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Multinatural geographies for the Anthropocene

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Abstract
The recent diagnosis of the Anthropocene represents the public death of the modern understanding of Nature removed from society. It also challenges the modern science-politics settlement, where natural science speaks for a stable, objective Nature. This paper reviews recent efforts to develop 'multinatural' alternatives that provide an environmentalism that need not make recourse to Nature. Focusing on biodiversity conservation, the paper draws together work in the social and natural sciences to present an interdisciplinary biogeography for conservation in the Anthropocene. This approach is developed through an engagement with the critiques of neoliberal natures offered by political ecology.

Keywords
Anthropocene, biodiversity, more-than-human geography, multinaturalism, Nature

I Introduction

The Nobel-prize-winning atmospheric chemist Paul Crutzen (2002) has argued that our planet has entered a new era – the Anthropocene – since a threshold has been crossed now that a single species has become an earth-changing force. This term has begun to gain traction among high-profile commentators advocating for the reorientation of environmentalism (e.g. Latour, 2010). Although we might contest its epochal diagnosis, this claim is significant as it represents a very public challenge to the modern understanding of Nature[1] as a pure, singular and stable domain removed from and defined in relation to urban, industrial society. This understanding of Nature has been central to western environmental thought and practice. Its purported end has prompted much doubt, debate and soul-searching among environmentalists, who have responded with both romantic antimodernism (McKibben, 1990) and an escalation of technocratic and market environmentalism (Lynas, 2011) (see Wapner, 2010). Life without Nature is proving confusing and there is a widely shared recognition of the need for new ways of thinking.

Here geography comes to the fore. The discipline has a distinguished history when it comes to critiquing Nature. As readers of this journal will be aware (Bakker, 2010; Braun, 2008) geographers and other social scientists have been challenging the 'politics of Nature' since well before the diagnosis of the Anthropocene. Indeed, many would agree that the Nature whose death it heralds never really existed; there has never been a world without us (see Castree, 2012). A mature and differentiated

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body of work now exists for conceiving and conducting environmental politics without making recourse to Nature. In this paper I have three aims. The first is to review recent developments in one strand of this thinking that develops 'multinatural' and 'more-than-human' approaches to biogeography. I take the term 'multinatural' from Latour (2004) for whom it describes both the multiple trajectories along which any ecology might evolve and the various ways in which they can be sensed, valued and contested. The second aim is to bring this strand of multinatural thinking into conversation with cognate developments in the environmental sciences to present an interdisciplinary biogeography for the Anthropocene. The third aim is to develop this biogeography through an engagement with the critiques of neoliberal natures offered by a vibrant strand of political ecology.

This paper will focus on biodiversity conservation, an exemplary field for developing multinatural political ecologies. Biodiversity is a neologism that was coined at the end of the 1980s by the architects of conservation biology – a self-declared 'crisis discipline' (Soule, 1985) that sought to catalyse public support and provide the scientific expertise for biodiversity conservation (Takacs, 1996). In some ways biodiversity advocates have been incredibly successful. Nearly 200 nations have ratified the Convention on Biological Diversity (CBD). Conservation biologists and their NGOs are copious and are in good health. There is an extensive and growing infrastructure for monitoring ecological change, significant tracts of land have been designated for conservation and ex-situ zoos, herbaria and genetic repositories abound. However, when signatory governments gathered in Nagoya in 2010 for the International Year of Biodiversity to report on progress towards CBD targets, the story was of continued declines and the persistence of inequalities in the social benefits of both biodiversity use and conservation.

