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# Echoes in the dark: Technological encounters with bats

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A B S T R A C T

The threatened status of many European bat species highlights the importance of effective conservation policies and the collection of reliable data regarding abundance, and distribution. In ecological practice, animals often become visible and are 'made present' with assistance from technological devices. These technologies are not inert, and their use is not unproblematic; it is frequently necessary for those operating them to develop additional skills and sensitivities. This paper forges an interdisciplinary alliance between a geographer and a biological scientist to consider the centrality of technologies within these practices and explore how bats are detected, tracked and accounted for in the area around Greywell Tunnel, Hampshire, an internationally important bat hibernacula and a UK Site of Special Scientific Interest (SSSI). The paper discusses the necessity of human attunement to the echolocation calls of bats and the practices through which this can be achieved, whilst demonstrating that engagement with technology does not preclude enchantment. Detailed discussion of bat swarming behaviour further highlights the need to re-tune human–technology–bat alliances, and provides an opportunity to explore nonhuman difference. We conclude by highlighting the implications of our engagement with swarming for the practices of conservation, whilst further reflecting upon the interdisciplinary experience.



## 1. Introduction

The Agreement on the Conservation of Populations of European Bats (UNEP/EUROBATS) highlights the significant impact continued intensification and fragmentation of the European countryside has had upon bat populations through the loss of roost sites, restriction of foraging areas, and general disturbance (Battersby (comp. EUROBATS), 2010). The threatened status of many European bats has led to calls for increased data regarding bat species and populations, together with range and abundance, which directly assist the establishment of national and international conservation policy (Battersby (comp. EUROBATS), 2010). This paper develops an interdisciplinary alliance to consider the centrality of technologies within these practices and explore how bats are detected, tracked and accounted for in the area around Greywell Tunnel, Hampshire, an internationally important bat hibernacula and a UK Site of Special Scientific Interest (SSSI) (Stebbings, 1993).

### 1.1. Forging alliances

The advent of the 'Anthropocene' represents a "public challenge" to our understanding of the environment; living without the reassurances of a "pure, singular and stable" Nature is confusing and requires attempts to think differently in the work of environmental politics (Lorimer, 2012: 593). Calls have subsequently been made for a 'multinatural' approach, a term taken from Bruno Latour and described as involving, "both the multiple trajectories along which any ecology might evolve and the various ways in which they can be sensed, valued and contested" (Lorimer, 2012: 594).

Within this posthumanism, Nature and Society are no longer served by different knowledge regimes, whilst issues such as climate change and biodiversity loss "raise fundamental questions concerning the very distinction between the natural and the social" (Barry et al., 2008: 37). Gabrys and Yusoff (2012: 1) argue that the "uncertainty, contingency, and experimentation" necessary to research and respond to environmental pressures requires new approaches within disciplines, and at their "thresholds, or 'meetings and mutations'". Collaborative work, such as that within the emerging field of 'integrative bioscience', is therefore increasingly being promoted as a mechanism through which to consider multiple scales and perspectives, thus bringing together "various forms

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of cross-disciplinary and multitaxon research" (Wake, 2008: 349). Within biology, and following Wake (2008: 349), such an integrative approach resembles both a methodological practice and "an attitude". The encouragement of such a disposition is not limited to the biological sciences, with Buller (2009), for example, suggesting that geographers should regard interdisciplinarity as a 'lively process of interaction', and not a predetermined engagement. Calls for a creative interdisciplinarity, or transdisciplinarity, that moves beyond the combining of established knowledge have further been made, and frequently focus upon sites of 'shared concern', including environmental controversies (Gabrys and Yusoff, 2012; see also Strathern, 2004; Nowotny et al., 2003). During such research, Nowotny et al. (2003: 186) argue, "knowledge is generated within a context of application". The creative act of research therefore derives, in part, from the mobilisation of a range of 'theoretical perspectives' and 'practical methodologies'. Managerial challenges and opportunities for interesting collaborations can be generated during the subsequent disruption of disciplinary boundaries, whilst emerging socio-cultural phenomena may result in previously "unexamined parts of the material fabric of our everyday lives [becoming] molten" (Whatmore and Landström, 2011: 583). However, whilst the potentials of interdisciplinarity have been widely discussed, the practicalities of conducting such research "remain contested and in development" (Barry et al., 2008: 37). This paper evolved from the serendipitous meeting of two PhD students in the course of their independent research, a geographer and a biological scientist. It is an experiment in the generative potential of such a 'reasonable alliance' (Lulka, 2009: 386) and an attempt to initiate wider discussion of interdisciplinary processes. In forging this relationship we sought to talk to each other, exchange concepts and actively write a multinatural account, thus continuing those interdisciplinary conversations which frequently cease with the completion of fieldwork (e.g. Lorimer, 2010; Hinchliffe et al., 2005).

