6), 833-853.

Anderson, B., Kearnes, M., McFarlane, C., & Swanton, D. (2012). On assemblages and geography. *Dialogues in Human Geography*, *2*(2), 171-189.

Barua, M. (2014). Bio-geo-graphy: Landscape, dwelling, and the political ecology of human-elephant relations. *Environment and Planning D*, *32*(5), 915-934.

Bear, C., & Eden, S. (2011). Thinking like a fish? Engaging with nonhuman difference through recreational angling. *Environment and Planning D,* 29(2), 336-352.

Bennett, J. (2010). *Vibrant Matter*. Durham: Duke University Press.

Benson, E. (2010). *Wired wilderness: Technologies of tracking and the making of modern wildlife*. Baltimore. John Hopkins University Press.

Benson, E. (2016). Trackable life: Data, sequence, and organism in movement ecology. *Studies in History and Philosophy of Science Part C*, *57*, 137-147.

Benson, J. F., & Patterson, B. R. (2015). Spatial overlap, proximity, and habitat use of individual wolves within the same packs. *Wildlife Society Bulletin*, *39*(1), 31-40.

Boitani, L., & Powell, R. (2012). *Carnivore ecology and conservation*. Oxford: Oxford University Press.

Boitani, L., Alvarez, F., Anders, O., Andren, H., Avanzinelli, E., Balys, V., & Dutsov, A. (2015). Key actions for large carnivore populations in Europe. *A Large Carnivore Initiative for Europe report prepared for the European Commission*. European Commission.

Brettell, J. (2016). Exploring the multinatural: Mobilizing affect at the red kite feeding grounds, Bwlch Nant yr Arian. *Cultural Geographies*, *23*(2), 281-300.

Buller, H. (2008). Safe from the wolf: Biosecurity, biodiversity, and competing philosophies of nature. *Environment and Planning A*, *40*(7), 1583-1597.

Buller, H. (2009). The lively process of interdisciplinarity. *Area*, *41*(4), 395-403.

Cagnacci, F., Boitani, L., Powell, R. & Boyce, M. (2010). Animal ecology meets GPS-based radiotelemetry: A perfect storm of opportunities and challenges. *Philosophical Transactions of the Royal Society of London B*, *365*(1550), 2157-2162.

Candea, M. (2010). "I fell in love with Carlos the meerkat": Engagement and detachment in human–animal relations. *American Ethnologist*, *37*(2), 241-258.

Chapron, G., Kaczensky, P., Linnell, J. D., Von Arx, M., Huber, D., Andrén, H., & Balčiauskas, L. (2014). Recovery of large carnivores in Europe's modern human-dominated landscapes. *Science*, *346*(6216), 1517-1519.

Collard, R. C. (2012). Cougar–human entanglements and the biopolitical un/making of safe space. *Environment and Planning D*, *30*(1), 23-42.

Deleuze, G., & Guattari, F. (1988). *A thousand plateaus: Capitalism and schizophrenia*. London: Athlone.

Dempsey, J. (2010). Tracking grizzly bears in British Columbia's environmental politics. *Environment and Planning A*, *42*(5), 1138-1156.

Despret, V. (2004). The body we care for: Figures of anthropo-zoo-genesis. *Body & Society*, *10*(2-3), 111-134.

Despret, V. (2013). Responding bodies and partial affinities in human–animal worlds. *Theory, Culture & Society*, *30*(7-8), 51-76.

Dewsbury, J. D., & Naylor, S. (2002). Practising geographical knowledge: Fields, bodies and dissemination. *Area*, *34*(3), 253-260.

Eisenberg, C. (2013). *The wolf's tooth: Keystone predators, trophic cascades, and biodiversity*. Washington, DC: Island Press.

Foster, S. L. (2011). *Choreographing empathy: Kinesthesia in performance*. London: Routledge.

Fuentes, A. (2010). Naturalcultural encounters in Bali: Monkeys, temples, tourists, and ethnoprimatology. *Cultural Anthropology*, *25*(4), 600-624.

Fuller, M., & Fuller, K. (2012). Radio-telemetry equipment and application for carnivores. In Boitani, L., & Powell, R. (Eds.), *Carnivore ecology and conservation* (pp. 152-168). Oxford. Oxford University Press.

Fuller, T. K., & Sampson, B. A. (1988). Evaluation of a simulated howling survey for wolves. *The Journal of Wildlife Management*, *52*, 60.

Fuller, T., Mech, D., & Cochrane, J. (2010). Wolf population dynamics. In Mech, L. D., & Boitani, L. (Eds.), *Wolves: Behavior, ecology, and conservation* (pp. 161-192). Chicago: University of Chicago Press.