For biodiversity advocates (and their critics) the paradoxical flourishing of their discipline and the failure to meet the 2010 targets has prompted critical reflection (Rands et al., 2010). Diagnoses of the causes of this failure are damning and too diverse to summarize here (see Hirsch, 2010). This paper examines one important strand of this discussion, where recognition of the Anthropocene challenges prevalent and powerful understandings of biodiversity as Nature – a pure and timeless collection of objects, best removed from Society. For an emerging body of conservation biologists and social scientists the Anthropocene demands fresh approaches to biodiversity conservation that need not make recourse to Nature. Biodiversity conservation is a highly differentiated collection of practices. In identifying general trends I run the risk of masking this diversity. I apologize for this and hope readers appreciate why it is necessary within the confines of this paper. Where possible I have tried to flag important differences in conservation theory and practice to avoid tarring all conservationists with the same brush.

The paper is divided into three sections. The first two offer materials for a multinatural biogeography by reviewing new ontologies and new relationships between science and politics for the Anthropocene. The third section brings the resulting framework into conversation with critiques of capitalist ecology. After working through these developments in relation to biodiversity conservation, the paper concludes by reflecting on their general implications for environmental geographies in the Anthropocene.

II Multinatural ontologies

Environmental geographers and other social scientists have been returning to questions of ontology in their analyses. There is now a diverse array of non-deterministic and non-dualistic materialisms that circumvent the realist-relativist impasse that plagued debates

between the social and natural sciences in the 1990s (for reviews, see Anderson and Wylie, 2009; Bakker and Bridge, 2006). In this section I focus on just one of these, which emerges from recent engagements with the biophilosophies of Bruno Latour, Gilles Deleuze and Donna Haraway. Jane Bennett (2010) has termed this approach a 'vital materialism', while Bruce Braun (2008) identifies a common interest in 'inventive life'. I will outline the main characteristics of this approach that resonate with new approaches in conservation biology and biogeography.

A vital materialist ontology in environmental geography has been strongly influenced by Latour's and Haraway's famous critiques of the modern Nature-Society dualism. Challenging the purification of the world into two distinct categories, they identify and advocate ontologies comprising 'hybrid' and 'cyborg' forms; mixtures of human and non-human components. Nature, Society and a range of other identities have been rethought as relational achievements, power-laden constructions emergent from 'assemblages' (see Dewsbury, 2011) of interacting 'actants' – not all of whom are human or alive. Geographers now describe 'more-than-human' (Whatmore, 2006) and 'multinatural' (Bingham and Hinchliffe, 2008) worlds, characterized by lively processes and impure forms, co-existing in inhabited landscapes. These relational ontologies can be linked to work in conservation biology that recognizes the ubiquity and importance of 'human-dominated' landscapes in the Anthropocene, offering 'countryside biogeographies' (Daily et al., 2001) comprising 'novel ecosystems' (Hobbs et al., 2006). As Daily et al. (2001: 2) put it, 'from both purely academic and practical perspectives, ecologists should be able to say more than "weedy" about the biota that may survive human impacts'.

These relational ontologies challenge the privileged place of the human subject in accounts of environmental change. For example, in her recent work on 'companion species', Haraway (2008) extends Latour's (1993) claim that 'we have never been modern' to argue that 'we have never been human'. She traces the materialities of interspecies interaction – including genetic, microbial, haptic, digestive and ecological connections – to demonstrate the ontological impossibility of extracting a human body, let alone intentional mind, from the messy relations of the world. Haraway affirms the organism as the principal unit for her posthumanist analysis. She draws on and develops a rich and interdisciplinary body of work in animal studies that has opened up the category 'animal' (Derrida and Mallet, 2008) granting 'positive ontological difference' (Bingham, 2006: 492) to the entities this label subsumes. Recent work in this vein by animal geographers examines the 'beastly places' (Philo and Wilbert, 2000) and interspecies relations performed by an array of animal bodies (e.g. Bear and Eden, 2011; H. Lorimer, 2006; Lulka, 2004). This work has yet to make connections with the well-established and growing body of cognate animal science that explores the implications of animal behaviour and the contested notion of 'animal cultures' (Laland and Galef, 2009) for key themes in biodiversity conservation such as adaptation in fragmented landscapes, responses to exploitation and disturbance, captive breeding and reintroductions (Gosling and Sutherland, 2000).

