




# Bats in the City: Exploring Practices of Citizen Bat Conservation Through the Lens of Becoming-With Animal

Angelica Caiza-Villegas <sup>a</sup>, Bettina van Hoven <sup>a</sup>, and Owain Jones <sup>b</sup>

<sup>a</sup>Urban and Regional Studies Institute, Faculty of Spatial Science, University of Groningen, Groningen, Netherlands; <sup>b</sup>Emeritus Professor of Environmental Humanities, Bath Spa University, Bath, UK



## ABSTRACT

This paper explores practices of citizen bat conservation in the city through the lens of becoming-with animal. It draws on insights gained from practices related to bat conservation efforts through interviews and participant observation with bat advocates in the city of Groningen, Netherlands. We show how becoming-with happens and why it is significant to humans and bats. We argue that becoming-with is dynamic and contingent on the elements present in different human–bat networks, which comprise bodies, technologies, practices, forms of knowledge, and urban spaces and places and result in varied relations that bats and bat conservationists enter into. Also, we observed the various outcomes of local bat conservation efforts. We argue that each of these ways of becoming-with must be considered valid, and is needed, in the big picture of bat conservation efforts in the city.

## KEYWORDS

Actor network; bat advocates; bat conservation; becoming-with animal; human–animal interaction; urban ecologies

How can nature flourish in urban areas? This is a vital question. Although urban areas only make up a small percentage of the overall terrestrial land area, for some species cities and towns, which are rarely considered wildlife habitats, are becoming wildlife refuges as rural and wildlands are denuded of biodiversity through a range of processes including modern agriculture, climate change, and pollution. In this paper, we address this important question by turning our attention to the microlevel of individual human–nature encounters, and we look at it through the lens of becoming-with animals (Haraway, 2008). As Wright (2014) says, “becoming-with nonhumans, and appreciating their capacity for meaning-making and worlding, may enhance our ability to respond to the disturbing and amorphous becoming-withs of the Anthropocene” because “if our knowledge of Earth’s complex ecological systems relies on interspecies connectivities, issues like extinction, biodiversity and conservation become epistemic” (p. 280). We focus on bats in the city, which provide rich insights into the messy detail and variation, the degrees and contradictions, that must always be in play in becoming-with.

**CONTACT** Angelica Caiza-Villegas  [m.a.caiza.villegas@rug.nl](mailto:m.a.caiza.villegas@rug.nl)  Urban and Regional Studies Institute, Faculty of Spatial Science, University of Groningen, Postbus 80, 9700AV, Groningen, Netherlands

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Since the 1950s, bat populations have declined markedly in Europe and around the world because of human impacts on ecosystems (Voigt & Kingston, 2016). While there are regulations like the United Nations Environment Program's Agreement on the Conservation of Populations of European Bats, which provides guidelines for the conservation of bats, human–bat encounters at the microlevel remain persistently problematic. Humans tend to consider bats “awkward creatures” (Ginn et al., 2014, p. 113) and “unloved others” because they are “less beautiful and less visible” (Rose & van Dooren, 2011, p. 1) than many other animals. According to Arluke and Sanders' (1996) “sociozoological scale,” which ranks animals according to their place and use in human society, humans frequently find bats repulsive, seeing them as vermin or frightening demons (Bjerke & Østdahl, 2004; Knight, 2008; Prokop & Kubiato, 2009; Prokop & Tunnicliffe, 2008). In extreme cases, this repulsion can lead humans to exterminate entire bat colonies comprising hundreds of individuals (see Reid's example of Costa Rica, 2016). However, the overall status and direction in numbers of bat populations are central to societal concerns about sustainable ecological futures for a number of reasons. Bats are key indicator species (Jones et al., 2009) for the wider decline, and possible reversal, of catastrophic biodiversity loss. In temperate zones, they feed predominantly on insects, and a range of studies show how insect populations are crashing (Cardoso et al., 2020). While the decline of bat species, like that of others, is due to a complex mix of pressures, their decline as keystone species indicates an unweaving of the web of life, signaling danger for global biodiversity and human society. In addition, bats are important animals in terms of themselves, with all the nonhuman rights that have slowly emerged as political and ethical questions, through science, philosophy, and activism in recent decades (Lorimer, 2012). Though they are mammals, like we are, the morphology of their bodies is vastly different from that of human bodies, and bats are entangled in all manner of negative cultural associations around the world (Bhattacharjee et al., 2018; Gunnthorsdottir, 2001; Jung & Threlfall, 2016; Kansky & Knight, 2014; Musila et al., 2018; Prokop & Kubiato, 2009). These factors make it more complicated for humans to feel a duty to care for them (Cooke, 2017) and to attribute rights to them, either as individuals or as populations.

