

The fly that tried to save the world: Saproxylic geographies and other-than-human ecologies

Matthew Gandy 

Department of Geography,
University of Cambridge, Cambridge, UK

Correspondence

Matthew Gandy
Email: mg107@cam.ac.uk

Funding information

European Research Council

The discovery of a rare fly in a North London cemetery marks my entry point into a wider reflection on the value and significance of urban biodiversity. Using different indices of ecological endangerment, along with a critical reading of new materialist insights, this paper explores the cultural, political, and scientific significance of saproxylic (rotten wood) invertebrate communities in an urban context. The paper brings the fields of urban ecology and post-humanism into closer dialogue to illuminate aspects to urban nature that have not been systematically explored within existing analytical frameworks. We consider a series of intersecting worlds, both human and non-human, as part of a glimpse into saproxylic dimensions to urban nature under a putative transition to a new geo-environmental epoch.

KEYWORDS

ecologies of endangerment, forensic ecology, indicator species, other-than-human ecologies, saproxylic geographies

1 | INTRODUCTION

You have to record to protect.

Agata Marzecova¹

On 16 May 2013 one of Britain's rarest flies was discovered in Abney Park, an overgrown cemetery located in north London. This type of hoverfly, with the scientific name *Pocota personata*, had last been recorded in the London area back in 1966 and is considered a rare species throughout Europe.² The fly has an unusual life cycle, being dependent on so-called "rot holes" in old trees, and is considered to be a saproxylic (rotten wood loving) indicator species for "ancient woodland." Saproxylic invertebrates, comprising mainly beetles and flies, form part of the complex ecology associated with the gradual death and decay of trees.³ The presence of this fly in Abney Park is undoubtedly part of a relic woodland fauna that has somehow managed to cling on in the heart of London just a few metres away from busy streets. The role of decay, and its distinctive temporalities, underlines the need to theorise multiple space-times as part of an expanded conception of agency, materiality, and urban ecology. The outpouring of life in the midst of death, exemplified by the labyrinthine structure of old trees, and their vast assemblages of organisms, poses not only ecological puzzles but also philosophical questions about the structural relations between space and time.

In many respects Abney Park seems like a typical example of "semi-wild" urban nature. In summer, the dense woodland provides an acoustic transition from traffic noise to birdsong and the buzzing of insects. Senses become heightened as our

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

The information, practices and views in this article are those of the author(s) and do not necessarily reflect the opinion of the Royal Geographical Society (with IBG).

© 2019 The Author. *Transactions of the Institute of British Geographers* published by John Wiley & Sons Ltd on behalf of Royal Geographical Society (with The Institute of British Geographers).

eyes adjust to the dim light, patches of sunlight flicker across leaves and olfactory traces of rot and decay linger in the cooler air. In this paper I reflect on the meaning of rarity and ecological vulnerability in an urban context: we consider how the protection of a fly associated with old trees might hold wider political and philosophical ramifications. The survival of the hoverfly *Pocota personata* on this urban site clearly dates from before the creation of Abney Park as a landscaped cemetery in 1840 – one of the so-called “magnificent seven” that were constructed around the margins of the expanding Victorian metropolis.⁴ This unusual 13-hectare site now serves as a tranquil island, a sub-cultural zone, a place of mourning and remembrance, and an urban ecological refugia.

Since the late 1990s, a dedicated group of local naturalists have been collecting data about Abney Park, their work being periodically supplemented by that of professional botanists, entomologists and other specialists. This collaborative longitudinal study brings together a mix of self-taught local experts, auto-didactic beneficiaries of further education and professional scientists based in natural history museums. In some cases difficult determinations have required the sharing of knowledge or specimens between two or three people, occasionally calling on national or even international authorities for trickier taxonomic groups.⁵ “Taxonomic debates,” the historian Peter Alagona observes, “pervade every area of environmental science, management, and law that requires making distinctions between and mapping the relationships among related objects or processes” (2016, p. 759). Far from being just an arcane domain of specialists or a minor curiosity within intellectual history, the question of differentiating, naming and structuring the complexity of nature is a fundamental dimension to conservation biology and environmental politics. Taxonomy serves as a tantalising window into the web of life, where field encounters can produce “an ecstatically intimate exploration of place” (Bonta, 2010, p. 146). The accumulated data show that Abney Park is an exceptionally rich biodiversity “hotspot” with hundreds of species of plants, insects, and fungi, including dozens of rare or uncommon taxa that are scarce everywhere, let alone in the middle of a city. Despite its ecological value, however, the site does not enjoy any form of legal protection for its biodiversity, which throughout most of the UK rests on designation as a Site of Special Scientific Interest (SSSI).⁶

In this paper, following Uli Beisel and her colleagues, we will “permit insects to be our guides and our provocation” (Beisel et al., 2013, p. 34). We begin by examining the life cycle of the hoverfly *Pocota personata* as a portal into saproxylic geographies and the cultural and ecological significance of old trees. We then turn to the role of *personata* and other saproxylic invertebrates as “indicator species” that can contribute to forensic ecologies. By using the term “forensic ecology,” I am tracing a conceptual lineage to both forensic entomology and the recently emerging field of forensic architecture, as part of a post-positivist interpretation of incomplete, complex, or contentious sets of data. I am especially interested in how biodiversity data is generated, shared, and interpreted in a context where regulatory agencies or planning authorities have become extensively denuded of scientific expertise. Finally, we consider how greater attention to ecologies of decay might inform an environmental ethics that can extend to saproxylic invertebrates. It is suggested that existing analytical frameworks have yet to fully engage with the multiple space-times that inhere in post-humanist conceptualisations of urban nature.

2 | SAPROXYLIC GEOGRAPHIES

The hoverfly *Pocota personata* is a bumblebee mimic, hence its Latin name *personata*, and was first described as new to science by the London-based naturalist and entomological illustrator Moses Harris in 1780 (Figure 1). His original description, from a specimen found in east London, exemplifies Foucault’s characterisation of natural history as the “nomination of the visible”:

The *head* is black, and formed much like that of a bee. The *thorax* is thinly covered with long hair, the part which is next [to] the head is yellow, the rest is jet black and glossy. ... This curious insect was taken on the inside of a window, in an empty room at Stepney, having lost half of one of its wings. It is so like a bee, that at first sight any one would be deceived.⁷

If Harris had had the opportunity to observe a living specimen his level of amazement would have been even greater: the mimicry of *personata* extends beyond visual resemblance to a bee to include an irritated buzzing sound (acoustic mimicry) and the repeated lifting of its hind legs (behavioural mimicry). Like many other types of hoverfly, *personata* can be characterised as a Batesian mimic, in contrast to distasteful or best-avoided Muellierian mimics, since it is both harmless and relatively scarce: indeed, Batesian mimics must of necessity exist in low numbers, otherwise the evolutionary dynamics of their mimicry would no longer work effectively (see Ruxton et al., 2004). Mimicry contributes to the extraordinary diversity of insect life that constitutes at least 80% of the species thus far described on Earth. And the dizzying array of Batesian mimics associated with rotten wood is an integral part of this story.



FIGURE 1 *Pocota personata*, Abney Park, Stoke Newington, London (2013). Photo: Russell Miller. [Colour figure can be viewed at wileyonlinelibrary.com]

Pocota personata is associated with old trees, where its larvae can develop in so-called “rot holes” after fallen branches have left behind a distinctive micro habitat. The term saproxylic, derived from the Greek σαπρός (*saprós*) meaning “putrid,” refers to organisms that depend on ecological niches derived from damaged or hollow trees, rotten wood, and their associated fungi. In the UK alone, more than 1,500 species of beetles and flies are dependent on saproxylic habitats, and many of these species are rare or highly restricted in their distribution. Although the conservation value of saproxylic habitats is now recognised internationally as one of the most distinctive features of woodland ecology very few sites enjoy some form of legal protection in the UK or elsewhere on the basis of their saproxylic fauna alone.⁸

Further survey work in Abney Park has revealed that *Pocota personata* is associated with just four old ash trees that date back to the cemetery's original planting scheme in 1840 (Figure 2).⁹ Senescent or “veteran” trees play a critical role in woodland ecology, providing nesting or roosting spaces for birds, bats, and other creatures, and also supporting hundreds of species of fungi and invertebrates. The botanist and woodland historian Oliver Rackham describes how “one 200-year-old ash can be a series of ecosystems for which 10,000 50-year old ashes are no use at all” (2014, p. 64). Similarly, the arboriculturalist Russell Miller, who first recorded *personata* at Abney Park, describes how each veteran tree “is a nature reserve on its own.”¹⁰ “To the saproxylic fauna,” writes the pioneering specialist Martin Speight, “a moribund, over-mature tree represents not a habitat but a multiplicity of habitats. It is not so much an individual abode as a megalopolis” (1989, p. 19).