Gazzola, A., Avanzinelli, E., Mauri, L., Scandura, M., & Apollonio, M. (2002). Temporal changes of howling in south European wolf packs. *Italian Journal of Zoology*, *69*(2), 157-161.

Gibbs, L., Atchison, J., & Macfarlane, I. (2015). Camel country: Assemblage, belonging and scale in invasive species geographies. *Geoforum*, *58*, 56-67.

Haraway, D. (2006). Encounters with companion species: entangling dogs, baboons, philosophers, and biologists. *Configurations*, *14*(1), 97-114.

Haraway, D. (2008) *When species meet*. Minneapolis: University of Minnesota Press.

Hebblewhite, M., & Haydon, D. T. (2010). Distinguishing technology from biology: A critical review of the use of GPS telemetry data in ecology. *Philosophical Transactions of the Royal Society of London B*, *365*(1550), 2303-2312.

Hinchcliffe, S. (2008). Reconstituting nature conservation: Towards a careful political ecology. *Geoforum*, *39*(1), 88-97.

Hinchcliffe, S., & Lavau, S. (2013). Differentiated circuits: The ecologies of knowing and securing life. *Environment and Planning D, 31*(2), 259-274.

Hinchcliffe, S., & Whatmore, S. (2006). Living cities: Towards a politics of conviviality. *Science as Culture*, *15*(2), 123-138.

Hinchcliffe, S., Kearnes, M. B., Degen, M., & Whatmore, S. (2005). Urban wild things: A cosmopolitical experiment. *Environment and planning D*, *23*(5), 643-658.

Howes, D. (2005). Introduction. In Howes, D. (Ed.). *Empire of the senses: The sensual culture reader*. London: Berg.

Ingold, T. (2000). *The perception of the environment: essays on livelihood, dwelling and skill*. London: Routledge.

Kaczensky, P., Chapron, G., von Arx, M., Huber, D., Andrén, H., & Linnell, J. (2012). *Status, management and distribution of large carnivores–bear, lynx, wolf and wolverine–in Europe*. IUCN/SSC Large Carnivore Initiative for Europe.

Kelly, M. J., Betsch, J., Wultsch, C., Mesa, B., & Mills, L. S. (2012). Noninvasive sampling for carnivores. In Boitani, L, & Powell, R. (Eds.), *Carnivore ecology and conservation: A handbook of techniques* (pp. 47-69). Oxford: Oxford University Press.

Kohler, R. E. (2002). *Landscapes and labscapes: Exploring the lab-field border in biology*. Chicago: University of Chicago Press.

Krause, B. (2012). *The great animal orchestra: Finding the origins of music in the world's wild places*. London: Profile Books.

Krebs, J. R., & Davies, N. B. (1993). *An introduction to behavioural ecology*. London: Blackwell Science Limited.

Kuijper, D. P. J., De Kleine, C., Churski, M., Van Hooft, P., Bubnicki, J., & Jędrzejewska, B. (2013). Landscape of fear in Europe: Wolves affect spatial patterns of ungulate browsing in Białowieża Primeval Forest, Poland. *Ecography, 36*(12), 1263-1275.

Latimer, J., & Miele, M. (2013). Naturecultures? Science, affect and the non-human. *Theory, Culture & Society*, *30*(7-8), 5-31.

Latour, B. (2004). How to talk about the body? The normative dimension of science studies. *Body & Society*, *10*(2-3), 205-229.

Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory*. Oxford: Oxford University Press.

Law, J. (2004). *After method: Mess in social science research*. London: Routledge.

Lestel, D., Brunois, F., & Gaunet, F. (2006). Etho-ethnology and ethno-ethology. *Social Science Information*, *45*(2), 155-177.

Levi, T., & Wilmers, C. C. (2012). Wolves–coyotes–foxes: A cascade among carnivores. *Ecology*, *93*(4), 921-929.

Lien, M. E. (2015). *Becoming salmon: Aquaculture and the domestication of a fish*. Oakland: University of California Press.

Locke, P. (2013). Explorations in ethno-elephantology: Social, historical, and ecological intersections between Asian elephants and humans. *Environment and Society*, *4*(1), 79-97.

Long, R. A., MacKay, P., Ray, J., & Zielinski, W. (Eds.). (2012). *Noninvasive survey methods for carnivores*. Washinton, DC: Island Press.

Lopez, B. (1978). *Of wolves and men*. New York: Simon and Schuster.

Lorimer, H. (2006). Herding memories of humans and animals. *Environment and Planning D*, *24*(4), 497-518.

Lorimer, J. (2007). Nonhuman charisma. *Environment and Planning D*, *25*(5), 911-932.