### 1.2. Shared concerns

Our interdisciplinary alliance was generated through a shared concern for the threatened status of European bats, and a willingness to encounter animals that inhabit space in very different ways to humans. This approach complements the work of Bear and Eden (2011) on human–fish relations, in which they note that despite the inclusive politics of posthumanism's new 'animal geographies', the field still includes some animals more than others. Those animals exhibiting unfamiliar bodily characteristics and inhabiting territorial spacings that are 'alien' to humans are particularly subject to neglect. This paper therefore begins by identifying the centrality of technological devices, particularly bat detectors, to attempts to encounter and record the presence of one such 'alien' group. These human–technology–bat assemblages are situated within a wider body of literature exploring the practices through which lively nonhuman ecologies are rendered present within conservation science; particular attention is here given to processes of bodily learning (e.g. Hinchliffe et al., 2005; Lorimer, 2008). Initial engagements are with individual bats, detected and tracked around the tunnel; through these practices the intensity of their inhabitation and choreographies of movement are made visible. Surveys of population and calculations of abundance translate and establish the presence of bats. These practices reaffirm inhabitation of the area whilst continued technological developments, new surveying practices, and the skills of researchers, enable sensitivity to the diversity of species and behaviours under consideration. Humans must become attuned to bats to render them present in a way that is useful to conservation. Attunement, following Stewart (2011: 445), is the process of 'becoming sentient' to bodies and rhythm, such that things "matter not because of how they are represented but because they have qualities, rhythms, forces, relations and movements". Attunement is here considered an embodied sensitivity to particular nonhuman differences and is central to the practices of bat detection.

The first half of this paper therefore extends work within animal geographies to consider the seemingly erratic flights of bats in the dark. However, as bats begin to swarm at the entrance to Greywell Tunnel at the onset of autumn, so both the rationales of conservation and ideas of nonhuman subjectivity are challenged. The second half of this paper therefore engages with both swarming bats and assemblage theory, whilst exploring the contention that a 'lingering humanism' remains within posthuman approaches (see Lulka, 2009). Tensions between biological notions of diversity and geographical appreciations of difference are further negotiated within the enchanting atmosphere of the swarm. Our interdisciplinary alliance therefore proceeds through creative exchanges within a shared concern for human–bat relations; this experience confronts disciplinary expectations and enables different kinds of knowledge to emerge. We are subsequently able to offer both practical and theoretical remarks within this paper's conclusion.

## 2. Introducing bats: field site and methodology

The UK is home to 17 breeding bat species, comprising around a quarter of national mammal species (Stebbings et al., 2007). These bats are relatively small (ranging in weight from 4 to 40 g), roost by day in secluded locations, and fly at night. Whilst these behavioural characteristics make them very difficult animals to study they are heavily protected within UK legislation and identified as indicator species (Jones et al., 2009). As Nagel (1974: 439) famously recognised, the 'sensory apparatus' of bats differs so greatly from our own that we cannot imagine being a bat, rather "the best evidence would come from the experience of bats"; we must become attuned to their presence. Technological developments in recent decades have made it increasingly possible for humans to become sensitive to the experiences of bats, assisting the identification of species and the reliable study of many aspects of behaviour. One of the most useful advances has been the widespread availability of a range of ultrasound detectors. Bats emit echolocation calls, usually ultrasonic, during commuting, foraging, and social communication. The form and frequency pattern of echolocation varies between species and is influenced by a number of factors. For example, a relationship has been posited between echolocation frequencies and the detectability of insects according to size, with higher frequencies being better suited to the detection of smaller prey (Jones, 1999). A bat's foraging ecology also influences the necessary frequency range and amplitude of calls. Bats foraging in open habitat and hunting larger prey (e.g. Noctules, *Nyctalus noctula*) will usually use longer duration and lower frequency calls, whilst those tending to forage in edge habitats or cluttered environments (e.g. Natterer's, *Myotis nattereri*) will emit shorter duration, frequency modulated calls (Jones, 1999). The relationship between echolocation and species identity has therefore placed the interpretation of call patterns at the centre of bat detection. Technology is crucial to this process for bats primarily echolocate between 11 and 212 kHz (Jones, 1999), whilst the upper limit of human hearing is generally around 20 kHz. Detecting and recording the presence of bats therefore often occurs audibly, without physical or visual contact.

Greywell Tunnel, Hampshire (Ordnance Survey Grid Reference SU707524) (see Figs. 1 and 2), forms this paper's empirical focus; a 1124 m canal tunnel constructed between 1788 and 1794, it was abandoned in the 1930s following a roof collapse and now forms the rural western terminus of the 32mile Basingstoke Canal (Vine, 1994).

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