But this story is not a universally negative one, as in some locations bat populations have recovered to some extent in recent years (Jung & Threlfall, 2016). This is due, at least in part, to an increase in their populations in urban areas where some species have adapted to human presence and have even flourished (Dietz & Kiefer, 2016; Voigt & Kingston, 2016). This urban turn in wildlife habituation is vitally important for bat biodiversity and for biodiversity more generally. It also has implications for the greening of cities, as well as for the creation of multispecies human/nonhuman communities. This is evident also in the presence of synanthropic animal species, which not only adapt to human-inhabited infrastructure but even “have a strong ecological association with humans” (Voigt et al., 2016, p. 427).

In this paper, as we address the details and variations of becoming-with bat. We also illustrate the creation of hopeful spaces that are multispecies communities. Specifically, we explore practices of citizen bat conservation through the lens of becoming-with animal. We consider how becoming-with happens and why it is of significance to both the human and nonhuman actors in this urban multispecies story. Further, we show

what the consequences are of this for the bats and the humans involved and what benefits emerge for both humans and the bats, particularly for bat conservation. In doing so, we reveal how “meaning-making and worlding” (Wright, 2014, p. 280) can give rise to empowerment and agency to ecological practices that are skilled, affective, and multi-sensory (cf. Lorimer, 2012).

### ***Becoming-With: Extending Ecological Imaginations***

We take much inspiration from Donna Haraway (2008). She provides an extensive account of becoming-with by exploring interactions between humans and animals through the use of technologies and co-habitation in contact zones where humans and animals share embodied encounters, shaping the identities and emotions of those who are in the encounter. Although much of Haraway’s work draws on companion species, she also highlights the importance of including other “critters” in contemporary urban life, such as feral members of domesticated species (stray cats and dogs), microorganisms, and wild animals (2008, p. 260), which is relevant to our discussion. Becoming-with animals entails “appreciating their capacity for meaning-making and worlding” (Wright, 2014, p. 280). For Wright (2014), becoming-with requires developing an “extended ecological imagination” (p. 280) –an act that Haraway (2008) emphasizes enlists the human capacity to learn about other species and to “adapt to the specific animals [...] in specific ecologies” (p. 262). Such adaptation can be challenging, especially where significant differences exist between the living spaces and rhythms of humans and animals (see also Thrift, 2005).

In the past 20 years, a number of animal studies, including animal geographies, have contributed to the idea of extending ecological imaginations. Key themes include the spaces and places where animals interact with humans, the ways relationships between human and nonhuman animals are established, and the disruption of previously fixed divisions between humans and nonhumans (Buller, 2013; Francis et al., 2011; Philo & Wilbert, 2000; Thrift, 2005; Urbanik, 2012; Wolch et al., 1995). In other work, researchers have focused on the embodied experiences that human individuals and groups have had with animals and how these experiences impact their feelings, bodies, and identities. These studies show that special knowledge and technology must be employed to adapt, physically and mentally, for times (e.g., night) and spaces (e.g., water or air) that human bodies are not well attuned to. For example, Lorimer (2008) describes how ornithologists in the UK must adapt to the nocturnal rhythm and the wetlands home of corncrakes when surveying the birds’ populations; the author describes these scientific inventories as embodied experiences that create emotional bonding. Bear and Eden (2011) explain how anglers explore water environments to encounter fish in rivers and how these encounters can develop affective relations with them. Mason and Hope (2014) found that volunteers carrying out a national bat survey had to adapt their sense of hearing to the bats’ echolocation systems using bat detectors, machines that functioned as “prostheses” extending the reach of their human bodies, enabling them to enter into contact zones. And for Hinchliffe et al. (2005), extending human reach in order to engage with water voles, and understand how this mammal navigates their space, necessitated knowledge of how to read “water vole writing” (footprints, smells, and traces).