Other work in 'more-than-human' geography has taken analysis in a less familiar direction by questioning the ontological coherence and preeminence of the organism as the foundational unit for explanation and analysis. Drawing on Deleuze and Guattari's (1987) concept of the rhizome it challenges prevalent modes of thinking configured around bounded interacting bodies and offers ecologies characterized by flows above, through and below the level of the organism. For example, geographers have developed microbial and biochemical ontologies of 'interdependence' (Smith et al., 2007) to explore the 'corporeal generosity' (Diprose,

2002) of organic bodies living 'in the midst of things' (Bingham, 2006) – ranging from asbestos (Gregson et al., 2010) to anti-depressants (McCormack, 2007). Nigel Clark (2011) has documented the 'radical asymmetry' of geological processes and their extended and volatile consequences for social life. Strands of this work resonate with Margulis' radical theory of symbiogenesis, which traces the 'extreme genetic fluidity' of bacteria and their promiscuous capacities to 'merge transiently or permanently with larger organisms' (Margulis and Sagan, 2007: 31), challenging biologies fixed on beings that are 'big-like-us' (Hird, 2009) and accounts of evolution through genealogical filiation.

This focus on fluidity offers new ways of thinking about time. Here geographers have sought to develop Henri Bergson's critique of linear, cyclical, reversible and orderly temporalities to offer a range of concepts that affirm the creative, non-linear, irreversible and open-ended nature of time (Massey, 2005). This approach provides a theory of time without linear trajectories of either acceleration or decay from a premodern to a modern epoch. Instead appeals are made for a pluralistic understanding of time that is open to its multiple rhythms, events and trajectories over different scales depicting a world composed of a multiplicity of forces and trajectories with the potential for differentiation. The coming into being of humans and non-humans involves immanent processes, not the revelation of universal and transcendent forms (Kearns, 2003). These multinatural approaches offer a world of difference, whose forms and trajectories cannot be known in advance. Drawing on Deleuze's (1994: 222) proposal that 'difference is not diversity. Diversity is given. Difference is that by which the given is given', the focus shifts from the diversity of essential, existing beings to the processes of becoming – among non-humans, as well at the interface of people and wildlife (Lulka, 2009b).

As several authors have noted, this concern for immanence resonates with the long-standing interest in non-equilibrium, complexity and uncertainty across the physical and life sciences (e.g. De Landa, 2002). In ecology and biogeography, ideas of nature in balance have long been challenged by non-equilibrium ecology (see Zimmerer, 2000, for a review), characterized by forms and processes with multiple and often divergent trajectories, where single events can have significant and unforeseeable consequences. This is evidenced in conservation biology in recent work on landscape fluidity or 'the ebb and flow of different organisms within a landscape through time' (Manning et al., 2009: 193). Emerging in the context of a growing awareness of ecological adaptation to climate change, this work eschews models of linear succession and categorizations of stable climax communities to argue that landscapes are forever 'chasing moving targets' (p. 194) and do not stand still. We can find surprising resonances of Massey's critique of unilinear and declensionist models of environmental change in recent work in conservation biogeography. For example, Whittaker et al. (2005) criticize the tendency to divide environmental history into two distinct periods as 'simplistic', while Kathy Willis and other palaeoecologists have been doing important work tracing the complex and persistent signatures of past human activities in conservation territories popularly figured as pristine (Willis and Birks, 2006).

These interdisciplinary approaches to form, agency and time have important implications for thinking space. Long regarded as the fixed and inert backdrop to the world-changing dynamics of time, the two are increasingly being rethought in conjunction as spatiality; the material nexus of history and an active constituent of political ecological processes (Massey, 2005). Here there is a growing interest in the networked, fluid and rhizomatic spatialities that result from diverse human and non-human ethologies and mobilities (Murdoch, 2006). For example, recent explorations of urban wildlife and invasive species have sought to circumvent