The distinctive structure of old ash trees has been woven into cultures of nature since at least the early modern period: the writer John Evelyn (1620–1706), in his *Sylva* of 1664, refers to the “rotten dottard part” of an ash tree in his elaborate treatise on the use of different types of trees (cited in Rackham, 2014, p. 88). The 19th-century nature poet John Clare recalls an “old huge ash-dottelrel wasted to a shell” that could provide shelter for farmworkers caught in a rainstorm.¹¹ Ash also features in Jacob George Strutt's evocative celebration of old trees in his *Sylva Britannica*, first published in 1822, where he describes a “beautifully luxuriant” ash tree at Carnock in Scotland, reputedly planted in 1596, with its “playful ramifications” and “houses not built with hands.”¹² The gnarled and fantastical forms acquired by old trees have not only been a source of admiration but also apprehension, with their hidden cavities and hollow structures believed to harbour uncanny infestations. For the philosopher Reza Negarestani, we encounter the symbolic “tree of rot” that “spews forth a cosmic range of both familiar and nameless creatures as a differential extension of its arborescent emptiness” (2010, p. 400). The field of putrefaction is marked “infinitesimal fields of differentiation” that confound conventional conceptualisations of shape or form (Negarestani, 2010, p. 412). Ecologies of decay generate many showy organisms that emerge from the murk of their “monster” larval phase, though of course these waxy grubs

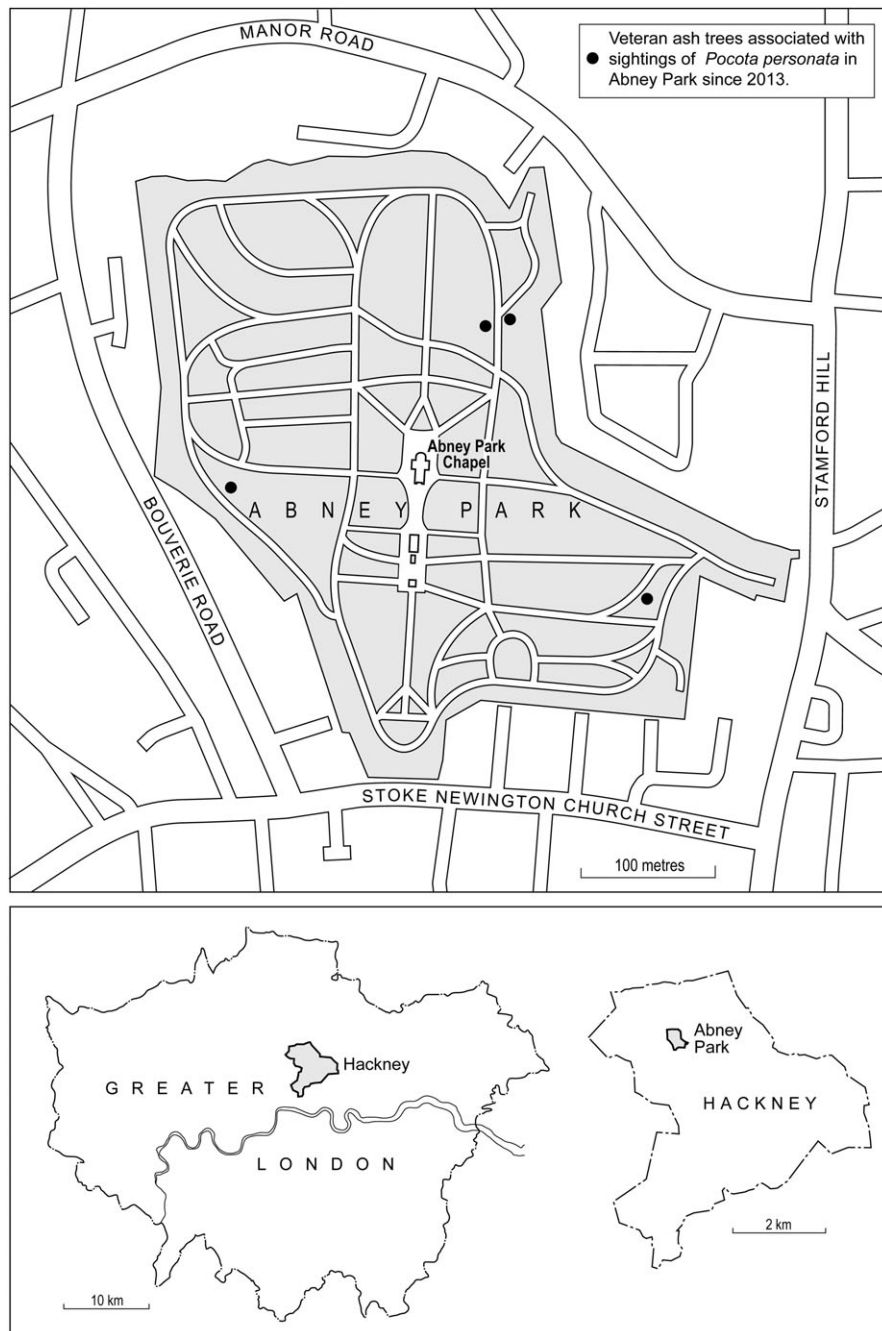


FIGURE 2 Map of Abney Park showing the location of the four ash trees where *Pocota personata* has been recorded since 2013.
 Source: Data derived from various sources, including Miller (2015)

or elaborately shaped larvae with their own specialised breathing apparatus are a vital source of food for other invertebrates as well as birds such as woodpeckers.

Saproxyllic habitats provided by relatively undisturbed forests, especially in lowlands, are among the types of “natural” vegetation to have been most extensively modified by human activity during the Holocene. Dead, decaying, or fallen trees in remaining fragments of woodland would have been regularly removed for fuel and at a later stage for reasons of “forest hygiene” under the development of modern forestry techniques (see Lowood, 1990; Scott, 1998). As recently as the 19th century, before the generalised adoption of fossil fuels for heating and cooking, there were bitter disputes over access to fuel wood and other forest resources in many parts of Europe (see, for example, Hölzl, 2010; Sahlins, 1994). And above all, it is the leaving of “over mature” trees in situ that is the specific element of woodland ecology that has declined most markedly with the rationalisation of forestry and arboriculture.

3 | FORENSIC ECOLOGIES

The field of urban biodiversity spans the scientific investigation of specific sites, as in the case of Abney Park, but also a series of cultural, political and institutional interventions regarding the value of different fragments or manifestations of nature. The expression “ecologies of endangerment,” as used by the anthropologist Tim Choy, has many possible applications in the urban arena. “A different scaling of the problem,” notes Choy (2011, p. 71), “designates a different unit for life’s analysis and definition: a population, an ecosystem, a cascade of energy’s transformations, a cycle of carbon, nitrogen, or other elements.” Similarly, Fernando Vidal and Nélia Dias describe how the status of “endangerment” is marked by a series of incorporations into “archives, catalogues, databases, inventories, and atlases” (2016, p. 1). They evoke an “endangerment sensibility” that suffuses the affective realm of late modernity with the actualities or possibilities of loss (see also Yusoff, 2012). In the case of our fly, we encounter two interrelated kinds of endangerment: first, the safeguarding of a unique urban ecosystem comprising a remnant socio-ecological assemblage; and second, a highly unusual saproxylic invertebrate association with old ash trees (most records of *personata* thus far have been from beech and poplar trees).

Since the 1980s, *Pocota personata* has been regarded as an “indicator species” for the conservation value of old woodland sites across central and northern Europe. The use of indicator species, and the frequency of the term “indicator” in scientific literature, has grown rapidly since the 1980s, yet many analytical and methodological uncertainties remain (see Heink & Kowarik, 2010; Siddig et al., 2016). Over what scales or temporalities, for instance, can an indicator species hold its significance? Is a small or isolated urban population of an ecologically vulnerable species of greater conservation value than other populations in less threatened parts of an organism’s range? On this last point, *personata* is certainly of interest since it is considered rare throughout Europe, as evidenced by its “red list” status in Germany, Sweden, and elsewhere. Although the “species” concept has ontological imperfections (see, for example, Kirksey & Helmreich, 2010; Misheler, 1999), the individual species remains the focal point for concerns with biodiversity loss.