In addition to mapping nonhuman animal spaces and practices, these studies help make the case that nonhuman animals should be objects of justice. Cooke (2017) notes:

The lives and interests of non-human animals are marginalised in public deliberation, partly because we are unable to easily understand their experiences and lack the conceptual apparatus to interpret their lives in the context of justice. Because an ideal of justice that includes non-human animals is radically different from our present world, progress towards it may not be practically possible without providing significant help to the imagination. (pp. 12–13)

The studies above present examples of practices to help that imagination. Employing their bodies as well as various pieces of equipment, these researchers “acquir[e] new modes of embodied attention and awareness” (Moore & Kosut, 2014, p. 520); they explore ways to interrelate and entangle across language and species barriers and to map and interpret nonhuman animals through “networks of sociological and ethnographic data and translation” (Callon, 1999, as cited in Moore & Kosut, 2014, p. 518).

Whilst these practices do not allow humans to “grasp the animals’ thoughts simply by learning and practicing their communicatory mode,” they can produce “‘good enough’ ethnographic knowledge [to generate] interspecies empathy, intersubjectivity and affect,” eventually helping humans choose to progress toward justice (Madden, 2014, pp. 289, 290). Supporting this point, Moore and Kosut (2014) discuss “how human understandings of bees and [...] connection to this insect is linked to the emergence of sustainability as a public issue and other contemporary environmental concerns, particularly animal extinction” (p. 521).

In terms of situating the research from which this paper draws, it is important to consider in somewhat more detail how we interpret becoming-with in contact zones. In our study, bats were “both discursively produced and simultaneously present” (Moore & Kosut, 2014, p. 512). In other words, they were discussed by participants and they were physically present in the local environment – as we considered them as part of social networks: configurations that also involve our participants, their ways of knowing through time-sensitive practices, as well as tools and technologies both tangible and intangible. Like Moore and Kosut (2014), we drew on actor-network theory to consider the various elements involved in the connections and relations between bats and humans. As we will show later, this may also involve maps, statistics, scientific descriptions, and legal documents, as these, too, actively contribute to the functioning and outcome of networks of which bats are part; each of these elements is regarded as “an actant in the [...] network whose ‘agencies’ can be analyzed in terms of doing something, that is, making some difference to a state of affairs” (Latour, 2005, p. 52, as cited in Gray, 2014, p. 221). Thus, we see that different ways of becoming in different networks involving bats and humans are necessary in the multi-faceted puzzle and overall attempt at caring about and for bats. We thus recognize Schuurman’s (2014) adoption of Flyvbjerg’s conception of “phronesis” in exploring human–animal relationships. Schuurman (2014) recalls:

Being pragmatic and contextual, phronesis also illustrates the use of tacit knowledge in contexts where humans interact with animals and learn to know their individual characteristics and needs. Decisions made in everyday practices make use of this knowledge and, when directed toward a good life for the animals, can be understood as phronetic. Knowledge about individual animals and ways of taking care of them varies in each circumstance, not

least because what is seen as care in some contexts is understood as neglect in others. What is universal for these phronetic efforts, however, is the purpose of caring about and for the animal. (p. 593)