Lorimer, J. (2008). Counting corncrakes: The affective science of the UK corncrake census. *Social Studies of Science*, *38*(3), 377-405.

Lorimer, J. (2010). Elephants as companion species: the lively biogeographies of Asian elephant conservation in Sri Lanka. *Transactions of the Institute of British Geographers*, *35*(4), 491-506.

Lorimer, J. (2015). *Wildlife in the Anthropocene*. Minneapolis: University of Minnesota Press.

MacKay, P., Zielinski, W. J., Long, R. A., & Ray, J. C. (2008). Noninvasive research and carnivore conservation. In Long, R., MacKay, P., Ray, J. & Zielinski, W. (Eds), *Noninvasive survey methods for carnivores* (pp. 1-7). Washington, DC: Island Press.

Manolache, S., Ciocanea, C. M., Rozylowicz, L., & Nita, A. (2017). Natura 2000 in Romania — A decade of governance challenges. *European Journal of Geography*, *8*(2), 24-34.

Mason, V., & Hope, P. R. (2014). Echoes in the dark: Technological encounters with bats. *Journal of Rural Studies*, *33*, 107-118.

Matless, D., Merchant, P., & Watkins, C. (2005). Animal landscapes: Otters and wildfowl in England 1945–1970. *Transactions of the Institute of British Geographers*, *30*(2), 191-205.

Mech, L. D., & Boitani, L. (Eds.). (2010). *Wolves: Behavior, ecology, and conservation*. Chicago: University of Chicago Press.

Moro, P., & Schantz, P. M. (2009). Echinococcosis: A review. *International Journal of Infectious Diseases*, *13*(2), 125-133.

Nygren, N. V., & Jokinen, A. (2013). Significance of affect and ethics in applying conservation standards: The practices of flying squirrel surveyors. *Geoforum*, *46*, 79-90.

Peters, R. (1973). Cognitive maps in wolves and men. *Environmental Design Research, 2*, 247-253.

Philo, C., & Wilbert, C. (2000). *Animal spaces, beastly places: New geographies of human-animal relations*. London: Routledge.

Pile, S. (2010). Emotions and affect in recent human geography. *Transactions of the Institute of British Geographers*, *35*(1), 5-20.

Popescu, V. D., Artelle, K. A., Pop, M. I., Manolache, S., & Rozylowicz, L. (2016). Assessing biological realism of wildlife population estimates in data‐poor systems. *Journal of Applied Ecology*, *53*(4), 1248-1259.

Porter, J. H., Nagy, E., Kratz, T. K., Hanson, P., Collins, S. L., & Arzberger, P. (2009). New eyes on the world: Advanced sensors for ecology. *BioScience*, *59*(5), 385-397.

Rose, D. B. (2011). *Wild dog dreaming: Love and extinction*. Charlottesville: University of Virginia Press.

Roth, W. M., & Bowen, G. M. (1999). Digitizing lizards: The topology of vision in ecological fieldwork. *Social Studies of Science*, *29*(5), 719-764.

Ripple, W. J., & Beschta, R. L. (2012). Trophic cascades in Yellowstone: The first 15 years after wolf reintroduction. *Biological Conservation*, *145*(1), 205-213.

Soulé, M. E. (1985). What is conservation biology? *BioScience*, *35*(11), 727-734.

Takacs, D. (1996). *The idea of biodiversity: Philosophies of paradise*. Baltimore: John Hopkins University Press.

Thrift, N. (2003). Performance and … *Environment and Planning A,* 35, 2019–24.

Thrift, N. (2004). Performance and performativity: A geography of unknown lands. In Duncan, J., Johnson, N., & Schein, R., (Eds.), *A companion to cultural geography* (pp. 121–136). Malden: Blackwell.

Thrift, N. (2009). Understanding the affective spaces of political performance. In Smith, J., Davidson, L., & Bondi, M. (Eds.), *Emotion place and culture* (pp. 75–95). Aldershot: Ashgate.

Van Dooren, T. (2014). *Flight ways: Life and loss at the edge of extinction*. New York. Columbia University Press.

Verma, A., van der Wal, R., & Fischer, A. (2016). Imagining wildlife: New technologies and animal censuses, maps and museums. *Geoforum*, *75*, 75-86.

Whatmore, S., & Thorne, L. (1998). Wild(er)ness: Reconfiguring the geographies of wildlife. *Transactions of the Institute of British Geographers*, *23*(4), 435-454.

Whitney, K. (2014). Domesticating nature? Surveillance and conservation of migratory shorebirds in the "Atlantic Flyway". *Studies in History and Philosophy of Science Part C*, *45*, 78-87.

Wilson, E. O. (1999). *The diversity of life*. London: Penguin.