Abney Park is an “urban island” set within a maelstrom of intensifying development pressures that have characterised inner London since the late 1990s. These pressures came to a head in the summer of 2013 as a bitter row erupted over the granting of planning permission for the construction of a six-storey “mixed use development” adjacent to the park, comprising predominantly luxury housing and a supermarket.¹³ A grassroots campaign emerged to protect the site, culminating in a march through nearby streets and a series of legal challenges to the local council over their decision to allow the project to go ahead. An ecological consultant working on behalf of the property developers claimed that the scheme posed no threat to the park, although only a perfunctory environmental impact assessment had been carried out that did not extend to the park itself but did include a daytime survey of bats in a nearby car park (it is not uncommon for Environmental Impact Assessment reports to include methodologically useless components). The phenomenon of “expertise for hire” adds an additional layer of complexity to the politics of land use planning, particularly in a context where rising land values threaten to engulf existing ecological criteria for the protection of vulnerable species or biotopes.¹⁴ A rancorous planning committee meeting held in the main council chamber at Hackney town hall in July 2013, attended by hundreds of local people, failed to prevent the re-granting of planning permission despite the range and intensity of objections, including the impacts of noise, the partial overshadowing of the site, increased light pollution, and the felling of trees on the park boundary, along with the contravention of London-wide planning targets for minimum levels of provision for affordable housing.¹⁵ Over 5,000 individual objections to the scheme were submitted to the council and a group of local campaigners organised a crowd-funded legal challenge to the council’s decision via a lengthy process of judicial review, focusing in particular on the failure of the developers to carry out a competent environmental impact assessment, along with a flawed financial viability appraisal, but this was comprehensively dismissed in October 2014 at the Royal Courts of Justice.¹⁶ The proposed development itself was later abandoned in 2015 after the supermarket withdrew from the project under public pressure. Having lost their main tenant, the developers then simply sold the site to new owners at a large profit, the value of the land having been greatly enhanced by the granting of planning permission. At the time of writing, a new luxury housing project (without a supermarket) is now under construction.

The growing tensions between urban biodiversity and land use planning in London must be set within the context of a steady de-municipalisation of public services, including the management of parks, street trees, and other elements of “managed nature” within the public realm. Overstretched local planning officers lack the time or expertise to interpret ecological surveys (which are in most cases not part of their formal training) and have limited interaction with the statutory regulator for nature conservation, Natural England, an under-resourced quango created in 2006. The administrative origins of Natural England belie the agency’s rural orientation along with a shift of priorities away from the more scientific focus of the better resourced Nature Conservancy Council that it effectively replaced.¹⁷ In the case of London, a dedicated agency for urban nature conservation, the London Ecology Unit, was set up under the former Greater London Council in the early 1980s,

and continued to operate after the abolition of the GLC in 1986, until the return of regional government for the capital under the weaker Greater London Authority in 2000 (see Goode, 2014). Although the GLA has produced various documents, including biodiversity action plans, its level of scientific expertise is clearly lower than that under the GLC, and in particular the London Ecology Unit, which published a series of detailed reports in the 1980s and early 1990s, and also successfully influenced national policy-making towards urban nature with its dual emphasis on conservation value and public accessibility.¹⁸ If the scientific capacity of government and its regulatory agencies is reduced or inadequate, then where does ecological or taxonomic expertise lie? If we look beyond the denuded regulatory capacities of the state, we are left with a scattering of expertise held by individuals, under-funded museums or universities, and in some cases environmental consultants (who might once have worked in the public sector).

A strategic aim of the grassroots ecological survey work in Abney Park is the possibility of getting the site designated as an SSSI: the London-based fly specialist Joan Childs has even suggested that Abney Park should be assigned SSSI status on the basis of the presence of *Pocota personata* alone but five years of attempts to draw attention to the ecological significance of the park by establishing a dialogue with the statutory authority for nature conservation, Natural England, have yet to achieve even a single site visit.¹⁹ There is a perception that Natural England is especially reluctant to make potentially controversial SSSI designations for urban sites that are caught up in land-use planning disputes: the overwhelming focus of legal protection has been on either less valuable sites or specific kinds of cultural landscapes such as moorlands or chalk downlands. Yet if Natural England were to designate Abney Park as an SSSI, on the basis of its saproxylic fauna, it would alter the potential dynamics of planning decisions in the immediate proximity of the site as well as safeguard woodland management practices such as leaving most dead or decaying wood in situ.

Data on indicator species can be “scaled up” to produce more elaborate indices marked by gradations in ecological value from regional, to national, and ultimately international significance. The use of measures can produce a heuristics of comparison for the degree of endangerment facing specific localities (see Choy, 2011). “A quantitative index or indicator typically cannot measure the very thing of interest,” as the historian Theodore Porter notes, “but in its place something whose movements show a consistent relationship to that thing” (2015, p. 34). If we were to substitute Porter’s “movements” with “differences,” we have a sense of what is potentially at stake in producing a degree of comparative validity in a juridical, technical, or policy-making context. In the case of the saproxylic value of woodland habitats, there are now two indices used in Europe: the Index of Ecological Continuity (IEC) and the Saproxylic Quality Index (SQI). The IEC measure, which has been successively modified since the mid-1970s, is derived from the presence or absence of a range of specific invertebrates that are scored in terms of their significance to produce a composite index of 15 or higher for woodlands of regional importance, over 25 for national importance, and more than 80 for European importance (see Alexander, 2004; Fowles et al., 1999). The simpler SQI measure is based on the proportion of rare species from a total species count with a score of over 500 considered of national significance. Survey work conducted in Abney Park reveals that the site has an IEC of 30 and an SQI of 570, showing that the critical thresholds for national significance have been exceeded. In 2017, for instance, a further species of saproxylic beetle was discovered at the site, *Stichoglossa semirufa*, that is so rare and little known that it has not yet even been allocated an IEC score: just two specimens now exist in the British beetle collection at London’s Natural History Museum (one of which was found in Abney Park).²⁰

These are remarkable results for an isolated inner-city location but what are the wider practical and political implications of the presence of so many rare or interesting species? The wealth of data derived from the grassroots survey work at Abney Park has produced an entomological archive that comprises records, photographs, museum specimens, various types of eyewitness accounts, and site perambulations (some local naturalists have made almost daily visits to the site over many years). This collaborative ecological inventory is of necessity provisional, whether in relation to short-term ecological perturbations, human effects, or the looming temporalities of “deep time” under the putative transition to the Anthropocene. We encounter a grassroots form of scientific practice that works alongside, but sometimes in opposition to, the institutional framing of ecological science and its evidentiary hierarchies. The survey work can be characterised as a contribution to “citizen science” marked by an expanded emphasis on the urban laboratory and its multiple investigative practices (see, for example, Gabrys, 2012; Hinchliffe & Whatmore, 2006).

The systematic collection of data on indicator species contributes to what we might term “forensic ecology” by bringing together two distinctive epistemological frameworks: first, the extremely precise environmental data available from the study of insects used in “forensic entomology” for the reconstruction of crime scenes (as elaborated by the pioneering analysis of Hermann Reinhard, Jean-Pierre Mégnin and others); and second, the multi-dimensional spatial and political insights discerned through “forensic architecture” as elaborated by the architectural theorist Eyal Weizman.²¹ Weizman’s project can be conceived as working backwards from theoretical abstraction: a form of evidentiary materialism that disavows the ahistorical dimensions to neo-vitalism or the neo-romanticist aura that surrounds recent interest in object-oriented ontologies

(see Bois et al., 2016; Weizman, 2014). Forensic ecology enables an elaborate proxy reconstruction of the socio-ecological characteristics of specific sites that extends the use of existing indices to the historical and political dynamics of space. Although Weizman (2017, p. 119) refers to plants as a valuable guide to “field causality,” we can surely add insects to the pantheon of human–non-human collaborations for the long-term “biomonitoring” of environmental threats. The changing behaviour, distribution, and population dynamics of insects provide a comprehensive multi-dimensional set of insights into climate change, habitat fragmentation, the effects of neonicotinoids and other toxins, and a plethora of other anthropogenic environmental impacts. These invertebrate sentinels provide an eerie portent of global ecological decomposition that has profound political significance. Insects emerge as a legion of post-human “sensors” comparable with Weizman’s emphasis on the use of buildings and the transcendence of the classic art-historical emphasis on the human subject as an aesthetic observer (see Bois et al., 2016). These scientific alliances with the non-human can produce new sources of knowledge that have a quasi-legal as well as post-positivist epistemological foundation.²² Forensic ecologies, with their critical realist underpinning, also open up potentially new lines of conceptual engagement between the bio-physical sciences and political ecology (including urban political ecology).