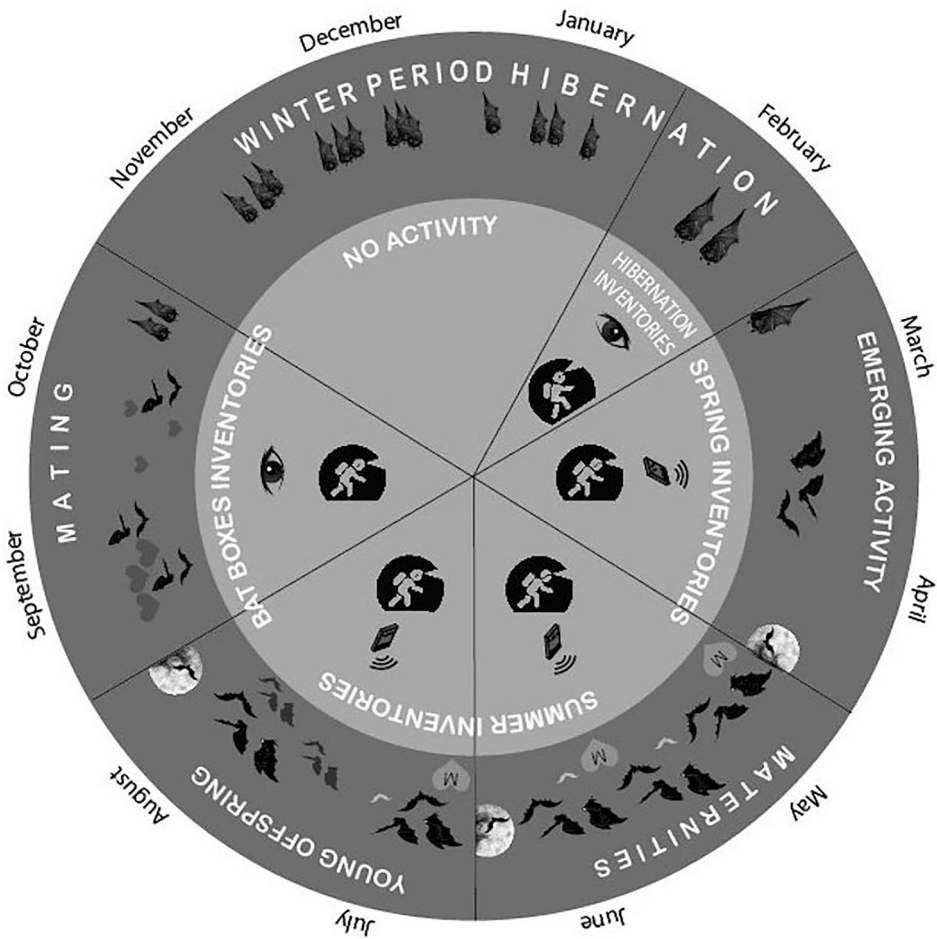
In this vein, we also take inspiration from Gray (2014), who emphasizes the role of place. In his study on sheep, he stresses that they cannot be understood in isolation from place. And neither, we argue, can bats. Place, and the way humans and animals create it and relate to it, acquires significance through its so-called “affordances” (Gibson, 1979, as cited in Gray, 2014). An affordance can be defined as “an action possibility available in the environment to an individual independent of the individual’s ability to perceive this possibility”; that is, “the perceived and actual properties of a thing, primarily those that determine just how the thing could possibly be used” (Gibson, 1979, as cited in Gray, 2014, p. 224). In the case of urban bats, such actions made possible in a human-modified urban (green) environment comprise safe space for resting, mating, and nurturing offspring, as well as flying routes that allow for both feeding and social calls. Human interference through construction materials, street patterns, green and blue spaces, and building insulation shape and potentially compromise the experience and usability of urban spaces for bats. As urban spaces evolve, so do bats.

## Methods

This paper is based on a broader project on human–bat relationships in the northern Netherlands. Much of this geographic area is considered rural; however, we focused on encounters in the city of Groningen owing to the high concentration of bats living there and that there was an active group of bat advocates. A qualitative data collection approach was adopted, including in-depth interviews and participant observations. We drew upon and discussed the experiences and practices of seven bat advocates to gain an understanding of the different becoming-with bat practices unfolding in the city. Participant observation was conducted across the entire bat life cycle (see [Figure 1](#)) to observe human–bat interactions as they occurred.

As a part of the in-depth interviews, participants were asked to describe why and how they became involved in bat activities; what activities they engaged in to encounter bats; where and how often they engaged in these activities; what materials and instruments, if any, they used; how they experienced the encounters; what they knew and learned about bat biology and behavior; and finally, how they thought their work contributed to bat conservation in the area. While the types of encounter and the nature of engagement varied, all participants had spent time learning about bat ecology and the techniques and technology associated with the study of bats. Some technologies were simple to use, such as flashlights, while others were more advanced, such as bat detectors, GPS, sound recorder, cameras, and bat sound analysis software (see [Table 1](#)).

Participatory observation of bat engagement activities varied in length from three to five hours. It was not possible to follow more than one bat advocate at a time as bat activities were often carried out simultaneously in different places and adhered to a strict protocol: all involved a limited number of people and many could be carried out only under



**Figure 1.** Synchronization of the annual life cycle of a European insectivorous bat with the annual citizen bat conservation activities in Groningen. Copyright author.

optimal weather conditions. For example, hibernation inventories can only be performed during a few days in the year – the coldest days of winter – and under the supervision of a coordinator with a legal permit for these activities.