modern geographies of Nature that efface non-human life from urban areas or map it to national territories. Instead this work challenges the utility of distinctions like alien-native species (Warren, 2007) or wild-domestic (Cassidy and Mullin, 2007), acknowledging the more-than-human spatialities performed by people, plants and animals in 'living cities' (Hinchliffe and Whatmore, 2006) and global networks (Clark, 2002). Accounts of these lively spatialities are strongly influenced by Deleuze's concept of assemblages, which offers a flat ontology of human and non-human entities whose connections and dynamics spatialize and order the world (Marston et al., 2005). Similar networked and fluid spatialities also characterize recent work in conservation biogeography and restoration ecology that anticipates the non-human mobilities that will accompany ecological adaptations to climate change. For example, work on 'ecological networks' (Jongman et al., 2004), 'landscape permeability' (Singleton et al., 2002), 'assisted migration' (Hewitt et al., 2011) and 'landscape fluidity' (Manning et al., 2009) challenge fixed territories for biodiversity.

Deploying similar spatial registers, environmental historians and biogeographers have begun to trace how the connections and space-time compression associated with vectors of globalization have enabled the proliferation of 'global swarmers' (Bright, 1998). This collection of cosmopolitan flora and fauna has opened up a 'New Pangaea' (Rosenzweig, 2001) through a networked biogeography that effaces continental boundaries, links isolated island biogeographies and reorganizes the conditions in which life has and will evolve. For some conservation biologists the Anthropocene is also a 'homogecene' (Olden, 2006) in which ecological globalization creates a 'global anthropogenic blender' resulting in the 'convergence' of emerging novel ecosystems and the erasure of established forms of genetic, species and habitat diversity. Here the biopolitical story of human history is one of the systematic and inadvertent domestication, disciplining and extermination of difference (Crosby, 2004). Dissenting voices have begun to question this account and explore the possibility that the forms and relations emerging in the New Pangaea might be more differentiated. Here ecological globalization might also act as a tool for differentiation producing cosmopolitan hybrids and nurturing threatened natives (Davis et al., 2011). This debate centres on the location and nature of the difference being compared and the scale at which the comparison takes place (Sax and Gaines, 2003).

III Multinatural sciences and politics

In his recent work on multinaturalism and the Anthropocene, Latour (2004, 2010) notes how these immanent, hybrid and discordant ontologies pose a series of crises to modern science-politics relations. He identifies a shared and growing appreciation across strands of the social and the ecological sciences of the deficiencies of modern natural science and the political settlement that it has engendered where scientists speak for Nature; providing facts and politics speaks for society, which must adapt to the facts. Instead, as Bingham and Hinchliffe explain:

> Things are a little different now. Nature … seems to have stopped working so well. It no longer offers a stable category to which objects can be intuitively allocated … It is neither a source of smooth facts which seem to speak for themselves … nor an unchanging ground on which one might rely. Nature does not form a rallying site where an agreeable collective might be formed … or serve as an external arbiter which could speed matters along past due process. (Bingham and Hinchliffe, 2008: 83)

When Nature was conceived as pure, singular and in balance, conservation biology could be guided towards and audited by a set of transcendent archetypes – species, habitats, ecosystems, etc. The authenticity or truth of a landscape

could be objectively measured by its divergence from a fixed form, which provided the benchmark for (sometimes autocratic) conservation management (Adams, 2003). As several critics have observed, non-equilibrium political ecology with biodiversity as a multiplicity of immanent and discordant harmonies poses far-reaching challenges to this model of conservation (Botkin, 1990; Sullivan and Homewood, forthcoming).

Faced with the end of Nature, geographers have avoided popular tendencies to retreat or remodernize. Instead, figures like Bingham and Hinchliffe have joined Latour and a collection of scholars looking to develop multinatural alternatives. Among this group there is a growing sense that it is not analytically, ecologically or politically sufficient just to identify hybridity, relationality and vitality (Braun, 2008; Whatmore, 2002). The important practical and theoretical questions that are posed by the end of Nature are also epistemological and political. When one can no longer make recourse to Nature, what forms and trajectories of difference matter? Who decides? On what grounds? And through what processes? Attempts to answer these questions can be differentiated by their theoretical commitments and empirical foci, offering concepts and methods that span the lab and field sciences, in the global North and South.