In addition to development pressures, and conflicting conceptions of site maintenance, *Pocota personata* also faces other emerging threats, such as new predators and the loss of ash trees. The growing population of the Rose-ringed Parakeet *Psittacula krameri* in Abney Park, a bird that has spread rapidly across London since its escape from captivity in the 1960s, is now an increasingly frequent component of the avian fauna across the city that may begin to impact on urban ecosystems: there has been at least one field observation in Abney Park of a parakeet snapping at a *personata* as it buzzes around a “rot hole” and there is also likely competition with other birds for the use of tree cavities as nesting sites.²³ More serious, though, is the danger to ash trees themselves: ash, one of the commonest British trees, is now under threat from a fungal disease known as “ash dieback,” first recorded in the UK in 2012, and from invasive wood-boring insects such as the expected arrival of a beetle called the Emerald Ash Borer *Agrilus planipennis*. These and other threats to trees are being introduced under poorly enforced regulations for plant imports by commercial nurseries and the use of contaminated wooden pallets for the global transport of goods. Although ash dieback has not yet been recorded at Abney Park – the site is perhaps protected by its degree of isolation – there are predictions that almost all of the ash trees in the UK will ultimately be lost, with significant implications for landscape and woodland ecology comparable with the loss of elm trees in the 1970s (see Rackham, 2014). The potential loss of ash and other trees is indicative of the simplified ecological structures that may characterise future forests due to a combination of climate change and the globalisation of plant pests and diseases (see also Clark, 2013). These denuded ecosystems of the Anthropocene may appear as jagged stratigraphic shifts in the future palynological record to pre-empt the gathering momentum of the sixth mass extinction (see Davies, 2016). And in any case, as James Scott and others have shown in relation to the history of forestry, modernity itself has been a long-term process of ecological simplification. Ecological projections or reconstructions can be extended both forwards and backwards in time, yet it seems that future uncertainties are proliferating just as the environmental past is becoming better understood.

The protection of invertebrates, including the saproxylic ecological realm, has become an increasingly significant strand in conservation biology. By the early 1980s, it was estimated that about 20% of Europe’s terrestrial and freshwater invertebrates faced the threat of extinction, prompting the Council of Europe to adopt the Charter on Invertebrates (see Pavan, 1986). If anything, the picture has sharply deteriorated since the 1980s in terms of invertebrate biomass decline, population fragmentation, and further loss of habitats (see Haslett, 2007). Indeed, the scale of recent decline throws into doubt the pretext for “protected areas” as the cornerstone for conservation biology (see Gaston et al., 2006; Hallmann et al., 2017). The rationale for isolated interventions must be considered in relation to the articulation of wider ethical obligations towards the non-human realm.

4 | LOVING THE ALIEN

If the world of our fly revolves around a few old trees, then how can we conceptualise the kind of ecological relations that characterise the scale of a single tree? To suggest that a tree is an ecosystem in itself is only half the story: we know that trees form an interconnected skein of living organisms through fungal hyphae, the sharing (or restricting) of access to light and water, and complex patterns of chemical communication in relation to threats and opportunities.²⁴ “The tree is itself a differential field of ideas,” notes Negarestani (2010, p. 416), “– or in a Leibnizian sense a generative reservoir of smaller bodies – which themselves are changing and have their own derivatives”²⁵ We have seen how “over mature” trees pass through a series of stages of increasing spatio-temporal complexity within which the saproxylic dimension to their fauna steadily increases before a final re-absorption into the web of life.

What are the ontological characteristics of saproxylic geographies? The process of decay poses difficulties in delineating a clear boundary between the organic and the inorganic, and between life as a force or process and death as an individuated change in state. The saproxylic realm captures a sense of life as a series of perpetual re-combinations that is underpinned by multiple manifestations of both human and non-human agency. If a mycorrhizal fungal network continuously reproduces itself, and dying trees are gradually absorbed into their offspring, then the boundary between life and death is rendered uncertain, unless we refer to geological shifts in the possibilities for life or the evolutionary dynamics of speciation as the basis for new life forms.

What kind of political or philosophical arguments might be deployed for the protection of *Pocota personata*? For Roberto Esposito (2004/2008), the articulation of a non-utilitarian ethics towards nature is grounded in a critique of the bio-political denigration of the non-human. Esposito argues that the only way to prevent bio-politics from becoming a form of thanopolitics is to value all life, shorn of its violent demarcations, yet his ostensibly all-encompassing position has elicited criticism for its overextension of rights discourse to facets of nature that are inimical to human well-being (see Mitchell, 2013). In the case of insects, we might compare our fly, which is attractive, harmless, and possesses an innocuous life cycle, with dipteran disease vectors such as houseflies or mosquitoes. In defence of Esposito, however, we can argue that his concern is with the flourishing of conditions for life in general, rather than an individuated emphasis on any and all life forms: a formulation that might include a biodiversity hotspot even if it contains some elements of threat (such as the presence of the tetanus bacterium in soil). To elaborate on Esposito's framing, we could argue that insects have too readily fallen under an immunological paradigm of bio-political governmentality that veers consistently towards eradication and control.

In his late period of work on the non-human, Derrida (2006/2008) emphasises the systematic neglect of animals within European philosophical traditions, surmised as a lineage through the thought in particular of Aristotle, Kant, Heidegger, Lacan, and Levinas. But can we extend Derrida's neo-Benthamite concern with the suffering of animals to flies and other insects? He posits the need to “awaken us to our responsibilities and obligations vis-à-vis the living in general” as part of his recasting of “the philosophical problematic of the animal” (Derrida, 2006/2008, p. 27). Yet even Derrida's own writing on animals has been subjected to a quixotic line of criticism due to his ostensible privileging of organisms over matter (see Iveson, 2017). How far, in other words, can we usefully extend the discourse of rights to non-human nature, or indeed, to the non-human realm of matter? The philosopher Michael Marder tackles this conundrum by emphasising the experience of time rather than consciousness as the marker of life: in so doing, his concern with the protection of life effectively extends beyond sensate organisms to include plants. Marder draws on Henri Bergson's neo-vitalism to develop an expanded conception of the botanical realm. “Plant life,” writes Marder, “expresses itself both by means of biochemical signalling and in an incessant, wild proliferation, a becoming-spatial and a becoming-literal of intentionality” (2013, p. 37). The intersections between space and time are a central element in Derrida's conception of how living constellations of matter come into being under the “infinite finitude of *différance*” (see Hägglund, 2008, p. 3). In essence, Derrida offers a form of radical materialism within which life is predicated on its innate temporality, resting on a phenomenological elaboration of the experience of time that moves beyond the restricted scope of the Husserlian human subject (see Derrida, 1967/1973). He opens the door to a subtle re-reading of non-human “otherness” that is de-anchored from a range of metaphysical presumptions.

What kind of value can we place on sharing space with an organism such as our fly that few people are aware of and still fewer have actually seen? One line of argument that lies in distinction to both utilitarian and intrinsic perspectives is the possibility of phenomenological empathy rooted in childhood experiences of nature (see, for example, van den Born et al., 2017). Specialists working in the field of conservation biology have appealed for the protection of saproxylic invertebrates on account of their “peculiarity, strangeness, and beauty” (Stokland et al., 2012, p. 402), or in other words on the basis of what brings meaning and happiness to their own lives as scientists. For Ted Benton (2018), working from within a broadly historical materialist tradition, it is the capacity of nature to enrich and uplift human life that signals a potential pathway to a more culturally nuanced environmental ethics. Yet such a sensibility of openness to nature, in part derived from traces of memory or collective experience, is of necessity culturally specific. Or as Kate Soper (1995) reminds us, drawing on Adorno, it is a form of aesthetic experience that is rooted in its precise historical (and in this case metropolitan) context.

A modified environmental ethics might acknowledge the role of uncommon Batesian mimics such as *personata* as a key component of invertebrate biodiversity. An enlightened utilitarian framework based on the ecological need for decay, replacement, and the recycling of matter clearly forms an integral element in the well-being of nature and biodiversity in general. In this sense, the focus is not so much on the individual organism à la Tom Regan but rather on a species or population in relation to the flourishing of the web of life as a whole, as emphasised in eco-criticism as well as conservation

biology (see Cole et al., 2011). Conversely, post-humanist and new materialist angles on this question have tended to emphasise agency, subjectivity, and “becoming” in such a way that questions of life, and the valuing of life, are framed in opposition to both utilitarian conceptions of nature *and* anti-utilitarian extensions of rights discourse. Since our fly is clearly not a “keystone” species in terms of its ecological role, we need to find an alternative line of argument for its protection that transcends a utilitarian emphasis on its presence or absence.

Relations between the politics of human and non-human rights have been uneasy, and in some cases antagonistic, despite potential complementarities. There is a certain reluctance to extend the ethics of non-human life too far in the direction of ostensibly animist, mystical, or primordial systems of thought, partly out of fear that such a move might obfuscate the historicity of political struggles or subsume the complexities of modernity within a naturalising framework. In a similar vein, moral obligations towards non-human nature, based on an extended range of similarities to human attributes, remain implicitly anthropocentric through their reliance on the demonstration of specific cognitive or sentient capacities (see Benton, 1993). Yet at the same time, most modern legal frameworks, including many international statutes, indulge in a form of ironic or unintended animism through the recognition of rights for institutional entities such as corporations and other inanimate “things” (see Tavares, 2014).