Ethical approval was given by the Faculty of Spatial Science. All participants gave informed consent, including parental permission for one under-age participant. Anonymity and confidentiality were discussed with the participants because the community of bat advocates is small and the participants in this study would likely recognize each other in the results of the study. All interviewees allowed the researchers to use their real names for publication purposes.

The interviews were transcribed and, along with the field notes from participant observation, coded and analyzed using ATLAS.ti qualitative analysis software. We used codes drawing from our review of literature as well as from our close readings of transcripts to explore specific elements involved in becoming-with animal, such as temporalities, spaces, places, materialities, tools, and practices.



## Results

### *Becoming-With Bat: Interconnecting Spaces in Urban Multispecies Ecologies*

In the analysis of our data, we identified degrees and variations of becoming-withs by bat advocates. We did so by exploring practices to understand how becoming-with happens and why it is of significance to both human and nonhuman beings in this urban multispecies story. In the following section, we discuss the different elements of becoming that we observed. We then consider what the consequences are of this for bats and for the humans involved and to what extent there are benefits to both humans and bats, particularly in terms of bat conservation.

Encountering bats is not an easy task; the difficulty of finding them lies in the fact that they are nocturnal, flying animals, and they inhabit spaces that are difficult to reach. Moore and Kosut (2014) note that trying to interpret the actions of bees can be challenging for humans. The same is true of bats. Seeking to understand and engage with “bee-ness” and bat-ness requires new modes of embodied attention and awareness (Moore & Kosut, 2014, p. 520). It seems reasonably obvious, then, that those who meaningfully engage with bats, at whatever level, and for whatever purpose, must, as Haraway wrote (2008) “adapt to the specific animal in their specific ecologies and histories” (p. 262). For our participants, becoming-with bat includes a process of adaptation. Bat advocates need to be informed about bat ecology to understand the life of a bat, including behavior, physiology, morphology, habitats, seasonal activities, and conservation issues. Bats have a life cycle (see also Figure 1) that includes hibernation, emerging activity, maternity, and a period for mating and swarming. Each one of these life stages occurs in different spaces, and bat advocates must know where, when, and how to access those spaces. As a result, new social practices have emerged among bat advocates in Groningen as members make hibernation inventories in winter, inventories of active individuals in spring and summer, inventories of maternity colonies in summer, and inventories of bat boxes and observations of swarming in autumn. It is important to note that most of these activities are used by the municipality as part of urban bat conservation and management programs. The municipality also provides materials and means to construct temporary shelters for some bat species to use as artificial roosts in the city. Bat advocates associated with the Groningen Bat Group volunteer to monitor bat activity and check in on these bat boxes (see Figure 2).

Places used by bats vary, and so do the times and types of activities for bat encounters. During winter, for just two or three days in February, bat advocates organize in small groups to visit all the hibernation places in the area, mostly comprising churches and military bunkers (Figure 3). During spring and summer, bat activity increases owing to food availability; periods with no rain and high temperatures are the most suitable for monitoring bats. Bats are active for several hours each night from sunset to dawn. Bat advocates organize groups and go out at sunset to search for bat colonies, maternity roosts, and feeding areas. They spend between three and five hours per night in open areas making inventories of the number of individuals, the species, and their behavior. Having said this, some bat advocates also move continuously during the night, on foot, by bike or car, exploring the air space for bat activity, using their



**Figure 2.** Bat boxes counting. In this picture, Teddy is counting one of the bat boxes placed in a city park in Groningen. Copyright author.





**Figure 3.** Hibernation counting. Visiting one of the old military bunkers in Groningen to count the population of bats. Copyright author.

sense of sight, merely for their own sense of wonder and because they want to be near bats.

As humans cannot communicate directly with bats, in the next section, we show how technology enables bat advocates to engage with bats through sounds.

Our respondent Calvin told us:

In the summer, I always sit in the backyard because we have bats right here. So I listen to them [with my bat detector] when they fly over in the back. Sometimes I walk through the neighborhood to listen to them.

To establish contact with bats, bat advocates in our study use specialized technologies. Some species of bats are easier to identify because their calls are unique. Other species of bats require more experience to identify. A good bat detector can identify bats within a range of 18–120 kHz. The composition, frequency, and harmony of the ultrasounds help bat advocates to understand the bats' behavior. Here, becoming-with bat involves constant and repeated training, especially of the adjustments to the human sense of hearing.