In relation to biodiversity, important strands of work in the social and natural sciences build from a vital materialist ontology to propose political ecologies that are sensitive to non-human difference – and the multiple ways in which it might evolve and be governed. This pluralizing of the forms, spaces and times for biodiversities is interwoven with a critical assessment of the epistemological and political techniques through which they are made present and disputed. For animal geographers this shift towards a vital ontology redistributes political agency beyond the human subject (Hobson, 2007) to recognize the lived experiences of animals living in close proximity to human spaces and economies (e.g. Lulka, 2009a; Miele, 2011). For those of a more ecological orientation, multinaturalism redefines Foucault's concept of biopolitics as experimental processes of living with non-human difference in which diverse and uncertain non-human agencies threaten and are threatened by particular, contemporary human activities (Buller, 2008; Hinchliffe and Bingham, 2008; Holloway et al., 2009). Work at the interface of STS, environmental ethics and more-than-human geography has become increasingly normative in advocating modes of relating (Bingham, 2008). Building from detailed ethnographic investigations, it traces the 'ontological politics' (Mol, 1999) through which the flux of more-than-human life comes to be realized as biodiversity and documents and proposes alternative modes of relating that do not make recourse to Nature. As I will discuss in more detail below, this normative turn differs markedly from long-standing concerns for justice in the political ecology of nature conservation.

For example, Haraway draws on the work of ecofeminist philosophers like Chris Cuomo (1998) and Val Plumwood (2002) to propose an ethos of 'flourishing' to guide human-wildlife relations. Cuomo modifies Aristotle's transcendent, humanist model of flourishing to propose a more-than-human account that values the immanent tendencies and affective force – or what she terms the 'dynamic charm' (Cuomo, 1998: 71) of individual non-humans and the aggregates they compose. Haraway (2008) reframes dynamic charm as a sense of 'response-ability', which describes both an ability to adapt to and resist change and the ways in which such adaptations draw others into a relationship. The neovitalism and concern for affect in appeals for flourishing are echoed in recent work by geographers advocating 'lively biogeographies' (Lorimer, 2010a), 'convivial' politics toward wildlife (Hinchliffe and Whatmore, 2006) and an ethics of 'movement' and 'extension' (Lulka, 2004, 2008) in

nature conservation. Enthusiasms for inventive life can be detected (in more tempered form) in appeals for a 'careful' political ecology (Hinchliffe, 2008), 'emplaced ecologies' of 'responsive cohesion' (Sullivan, 2010), and relationships of 'friendship' (Bingham, 2006) and 'accommodation' (Barker, 2008) in human-plant-insect relationships. In contrast, Clark and Morton document far less exuberant and affirmative modes of relating in their discussions of the 'dark ecologies' (Morton, 2007) and 'radical asymmetries' (Clark, 2011) of lethal and volatile non-human processes, while Yusoff (2009, 2010), in her work on the 'political aesthetics' of climate change and biodiversity loss, reflects on the potential of a sensibility of mourning for making sense of and acting in the face of extinction.

This is a rich and variegated field of research and there are important differences between the modes of relating proposed to date. These differences are driven in part by the natures of the entities and relations being described, the distribution of agencies within the assemblages in which they are encountered and the anticipated consequences to privileged human and non-human actors of letting them run their course. They are also configured by the differing philosophers deployed – from the exuberance of Deleuze to the catastrophism of Bataille. Nonetheless, there are important similarities that can be identified; namely, their shared commitments to: (1) an inhabited world of porous and affective bodies connected by rhizomatic assemblages; (2) an immanent, indeterminable future, haunted by the past; (3) active experimentation and anticipatory interventions that (to differing degrees) seek to take responsibility for the future; (4) an epistemological pluralism underpinning a knowledge politics comprising multiple forms of human and non-human expertise; and (5) a methodological commitment to ethnographic inquiry; including the emerging field of multispecies ethnography (Kirksey and Helmreich, 2010). In the sections that follow I review some of the important contributions of this work for developing multinatural sciences and politics for biodiversity conservation in the Anthropocene.