There is an evident tension between an extended rights-based discourse *à la* Michel Serres and the recognition of a spectrum of different life forms within which the human subject retains a clearly defined status on the grounds of historical consciousness even though *both* these ostensibly contrasting positions lie outside the mainstream lineage of European thought (see Benton, 1993). An emphasis on “phenomenal consciousness” as a measure of sentience raises significant ambiguities when we try to extend the idea of rights to a successively wider range of organisms (see, for example, Cochrane, 2012). Recent neuroscientific research on the insect brain suggests that there are rudimentary elements of consciousness experienced such as attention, memory, and sleep (see Fox, 2004). Despite advances in neuroscience, however, these insect worlds must of necessity remain radically different and ontologically obscure. And even if flies can “think” this is less clear for their larval stages that might be characterised as “feeding-automatons” even further removed from the world of sentience (Benton, 2018). An alternative conceptualisation of “insect rights” might begin with a post-humanist perspective on alternative life forms, or unfamiliar life worlds, that are simply acknowledged on their own terms (see, for instance, Bingham, 2006; Ginn, 2014; Srinivasan, 2017). Imagine for a moment that our fly were an alien life form: not only does its body undergo an extraordinary metamorphosis, but the process of transformation can be staggered (as revealed by the different size classes of larvae found in rot-holes) so that adult flies might actually have experienced life spans that are years apart. A species that can experience multiple space-times is of necessity ontologically alien yet deeply woven into human practice (as evidenced by the writing of this paper).

A relatively obscure indicator species clearly points towards an ethics of populations or functional ecosystems rather than an individual organism. The scaling up from indicators to indices underlines the bio-political dimensions to ecological science as a techno-managerial realm of environmental control. Invertebrate biodiversity already falls within a modified bio-political frame in terms of the pollination needs of agriculture, pest control, and other fields of governmental concern (see Reckhaus, 2017). Yet a bio-political counter framing emanating from conservation biology, ecology, and other fields of intervention might be gathered under the aegis of an “affirmative” bio-politics.²⁶

The boundary between human and other-than-human life marks a recurring point of departure for thinking through the limits of agency, sentience, and environmental ethics. Indeed, the human body is itself a multi-species assemblage, with much of our corporeal DNA derived from gut bacteria and other sources (see Ingram, 2011; Kirksey et al., 2014; Paxson, 2014). Biological life is better conceived as a vast assemblage of perceptually incommensurate socio-ecological interdependencies.²⁷ The apparent novelty of various new materialist or speculative realist perspectives associated with a reprise of 20th-century vitalism, and more recent object-oriented ontologies, seems much less clear when viewed from a longer (and less Eurocentric) perspective (see Agamben, 2002/2004; Cole, 2013). As recently as the 18th century, for example, animals were routinely ascribed human capacities for thought or action, even as human traits such as language or self-recognition gathered significance.

5 | CONCLUSION

The discovery of *Pocota personata* in Abney Park has generated a degree of curiosity and excitement: now nature enthusiasts, and especially dipterists (fly specialists), travel across London in the hope of catching a glimpse of this elusive creature. In a small way perhaps, and certainly overshadowed by the Stag Beetle *Lucanus cervus* in a London context, this distinctive fly has sufficient “charisma” to foster public interest in the value of “rot” (or rot-holes to be more precise) within

the saproxylic geographies of urban space. For the protection of saproxylic biodiversity, however, the key element is not the practice of simply leaving sections of dead logs on the ground, as can frequently be observed in parks, but the more aesthetically and legally challenging need to allow “over mature” trees to die naturally in situ, over decades if not centuries, with their unique combination of the living and the dead.

The aesthetics of decay can be interpreted as a saproxylic dimension to “re-wilding” in an urban context (see Lorimer, 2016). Until recently, it was common arboricultural practice to simply fill “unsightly” rot holes or other cavities with concrete, tar, or other materials. The emerging interest in “disorderly space” contrasts with earlier efforts to remove signs of death or decay and the historic need for firewood. Indeed, a contemporary cause of damage to saproxylic ecologies in Europe is the intensified search for dead wood as a result of fuel poverty in austerity stricken Greece and elsewhere (see Stamouli & Bouras, 2013). Old trees, especially in an urban setting, are now under threat from a variety of sources, including health and safety fears (Abney Park is now closed on windy days), insurance claims (tree roots, for example, have proved to be a lucrative source of litigation), and older “difficult” trees that are expensive to maintain present a headache for cash-starved municipal authorities who have disbanded or heavily cut back on their in-house “tree gangs” with accumulated arboricultural knowledge of local trees.²⁸

The saproxylic geographies of Abney Park also extend to human remains: nearly 200,000 bodies had been buried at the site before the graveyard became effectively “full” in the 1960s and fell into a state of disrepair. In one sense, therefore, this study relates tangentially to emerging interest in “deathscapes,” “necrogeographies,” and other spatial manifestations of human mortality (see, for example, Cloke & Jones, 2004; Leshem, 2015; Maddrell & Sidaway, 2010; Romanillos, 2015). In the case of cemeteries, however, human bodies, through their decomposition, form part of the ecological dynamics of the site: people have become trees.

Cemeteries are now recognised as an increasingly important dimension to urban biodiversity (see Kowarik et al., 2016). The “urban island” of Abney Park has become a laboratory for the study of urban nature, serving not simply as a marker of cultural or ecological heritage, restricted to remnants or reconstructions of the past, but as a menagerie of possible socio-ecological future pathways. Like W. G. Sebald’s evocation of the overgrown Ashkenazi cemetery in east London in his novel *Austerlitz*, first published in 2001, with its criss-crossing themes of nature and memory, these incongruous spaces serve as progenitors of unexpected flourishings of life in the heart of the city.

What if the grassroots efforts to achieve an SSSI designation for Abney Park were to succeed? The creation of a new SSSI in inner London would signal a protective topography determined by a fly (and its saproxylic allies). The political salience behind the development of indicators, and even affirmative bio-political modes of governmentality, is instructive since the grassroots production of “biological opinion” can serve as a counter-hegemonic tool in the political arena. These ecological indices can carry legal weight in the face of powerful countervailing interests, yet the use of insects or other organisms as “biological sensors” is inseparable from the limits to environmental knowledge and the provisional status of many juridical judgements (see Lakoff, 2016). If *personata* were lost, for instance, along with other indicator species, this might alter measures of ecological value and effectively downgrade the site’s degree of legal protection. The granting of an SSSI designation does not, in any case, provide inviolable protection against damage, erasure, or neglect. Yet some form of legal recognition for Abney Park as an SSSI is only one among a number of possible scenarios. What if the protection of Abney Park were to rest on some kind of bio-security discourse in relation to the control of parakeets, ash dieback, or another newly identified threat? The Oak Processionary moth, *Thaumetopoea processionea*, which is a notifiable pest species in the UK on account of its nest-building larvae that shed poisonous hairs, has recently been recorded elsewhere in the borough (having been accidentally introduced into the Olympic Park), leading to the generalised use of insecticide sprays that would have devastating consequences for invertebrates if repeated in Abney Park. Or what if heritage concerns predominated in future park management so that forms of “aesthetic disorder” such as dead or dying trees were removed (along with the gothic sub-cultural atmosphere of the site)? Or in yet another scenario, the grassroots ecological activism might simply dissipate, and the unique saproxylic assemblages of Abney Park might fall back into obscurity, largely unrecorded, and existing only as a minor footnote in the history of London’s ecology.

The meaning and significance of urban biodiversity is in a state of flux. Crowd-funded environmental initiatives such as the London National Park campaign, underway since 2015, combine donor-based philanthropic urbanism with a veneer of ecological performativity. As if to showcase the glaring disconnect, however, between scientific knowledge and ecological rhetoric, the glossy promotional literature for the proposed London National Park misidentifies a “flagship” saproxylic beetle, reproduced at great magnification across an entire page.²⁹ In contrast, an emphasis on forensic ecologies highlights a combination of taxonomic precision with grassroots forms of care: questions of scientific accuracy, observational practices, and environmental ethics are framed differently. The boundaries of the detectable or recordable are expanded, in

conjunction with an enriched sense of civic engagement, to produce potentially indispensable and counter-hegemonic data sets that include longitudinal insights into environmental change.

The protection of saproxylic invertebrates highlights a productive tension between new materialism – sometimes referred to as “speculative realism” – and critical realism in the fields of biodiversity and conservation biology. The complex space-times of other-than-human nature are not easily subsumed within an anthropocentric epistemological framework, yet cultural and material transformations of nature rest on the decisive agency of the human subject unfolding within the wider dynamics of “deep time.” The survival of our fly forms part of this evolving socio-ecological matrix yet it is of necessity oblivious to our troubled world.