Klarissa explained:

Bats were a challenge for me when I joined the group because I am a visually oriented person and not very good at developing the recognition of bats by sonar sound. So it took me at least three years to understand the basics of how to recognize our only limited number of six bats that you can easily recognize with a bat detector. Well, this was a sort of challenge, so I didn't give up.

Bat advocates in Groningen have to learn at least six different frequencies, which correspond to the six most common species in the area. They have to understand frequency Hertz units because each species of bat has a repertoire of sounds within a range of specific frequencies. Using his bat detector, Calvin eavesdrops on the bats close to his house. Understanding their sounds requires and provides additional information about bat behavior. The frequency of a sound can tell a trained listener what species is present as well as whether it is flying around, feeding, or socializing.

The activities our bat advocates engage in demonstrate their sustained dedication to becoming better attuned to the spaces, places, and bodies of bats. This point echoes what Hinchliffe et al. (2005) describe as volunteers having to learn to distinguish water vole tracks from those of other small mammals, like rats, as well as understand which activities leave which tracks and traces, to read the so-called "water vole writing." The volunteers draw on fine observation training and print field guides, learning specific characteristics of grazing and the smells of latrines to interpret the "water vole writing." And, following Mason and Hope (2014) and what they call "enchantment within technologies," the examples above illustrate how technologies play an essential role in connecting humans with bats.

In both, the examples from the literature and our own study, the experiences the bat advocates/volunteers/citizen scientists describe allowed them to recognize what is important for bats/animals, in order to begin to understand how human spaces and animal spaces are interconnected in a multispecies urban ecology. Our study illustrates, as Haraway (2008) also maintains, that "we have to learn who they are in all their nonunitary

otherness in order to have a conversation based on carefully constructed, multisensory, computed language” (p. 263). Indeed, as the examples above illustrate, bat advocates choose to attune their bodies to new technologies, learn to observe rapid movements in air space, read ultrasound pulses, analyze visual sonograms, compare behavior, and more. It seems obvious from the descriptions above that there are many challenges and complexities to becoming an other, especially an other who lives through very different bodily, sensory, elemental, spatial, and temporal dimensions, as the bat does. Bat advocates have to work quite hard to become-with bats. This kind of familiarization with an animal species’ everyday life world is a fundamental underpinning to a range of knowledge from practical issues of monitoring, habitat protection, and enhancement of becoming-with. In the following sections, we demonstrate how relevant the context of a network is in degrees and variations of becoming-with. There may be different becoming-withs, and each must be regarded as an important puzzle piece in the needed care for bats in urban ecologies.

### ***In the Network: Multiple Ways of Becoming-With Bat***

As we noted above, and following Moore and Kosut (2014) and Gray (2014), we observe that becoming-with emerges as an outcome of the complex set of interactions in different networks. Like the elephant described by Barua (2014) and the leopard described by Whatmore (2002), bats play different roles in each of the networks in which they are embedded. Specifically, we found that as bat advocates employ different practices, tools, knowledge, and materialities, bats are cast in the roles of biodiversity units, environmental service providers, beings with rights, or injured patients. In Table 1, we give an overview of how we reached these different outcomes.

Here, we illustrate different ways of becoming-with that we observed in our respondents. We first consider Klaas, who works in the local government, and for whom bats are a vital part of the ecological system in the city because bat species in Groningen feed exclusively on insects (mosquitoes, moths, beetles). Therefore, they are categorized as a provider of environmental services that benefit the city. Klaas said:

Oh, they are nice animals! And they are very beneficial for the city environment because they eat many mosquitoes, they are very helpful in the ecological system of the city, so we need them.

In Klaas’ network, bats play the role of insect controllers as an outcome of their diet, embedded in a network that also involves the local government, management of urban environmental services, and bat ecology. Klaas plays a pivotal role in the local administration of the municipality in decision-making and as an environmental service advisor. In this network, Klaas primarily becomes the manager and bats become a resource. This is the most obvious way that he becomes-with bats, but his affection, his emotional involvement, and his enchantment with them are clear from his remark above.