In its popular theoretical definition, biodiversity is global and panoptic, comprising 'the variability among living organisms from all sources', including 'diversity within species, between species and of ecosystems' (Anon, 1992). However, conservation in practice requires accessible ontological units for cutting up the flux of biological diversity. As Maclaurin and Sterelny (2008) detail, there are multiple ways of making such cuts – as genotype, as species, as phenotype, as ecosystem, as ecological functions, for example. Some of these seem intuitive but none is essential. Maximizing some is detrimental to others. The same is true for the classification of biogeographical areas (Whittaker et al., 2005). Ethnographic work by multinatural political ecologists has produced a series of critical investigations of the ontological politics through which certain actors deploy such units to 'make Nature present' (Hinchliffe, 2008).

Here science in general and conservation in particular are presented not as disembodied and dispassionate observation but as a skilled, affective and multisensory ecology of practices in which scientists and those they study 'learn to be affected' in lab and field encounters (Lorimer, 2008). This involves multisensory, bodily knowledges described as modes of 'atunement' (Wylie, 2005). This approach draws attention to the assemblages of technologies, texts, institutions, classifications and standards required by scientists to make multiple natures present (Bowker, 2000; Robbins, 2001). Drawing on complementary work in non-representational theory (Thrift, 2007), these ethnographic inquiries display a growing willingness to consider the affective energies of conservationists. Here rationality is figured not as the absence of emotional engagement (the disembodied mind triumphing over the unruly body), but

as one particular 'affective logic' (Carter and McCormack, 2006) that guides human/non-human interactions. This work draws attention to the wide array of emotions fundamental to scientific practice, including joy, enchantment, anger, love, hope and fear (to name but a few) (Cousins et al., 2009; Lorimer, 2010c; Milton, 2002). Empirical accounts have begun to map their implications for the scope and conduct of biodiversity conservation (Lorimer, 2006, 2009).

Interest then turns to what happens when such knowledges become performative – anticipating and ordering the worlds they purport to represent. As a 'crisis discipline' conservation biology has largely been concerned with preventing the extinction of accessible forms of difference. For historical and pragmatic reasons biodiversity conservation has focused on extant populations of species, especially wild, rare species. Cutting up biodiversity as species offers conservationists several advantages. Species provide accessible units for disaggregation, identification and classification – especially of popular groups of plants and animals. They can be named, monitored and subjected to accountable management action plans. Species also provide intuitive, charismatic icons for fundraising and campaigning. However, from the perspective of a biogeography concerned for non-human difference, there is a host of problems associated with choreographing conservation this way. The species concept does not work well with the majority of less charismatic organisms that are not easily individuated. A species ontology can lead to a 'typological essentialism' (Ansell-Pearson, 1999) that subsumes the differences of individuals to the identity of the species and renders them equivalent. This is especially problematic when species and habitats are understood as fungible units in emerging markets for biodiversity offsets and trading. Conservation focused on existing species (and habitats) risks 'rendering the present eternal' (Bowker, 2005), fixing biodiversity as the collection of existing beings, or reducing them to stages in a teleology of ecological succession, forgetting that 'species are the result of biogeographic, ecological and evolutionary processes, not the stages of them' (Ansell-Pearson, 1999: 165). These problems are well known and much debated among conservationists (see, for example, Wilson, 1992).