CODA

It is a fine spring morning in early May. I am standing next to the largest of the veteran ash trees in Abney Park with my camera aimed towards a “rot hole” in the hope of catching a glimpse of the hoverfly *Pocota personata*. As I lean my right hand against the tree, to steady the lens under low light conditions, I can feel the contrast between the rough texture of the exposed bark and softer patches of moss. Looking more closely at the tree trunk I can see that it is teeming with life: single files of ants snake their way across the surface, some carrying fragments of leaves or other organic matter, whilst shafts of sunlight reveal small dancing clouds of midges. This living landscape is comprised of an infinite series of intersecting micro-realms where moss meets vision amid a jumble of rot and decay: an endless process of breaking down, circulating, and re-emergence.

ACKNOWLEDGEMENTS

I would like to thank the referees for their insightful comments. Additional feedback was received from Bill Adams, Maan Barua, Yasminah Beebeejaun and Ted Benton. Thanks also to Tristan Bantock and Marcel Ashby for their ERC funded survey work in Abney Park. I'm grateful to Russell Miller for sharing his knowledge of *personata* in Abney and to Tom Simpson for facilitating access to the site. An earlier version of this paper was presented to the AAG New Orleans and the research forms part of my on-going European Research Council funded project entitled *Rethinking Urban Nature*.

ENDNOTES

¹ Agata Marzecova, palaeoecologist, conversation with the author, Dobšiná, Košice, Slovakia (28 July 2017).

² For a full account of the discovery of *Pocota personata* at Abney Park, see Miller (2015). The handful of recent British records hail predominantly from the remaining fragments of “ancient woodland” extending from North Wales, through parts of south-central England to the New Forest, with a few older records scattered across the east of England dating from the 1940s or earlier. For further details on the ecology, distribution and conservation status of *Pocota personata* see Ball and Morris (2014), Bartsch (2009), and Stubbs and Falk (2002).

³ On the ecology of saproxylic invertebrates see, for example, García-López et al. (2016) and Stokland et al. (2012). Many of these insects have highly specialised ecological niches and are extremely vulnerable to habitat disturbance or fragmentation owing to their poor dispersal abilities (see Grove, 2002).

⁴ Maps from the 1840s show that the newly created Abney Park was enclosed by fields on three sides, with its northern boundary marked by a brook that has long been covered over. It is possible that *personata* managed to survive in a few trees left unfelled at the perimeter of the new park or re-colonised the site from surrounding woodlands before they were lost to the expanding city. On the complex socio-ecological characteristics of the site see Gandy (2012).

⁵ Especially difficult saproxylic invertebrates for identification include the fungus gnats, comprising six families in the superfamily Sciaroidea, and the smaller rove beetles from the family Staphylinidae.

⁶ The Site of Special Scientific Interest (SSSI) is the main protective legal measure dating from the 1949 National Parks and Access to the Countryside Act. The equivalent Area of Special Scientific Interest (ASSI) is used in Northern Ireland and the Isle of Man. London now has over 30 SSSIs, including six woodland sites, but the “urban environment” retains a somewhat anomalous position within British nature conservation.

⁷ The original description is contained in Harris (1782, p. 79). On the nominalist origins of natural history see Foucault (1996/2002, p. 144) and for a more recent assessment see Nealon (2017).

⁸ There is growing interest at a national level in France, Italy, Slovenia, and elsewhere for highlighting the presence of rare saproxylic invertebrates at designated Natura 2000 sites under the EU Habitats Directive, which is the key legal instrument within the European arena for the protection of vulnerable biotopes. Martin Speight, entomologist, personal communication with the author (11 February 2018).

⁹ The study of *personata* is difficult not only because of its rarity but also due to its restricted phenology (flight period), with peak emergence recorded during early May.

- ¹⁰ Russell Miller, presentation given to the Abney Park User Group (30 November 2017).
- ¹¹ John Clare's poem "The Hollow Tree" was completed in the 1830s. For further detail on Clare's life and work see Bate (2003).
- ¹² See Strutt (1822, p. 8). Strutt's book comprises a series of vignettes accompanied by his illustrations of noteworthy old trees.
- ¹³ Following negotiation between the developers and planning officials the original scheme went through a series of amendments, most notably a change from six to five storeys in height.
- ¹⁴ The lack of an SSSI designation for Abney Park was specifically cited by the developers as a reason to ignore environmental objections.
- ¹⁵ The author attended the planning committee meeting held at Hackney Town Hall on 3 April 2013.
- ¹⁶ *Perry vs London Borough of Hackney and Newmarket Properties Ltd and Sainsbury's Supermarket Ltd* (2014) EWHC 3499.
- ¹⁷ Natural England was created out of three existing agencies: the Countryside Agency (formed from a merger in 1999 between the Countryside Commission that had existed since 1949 and the Rural Development Commission created in 1988), English Nature (created in 1991 out of the Nature Conservancy Council that had existed since 1973) and the Rural Development Service (dating from 2001 as part of yet another governmental re-organisation).
- ¹⁸ Tristan Bantock, entomologist, site visit to Abney Park with the author (22 February 2018).
- ¹⁹ Joan Childs, London-based dipterist (fly specialist), personal communication with the author (19 May 2016).
- ²⁰ Tristan Bantock, entomologist, personal communication with the author (18 December 2017). See also Bantock and Ashby (2017).
- ²¹ For the classic exposition of forensic entomology, see Méglin (1894/2015). For a contemporary assessment of the field see also Greenberg and Kunich (2002).
- ²² A new grassroots organisation called the Abney Park User Group (APUG) was created in 2012 as a more socially and ecologically orientated forum compared with the existing Abney Park Trust that has managed the site since 1991. APUG has effectively emerged as the principal "public assembly" within which the presence of saproxylic invertebrates on the site are discussed, thereby opening up the esoteric worlds of entomology and taxonomy to wider forms of scrutiny. The author has served as vice chair of this organisation.
- ²³ Joan Childs, London-based dipterist (fly specialist), personal communication with the author (19 May 2016). On the ecological impact of parakeets in London see also Peck et al. (2014).
- ²⁴ In the case of ash, the fungal association is with glomalean mycorrhizas that emerged along with land plants in the Palaeozoic era some 541 to 252 million years ago (see Rackham, 2014).
- ²⁵ For further reflection on the agency of trees, see, for example, Jones and Cloke (2008) and Wohlleben (2015). On the metaphysics of Leibniz in relation to the natural world see also Mercer and Sleight (1995).
- ²⁶ See, for example, Cary Wolfe's contribution to the exchange in Cole et al. (2011) along with more recent interventions from Deutscher (2016) and Richter (2016).
- ²⁷ The classic elaboration is provided by von Uexküll (1934/2010) and is treated in some detail by Agamben (2002/2004), Buchanan (2008), and Parikka (2010).
- ²⁸ On the history and politics of street trees see Dümpelmann (2019) and Rotheram (2010).
- ²⁹ Instead of the red-listed Stag Beetle *Lucanus cervus* the much commoner Lesser Stag Beetle *Dorcus parallelipipedus* is depicted.

ORCID

Matthew Gandy  <https://orcid.org/0000-0002-8478-9808>

REFERENCES

- Agamben, G. (2004). *The open: Man and animal*. In K. Attell (Trans.). Stanford, CA: Stanford University Press. (Original work published 2002)
- Alagona, P. S. (2016). Species complex: Classification and conservation in American Environmental History. *Isis*, 107, 738–761. <https://doi.org/10.1086/689696>
- Alexander, K. N. A. (2004). *Revision of the Index of Ecological Continuity as used for saproxylic beetles* (English Nature Research Reports no. 574). Peterborough, UK: English Nature.
- Ball, S. G., & Morris, R. K. A. (2014). *A review of the scarce and threatened flies of Great Britain. Part 6: Syrphidae* (Species Status 9, 1–130). Peterborough, UK: Joint Nature Conservation Committee.
- Bantock, T., & Ashby, M. (2017). *Abney Park Cemetery. Invertebrate survey 2017*. Final report.
- Bartsch, H. (2009). *Tvavinger: Blomflugor. Diptera: Syrphidae: Eristalinae & Microdontinae*. Uppsala, Sweden: Sveriges lantbruksuniversitet.
- Bate, J. (2003). *John Clare: A biography*. New York, NY: Farrar, Straus, and Giroux.
- Beisel, U., Kelly, A. H., & Tousignant, N. (2013). Knowing insects: Hosts, vectors and companions of science. *Science as Culture*, 22, 1–15. <https://doi.org/10.1080/09505431.2013.776367>
- Benton, T. (1993). *Natural relations: Ecology, animal rights and social justice*. London, UK: Verso.
- Benton, T. (2018). Reconciliation of nature and society. How far can rights take us? In M. Oksanen, A. Dodsworth & S. O'Doherty (Eds.), *Environmental human rights: A political theory perspective* (pp. 47–65). Oxford, UK & New York, NY: Routledge.