But, framed in the classification system of natural science, becoming-with by bat advocates and bats can be re-configured as a relationship between a specialist and a species or organism to be studied. For our respondent Teddy, who works as a nature adviser, working with bats means acquiring a high level of knowledge about bat biology,

extensive fieldwork experience, and the use of technology, as described in the previous section. The appreciation of bats takes a scientific approach not just as a “dispassionate observation, but as a skilled, affective and multisensory ecology” (Lorimer, 2012, p. 599). Teddy explained:

I went to many churches looking [for bats]. I watched bats more closely in the hibernation counting, and there, I had to give every bat the right name. For example, I cannot say a *Dau-bentonii* bat is hanging there when it is a *Pipistrellus*, so at that moment, I had to learn what the bats looked like, not only what they sounded like on the bat detector.

Teddy has become known as the “Batman of Friesland” because of his ability to track and identify bats. His passion for bats led him to volunteer in several bat workgroups in the

**Table 1.** Bats and bat advocate characteristics, types of bat technologies they use, and agency.

Name	Tech device	Bat advocate characteristics	Bat advocate agency	Bat characteristics	Bat agency
Teddy	BD/GPS/RC/CR/SA	Focus on ecological information.  Member of ecological bureau. Use of specialized technology (bat sounds software, high-tech bat detectors, GPS and mapping software, sound recordings, photography). Self-education/knowledge production in the field of ecology, bat distributions, identification, evaluation of population, and mitigation programs.	Bat specialist	Organism.  Wild animal. Taxon (species, family, or class).  Specific name.	Species/ biodiversity unit
Klaas	GPS/CR/BD	Advisor for municipality.  Mediator in conflict cases between the community and the local administration. Local regulations, implementation of local bat conservation projects, monitoring, and urban planning.	Manager	Urban biodiversity. Natural resource.	Environmental service provider
Klarissa	BD/GPS/RC/CR	Engages in local activism.  Familiar with environmental law and institutional organizations. Self-education/Knowledge production in local and national regulations about bat conservation, policy, and legal process.	Activist/ litigant	Insect controller. Endangered bat.  Being with basic rights. Legal “person.”	Victim/client/ being with rights
Anja	BD/CR	Physical contact with bats.  Daily care (food, cleaning, medicine, medical care, shelter). Development of healing techniques for injured bats. Self-education/knowledge production about rescue, rehabilitation, and release of injury bats.	Companion/ rehabilitator	Wounded bat.  Orphan bat.	Injured patient

Note: BD = Bat detector, GPS = Global Position System, RC = Recorder, CR = Camera, SA = Sound Analysis Program.

northern provinces of Groningen, Friesland, and Drenthe. In addition, Teddy collaborates in scientific research and conservation projects with other bat specialists and educational institutions. Teddy shares his knowledge about bats with other bat advocates, students, local organizations, and the general public.

Another type of becoming-with can be discerned in bat advocates and bats who are involved in networks of legislation issues, wildlife protection laws, and lawsuits. Embedded in such a network, the bat becomes a vulnerable being to be protected by the use of the law: a client and the bat advocate becomes a litigant. Our respondent Klarissa recalled:

We made the group [Groningen Bat Work Group] into a foundation about ten years ago. This was actually for only one reason: As a foundation, we will be able to fight legal battles in case that is necessary for bat protection. There is a huge hibernation building, basically one of the best objects of the province of Groningen, which is in the process of being broken down. We knew that it was going to happen one day, and unfortunately, this year, it started to happen. I have been involved in this legal battle for a year, working three or four days per week.

Although she participated in many other bat activities, including monitoring and education, Klarissa devotes a considerable amount of time to legal cases related to bat protection in Groningen. She applies legal mechanisms to improve and enforce legal bat protection to secure the survival of bats in the city and province. Klarissa's interactions with bats include an emotional attachment in which the bat is regarded as a being deserving of rights and justice.

This emotional bond is even stronger in the case of Anja, one of three persons in the Netherlands who runs a shelter for injured bats. As a person specializing in bat care, Anja becomes a nurse, and the bat becomes a patient. Anja is in daily physical contact with bats and she uses her hands and body to help injured bats to heal. She described her interactions to us:

I have little syringes to feed them. I mix milk, vitamins, water, and also a combination of salt and sugar. I give them a little so they do not get constipated; this formula helps with digestion. I also put them close to my body to keep them warm. I feed them for the last time at 00:30 in the night and the first time at 05:00 AM. I had a couple of little ones: one was really burned, so I put cream on his wings, and he liked it. He knew at what time I was going to put the cream on, so he lay down with open wings. He was tiny. When I released him, he was very furry. The hair had come back, he was healthy, and it was so nice to see him flying away.

Anja's network includes a combination of medical equipment (injections, antibiotics, anti-septics, and anti-inflammatories), nutrition formulas, cleaning supplies, and books about bats. Her work also includes a shelter built within her house through donations made by friends, bat advocates, and family. Injured bats need daily, around-the-clock attention and special care during their process of healing. These bats depend entirely on Anja to survive. Anja's case illustrates an intimate relationship that transforms her into a nurse who has aided in the recovery of 400 bats as patients in the past ten years. Her production of knowledge about bat rehabilitation methods and her collection of data about the recovering of bats are significant contributions to the conservation of bats within the region.



## Discussion and Conclusions

In the first section of our analysis, we described the process of human body extension to animal spaces, temporalities, and ecologies. In so doing, we explored practices of human–bat engagement as comprising primarily spaces, bodies, and technologies. In the second part, we highlighted that such practices variedly also entail other sources of knowledge and actions about and for bats. Although bat advocates share similar interests and activities, becoming-with bat is dynamic and gives rise to a wide range of relations that differ between bat advocate networks.

Mason and Hope (2014) point out that “humans must become attuned to bats to render them present in a way that is useful to conservation” (p. 108). The sections above suggest that humans have different ways of achieving this and they offer different approaches to being useful to conservation. With regards to the bat advocates in our study, even Klaas, who may seem furthest removed from what one may imagine as “ecologically connected” (Wright, 2014), develops his variation of connectivity. He, like the others, is an example of how the lives and locations of bats and bat colonies become included in a human’s sense of the world – in his case, specifically, his sense of his city. His way of connecting may be less embodied than Anja’s way, but he refers to ecological knowledge as well as the way bats help humans get bitten less frequently by mosquitoes. Wright states (2014), “becoming-with is a form of worlding which opens up the frames of what registers to us and so what matters to us in part by recognising what matters to others” (p. 279). For Klaas, his insights into the lives and ecology of bats and how these intersect with human lives means that becoming-with is opening up a frame of what registers and matters to him. In discussing becoming-with, Klaas is a relevant case to include and should not be regarded as inferior to Anja’s. After all, they each have a way that is appropriate to them that makes sense and resonates with who they are. In addition, in both cases, their different ways of engagement translate to recognizing what matters to others and they each offer care in the way they can.

Gray (2014) states that “sheep are inseparable from the farmers who live and care for the land where the sheep live” (p. 220). In the same way, bats are inseparable from the humans who live and care for the cities where bats live. Each of our respondents, in different yet complementary ways, makes decisions in everyday practices “directed toward a good life for the animals” (Schuurman, 2014, p. 593). This includes providing a very close-contact, personal embodied way of care for individual bats (Anja), as well as developing policy that creates and protects roosting spaces (Klaas) and engaging in legal fights over maintaining green corridors and flying routes (Klarissa). Klaas and Klarissa most of all contribute to maintaining the possibilities of the urban environment for bats in terms of the affordances that groups of trees, bat boxes, buildings, and similar bat-relevant geographical features offer bats in various phases of their lifecycle.

It is obvious to us, then, that becoming-with bat does not occur in a vacuum as a dualistic human–animal relationship. Instead, it must be understood as an assemblage resulting in multiple forms of becoming; bat advocates and bats transform in different ways owing to the networks and relations that they establish.

In conclusion then, in a scenario where conflicts between humans and animals are frequent in urban contexts, interdisciplinary research in ecology and social practices can

contribute significantly to manage and protect bat urban wildlife populations (Francis, et al., 2011). Through the lens of the idea of becoming and observing the diverse outcomes of and networks, this paper illustrates the process of becoming-animal in urban wildlife conservation. It highlights the importance of addressing bats on their own terms and recognizing their capacities and their agency. Bat advocates do more than only learn about bats. Instead, through both cognitive and sensorial experiences, they open up their affective capacities to connect with bats. Their actions are translating into a variety of local conservation efforts that directly impact bat populations. In so doing, the lives and interests of bats stand a chance of being included in public deliberation.

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## ORCID

Angelica Caiza-Villegas  <http://orcid.org/0000-0002-8358-8131>

Bettina van Hoven  <http://orcid.org/0000-0002-6800-8602>

Owain Jones  <http://orcid.org/0000-0003-4548-8735>

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