- Bingham, N. (2006). Bees, butterflies, and bacteria: Biotechnology and the politics of nonhuman friendship. *Environment and Planning A*, 38, 483–498. <https://doi.org/10.1068/a38436>
- Bois, Y.-A., Feher, M., Foster, H., & Weizman, E. (2016). On forensic architecture: A conversation with Eyal Weizman. *October*, 156, 116–140. https://doi.org/10.1162/octo_a_00254
- Bonta, M. (2010). Ornithophilia: Thoughts on geography in birding. *Geographical Review*, 100, 139–151. <https://doi.org/10.1111/j.1931-0846.2010.00018.x>
- Buchanan, B. (2008). *Onto-ethologies: The animal environments of Uexküll, Heidegger, Merleau-Ponty, and Deleuze*. Albany, NY: State University of New York Press.
- Choy, T. (2011). *Ecologies of comparison: An ethnography of endangerment in Hong Kong*. Durham, NC: Duke University Press.
- Clark, N. (2013). Mobile life: Biosecurity practices and insect globalization. *Science as Culture*, 22, 16–37. <https://doi.org/10.1080/09505431.2013.776366>
- Cloke, P., & Jones, O. (2004). Turning in the graveyard: Trees and the hybrid geographies of dwelling, monitoring and resistance in a Bristol cemetery. *Cultural Geographies*, 11, 313–341. <https://doi.org/10.1191/1474474004eu300oa>
- Cochrane, A. (2012). *Animal rights without liberation: Applied ethics and human obligations*. New York, NY: Columbia University Press.
- Cole, A. (2013). The call of things: A critique of object-oriented ontologies. *Minnesota Review*, 80, 106–118. <https://doi.org/10.1215/00265667-2018414>
- Cole, L., Landry, D., Boeher, B., Nash, R., Fudge, E., Markley, R., & Wolfe, C. (2011). Speciesism, identity politics, and ecocriticism: A conversation with humanists and posthumanists. *The Eighteenth Century*, 52, 87–106. <https://doi.org/10.1353/ecy.2011.0004>
- Davies, J. (2016). *The birth of the Anthropocene*. Berkeley, CA: University of California Press.
- Derrida, J. (1973). *Speech and phenomena, and other essays on Husserl's theory of signs*. D. B. Allison (Trans.). Evanston, IL: Northwestern University Press. (Original work published 1967)
- Derrida, J. (2008). *The animal that therefore I am*. M.-L. Mallet (Ed.), D. Wills (Trans.). New York, NY: Fordham University Press. (Original work published 2006)
- Deutscher, P. (2016). The precarious, the immune, and the thanatopolitical: Butler, Esposito, and Agamben on reproductive biopolitics. In A. Hunt, & S. Youngblood (Eds.), *Against life* (pp. 119–141). Evanston, IL: Northwestern University Press. <https://doi.org/10.2307/j.ctv47w5sc>
- Dümpelmann, S. (2019). *Seeing trees: A history of street trees in New York City and Berlin*. New Haven, CT: Yale University Press.
- Esposito, R. (2008). *Bíos: Politics and philosophy*. T. Campbell (Trans.). Minneapolis, MN: University of Minnesota Press. (Original work published 2004)
- Foucault, M. (2002). *The order of things: On the archeology of knowledge*. A. M. Sheridan Smith (Trans.). London, UK & New York, NY: Routledge. (Original work published 1966)
- Fowles, A. P., Alexander, K. N. A., & Key, R. S. (1999). The Saproxylic Quality Index: Evaluating wooded habitats for the conservation of dead-wood Coleoptera. *The Coleopterist*, 8, 121–141.
- Fox, D. (2004, February 14). Do fruit flies dream of electric bananas? *New Scientist*. Retrieved from <https://www.newscientist.com/article/mg18124345-100-do-fruit-flies-dream-of-electric-bananas/>
- Gabrys, J. (2012). Becoming urban: Sitework from a moss-eye view. *Environment and Planning A*, 44, 2922–2939. <https://doi.org/10.1068/a44671>
- Gandy, M. (2012). Queer ecology: Nature, sexuality and urban heterotopic alliances. *Environment and Planning D: Society and Space*, 30, 727–747. <https://doi.org/10.1068/d10511>
- García-López, A., Galante, E., & Micó, E. (2016). Saproxylic beetle assemblage selection as determining factor of species distributional patterns: Implications for conservation. *Journal of Insect Science*, 16, 1–7. <https://doi.org/10.1093/jisesa/fiew030>
- Gaston, K. J., Charman, K., Jackson, S. F., Armsworth, P. R., Bonn, A., Briers, R. A., Callaghan, C. S., Catchpole, R., Hopkins, J., Kunin, W. E., & Latham, J. (2006). The ecological effectiveness of protected areas: The United Kingdom. *Biological Conservation*, 132, 76–87. <https://doi.org/10.1016/j.biocon.2006.03.013>
- Ginn, F. (2014). Sticky lives: Slugs, detachment and more-than-human ethics in the garden. *Transactions of the Institute of British Geographers*, 39, 532–544. <https://doi.org/10.1111/tran.12043>
- Goode, D. (2014). *Nature in towns and cities*. London, UK: Collins.
- Greenberg, B., & Kunich, J. C. (2002). *Entomology and the law: Flies as forensic indicators*. Cambridge, UK: Cambridge University Press.
- Grove, S. (2002). Saproxylic insect ecology and the sustainable management of forests. *Annual Review of Ecology, Evolution, and Systematics*, 33, 1–33. <https://doi.org/10.1146/annurev.ecolsys.33.010802.150507>
- Häggglund, M. (2008). *Radical atheism: Derrida and the time of life*. Stanford, CA: Stanford University Press.
- Hallmann, C. A., Sorg, M., Jongejans, E., Siepel, H., Hofland, N., Schwan, H., Stenmans, W., Müller, A., Hubert Sumser, H., Hörren, T., Goulson, D., & de Kroon, H. (2017). More than 75 percent decline over 27 years in total flying insect biomass in protected areas. *PLoS ONE*, 12, e0185809. <https://doi.org/10.1371/journal.pone.0185809>
- Harris, M. (1782). *An exposition of English insects, including the several classes of Neuroptera, Hymenoptera, & Diptera, or bees, flies, & libellulae*. London, England: Moses Harris.
- Haslett, J. R. (2007). *European strategy for the conservation of invertebrates*, (Nature and Environment No. 145). Strasbourg, France: Council of Europe Publishing.
- Heink, U., & Kowarik, I. (2010). What are indicators? On the definition of indicators in ecology and environmental planning. *Ecological Indicators*, 10, 584–593. <https://doi.org/10.1016/j.ecolind.2009.09.009>

- Hinchliffe, S., & Whatmore, S. (2006). Living cities: Towards a politics of conviviality. *Science as Culture*, 15, 123–138. <https://doi.org/10.1080/09505430600707988>
- Hölzl, R. (2010). Historicizing sustainability: German scientific forestry in the eighteenth and nineteenth centuries. *Science as Culture*, 19, 431–460. <https://doi.org/10.1080/09505431.2010.519866>
- Ingram, M. (2011). Fermentation, rot, and other human-microbial performances. In M. Goldman, & M. D. Turner (Eds.), *Knowing nature: Conversations at the intersection of political ecology and science studies* (pp. 99–112). Chicago, IL: University of Chicago Press.
- Iveson, R. (2017). Being without life: On the trace of organic chauvinism with Derrida and DeLanda. In R. Braidotti, & R. Dolphijn (Eds.), *Philosophy after nature* (pp. 179–194). London, UK: Rowman & Littlefield.
- Jones, O., & Cloke, P. (2008). Non-human agencies: Trees in place and time. In C. Knappett, & L. Malafouris (Eds.), *Material agency: Towards a non-anthropocentric approach* (pp. 79–96). New York, NY: Springer.
- Kirksey, E., & Helmreich, S. (2010). The emergence of multispecies ethnography. *Cultural Anthropology*, 25, 545–576. <https://doi.org/10.1111/j.1548-1360.2010.01069.x>
- Kirksey, E., Schuetze, C., & Helmreich, S. (2014). Tactics of multispecies ethnography. In E. Kirksey (Ed.), *The multispecies salon* (pp. 1–24). Durham, NC: Duke University Press.
- Kowarik, I., Buchholz, S., von der Lippe, M., & Seitz, B. (2016). Biodiversity functions of urban cemeteries: Evidence from one of the largest Jewish cemeteries in Europe. *Urban Forestry and Urban Greening*, 19, 68–78. <https://doi.org/10.1016/j.ufug.2016.06.023>
- Lakoff, A. (2016). The indicator species: Tracking ecosystem collapse in arid California. *Public Culture*, 28, 237–259. <https://doi.org/10.1215/08992363-3427439>
- Leshem, N. (2015). ‘Over our dead bodies’: Placing necropolitical activism. *Political Geography*, 45, 34–44. <https://doi.org/10.1016/j.polgeo.2014.09.003>
- Lorimer, J. (2016). Rot. *Environmental Humanities*, 8, 235–239. <https://doi.org/10.1215/22011919-3664333>
- Lowood, H. E. (1990). The calculating forester: Quantification, cameral science, and the emergence of scientific forestry management. In T. Frängsmyr, J. L. Heilbron, & R. E. Rider (Eds.), *The quantifying spirit in the 18th century* (pp. 315–343). Berkeley, CA: University of California Press.
- Maddrell, A., & Sidaway, J. D. (Eds.) (2010). *Deathscapes: Spaces for death, dying, mourning and remembrance*. Aldershot, UK: Ashgate.
- Marder, M. (2013). *Plant thinking: A philosophy of vegetal life*. New York, NY: Columbia University Press.
- Méglin, J.-P. (2015). *Le faune des cadavres: Application de l'entomologie à la médecine légale*. Paris, France: Klincksieck. (Original work published 1894)
- Mercer, C., & Sleigh, R. C. (1995). Metaphysics: The early period to the Discourse on Metaphysics. In N. Jolley (Ed.), *The Cambridge Companion to Leibniz* (pp. 67–123). Cambridge, UK: Cambridge University Press.
- Miller, R. (2015). *Pocota personata* returns to London. *The London Naturalist*, 94, 88–101.
- Mishler, B. D. (1999). Getting rid of species? In R. A. Wilson (Ed.), *Species: New interdisciplinary essays* (pp. 307–316). Cambridge, MA: The MIT Press.
- Mitchell, R. (2013). *Experimental life: Vitalism in Romantic science and literature*. Baltimore, MD: Johns Hopkins University Press.
- Nealon, J. T. (2017). The archaeology of biopower: From plant to animal life in *In the order of things*. In V. W. Cisney, & N. Morar (Eds.), *Biopower: Foucault and beyond* (pp. 138–157). Chicago, IL: Chicago University Press.
- Negarestani, R. (2010). Undercover softness: An introduction to the architecture and politics of decay. In R. Mackay (Ed.), *Collapse VI: Geophilosophy* (pp. 379–430). Falmouth, UK: Urbanomic.
- Parikka, J. (2010). *Insect media. An archaeology of animals and technology*. Minneapolis, MN: University of Minnesota Press.
- Pavan, M. (1986). *A European cultural revolution: The Council of Europe's Charter on Invertebrates*. Strasbourg, France: Council of Europe.
- Paxson, H. (2014). Microbiopolitics. In E. Kirksey, C. Schuetze, & S. Helmreich (Eds.), *The multispecies salon* (pp. 115–121). Durham, NC: Duke University Press.
- Peck, H. L., Pringle, H. E., Marshall, H. H., Owens, I. P. F., & Lord, A. M. (2014). Experimental evidence of impacts of an invasive parakeet on foraging behavior native birds. *Behavioral Ecology*, 25, 582–590. <https://doi.org/10.1093/beheco/aru025>
- Porter, T. M. (2015). The flight of the indicator. In R. Rottenburg, S. E. Merry, P. Sung-Joon, & J. Mugler (Eds.), *The world of indicators: The making of governmental knowledge through quantification* (pp. 34–55). Cambridge, UK: Cambridge University Press.
- Rackham, O. (2014). *The ash tree*. Toller Fratrums, Dorset: Little Toller.
- Reckhaus, H.-D. (2017). *Why every fly counts: A documentation about the value and endangerment of insects*. New York, NY: Springer.
- Richter, H. (2016). Beyond the ‘other’ as constitutive outside: The politics of immunity in Roberto Esposito and Niklas Luhmann. *European Journal of Political Theory*. Advance online publication. <https://doi.org/10.1177/1474885116658391>
- Romanillos, J. S. (2015). Mortal questions: Geographies on the other side of life. *Progress in Human Geography*, 39, 560–579. <https://doi.org/10.1177/0309132514545908>
- Rotheram, I. (2010). Thoughts on the politics and economics of urban street trees. *Arboricultural Journal: The International Journal of Urban Forestry*, 33, 69–75. <https://doi.org/10.1080/03071375.2010.9747596>
- Ruxton, G. D., Sherratt, T. D., & Speed, M. P. (2004). *Avoiding attack: The evolutionary ecology of crypsis, warning signals, and mimicry*. Oxford, UK: Oxford University Press.
- Sahlins, P. (1994). *Forest rites. The war of the demoiselles in nineteenth-century France*. Cambridge, MA: Harvard University Press.
- Scott, J. C. (1998). *Seeing like a state: How certain schemes to improve the human condition have failed*. New Haven, CT: Yale University Press.
- Sebal, W. G. (2002). *Austerlitz*. A. Bell (Trans.). London, UK: Penguin. (Original work published 2001)

- Siddig, A., Ellison, A., Ochs, A., Villar-Leeman, C., & Lau, M. (2016). How do ecologists select and use indicator species to monitor ecological change? Insights from 14 years of publication in *Ecological Indicators*. *Ecological Indicators*, 60, 223–230. <https://doi.org/10.1016/j.ecolind.2015.06.036>
- Soper, K. (1995). *What is nature? Culture, politics, and the non-human*. Oxford, UK: Blackwell.
- Speight, M. (1989). *Saproxyllic invertebrates and their conservation* (Nature and Environment Studies No. 42). Brussels, Belgium: Council of Europe.
- Srinivasan, A. (2017, September 7). The sucker! The sucker! *London Review of Books*. Retrieved from <https://www.lrb.co.uk/v39/n17/amia-srinivasan/the-sucker-the-sucker>
- Stamouli, N., & Bouras, S. (2013, January 11). Greeks raid forests in search of wood to heat homes. *Wall Street Journal*. Retrieved from <https://www.wsj.com/articles/SB10001424127887324442304578232280995369300>.
- Stokland, J., Siitonen, J., & Jonsson, B. (2012). *Biodiversity in dead wood (ecology, biodiversity and conservation)*. Cambridge, UK: Cambridge University Press. <https://doi.org/10.1017/CBO9781139025843>
- Strutt, J. G. (1822). *Sylva Britannica; or, portraits of forest trees, distinguished for their antiquity, magnitude, or beauty. Drawn from nature and etched by Jacob George Strutt*. London, UK: J G Strutt.
- Stubbs, A., & Falk, S. J. (2002). *British hoverflies*. London, UK: British Entomological and Natural History Society.
- Tavares, P. (2014). Nonhuman rights. In Forensic Architecture (Ed.), *Forensis: The architecture of public truth* (pp. 553–572). Berlin, Germany: Sternberg Press.
- van den Born, R. J. G., Arts, B., Admiraal, J., Beringer, A., Knights, P., Molinario, E., Polajnar Horvat, K., Porras-Gomez, C., Smrekar, A., Soethe, N., Vivero-Pol, J. L., Ganzevoort, W., Bonaiuto, M., Knippenberg, L., & De Groot, W. T. (2017). The missing pillar: Eudemonic values in the justification of nature conservation. *Journal of Environmental Planning and Management*, 61, 841–856. <https://doi.org/10.1080/09640568.2017.1342612>
- von Uexküll, J. (2010). *A foray into the worlds of animals and humans*. J. D. O'Neill (Trans.). Minneapolis, MN: University of Minnesota Press. (Original work published 1934)
- Vidal, F., & Dias, N. (2016). Introduction: The endangerment sensibility. In F. Vidal, & N. Dias (Eds.), *Endangerment, biodiversity, and culture* (pp. 1–38). New York, NY: Routledge.
- Weizman, E. (2014). Introduction: Forensis. In Forensic Architecture (Ed.), *Forensis: The architecture of public truth* (pp. 9–32). Berlin, Germany: Sternberg Press.
- Weizman, E. (2017). *Forensic architecture: Violence at the threshold of detectability*. New York, NY: Zone Books.
- Wohlleben, P. (2015). *Das geheime Leben der Bäume*. Munich, Germany: Ludwig.
- Yusoff, K. (2012). Aesthetics of loss: Biodiversity, banal violence and biotic subjects. *Transactions of the Institute of British Geographers*, 37, 578–592. <https://doi.org/10.1111/j.1475-5661.2011.00486.x>

How to cite this article: Gandy M. The fly that tried to save the world: Saproxyllic geographies and other-than-human ecologies. *Trans Inst Br Geogr*. 2019;44:392–406. <https://doi.org/10.1111/tran.12281>