In the context of such uncertainty as to what nature is and what it might become, the idea of experimentation is currently receiving a great deal of attention among social scientists (e.g. Latour, 2011), including those concerned with biodiversity. For example, in his work on ecological restoration Matthias Gross (2003, 2010a) offers an experimental epistemology that need not make recourse to the certainties of Nature. Drawing on Rheinberger (1997), he defines an experiment as 'a trial or a venture into the unknown' (Gross, 2010a: 4) and argues that 'what makes the physical, technical and procedural basis for an experiment work is that it is deliberately arranged to generate surprises' (p. 5). Through his fieldwork in Germany and the USA, he presents modes of 'real-world experimentation' for political ecology characterized by the 'proceduralisation of contingency' (Gross, 2010b: 69). Similar experimental epistemologies are presented by Hinchliffe and Whatmore (2006) in their work on vernacular urban ecologies in the UK and by Kezia Barker (2008) in her explorations of the management of invasive species in New Zealand.

Developing this experimental ethos to address the practices of anticipation in environmental governance, Braun (2007) and Hinchliffe (2008) both welcome 'speculative' and 'future-invocative' forms of biopolitics that do not foreclose inventive life. These modes of biopolitics depart from the practices associated with traditional nature conservation. Indeed Braun goes so far as to argue that:

> to the extent that socio-nature names an open rather than a closed field, eco-politics must be orientated

> not towards conservation, since the world never holds still, but to the possibilities and consequences of a 'new earth' and a 'new humanity' that is still to come. (Braun, 2006: 219)

Taken this way, and excusing the rather binary future offered, biodiversity conservation becomes something of a contradiction in terms, the implicit normativity being an admonishment of actions that constrain the lively potential of evolving ecologies. This reading would perhaps be unfair and, elsewhere, Braun (2008) cautions against any naive celebration of vital powers and fluidity. I will return to this theme in more detail below.

These experimental epistemologies and associated modes of biopolitics echo shifts in the discourse of conservation biology as the discipline adapts to the uncertainties associated with climate change and the Anthropocene more generally. Sutherland (2002) has described a growing 'openness' in conservation management, while Wain (2004) welcomes a shift from 'recovery' to 'discovery' conservation. There is a growing sense that the Anthropocene represents one global, accidental (and poorly designed experiment) and that, on a more local scale, novel ecosystems could represent 'ideal natural experiments' (Marris, 2009: 451) for tracking ecological adaptation to anthropogenic change. This enthusiasm for experimental and emergent futures, rather than past archetypes, is displayed most spectacularly in the growing ambition of ecological restoration and the wider enthusiasm for 'rewilding' (Fraser, 2009; Marris, 2011). In parts of North America and western Europe, conservationists advocate and implement the (re)introduction of keystone herbivores and their predators to catalyse ecological processes and create diverse and resilient landscapes. Although these make discursive reference to past epochs they are often geared towards anticipating emergent futures (Lorimer and Driessen, 2012). This shift poses fundamental problems to the audit culture of contemporary conservation which is configured around delivering action plan targets for species populations and habitat integrity.

These new, experimental modes of conservation demand new political tools for deciding among multiple biodiversities or multinatural futures. Conservation biology is an archetypal 'postnormal' discipline, operating in situations of 'crisis' with high levels of uncertainty and dependent on an 'extended peer community' many of whom are not scientific experts (Francis and Goodman, 2010). Accordingly, there is a well-established recognition among conservationists of the importance of 'public engagement' and 'citizen science' (Robertson and Hull, 2001) – at least when these citizens and publics are White and western. Much of this endeavour has adhered to a 'deficit model' of public engagement – people need a 'knowledge transfer' of more of the right information – rather than starting from the pluralist positions outlined above (Irwin, 1995; Wynne, 1991). However, there is some evidence of good practice from within the copious (and increasingly critical) literatures on 'community-based conservation' (Brosius et al., 2005). On a basic level, this work resonates with a nascent but growing sense among conservation biogeographers that 'values matter' (Trudgill, 2001) and that multiple modes of conservation are possible (Whittaker et al., 2005). On a more fundamental level, anthropologists like Tim Ingold, Hugh Raffles and Phillip Descola have explored the import and potential of indigenous ecologies in diverse non-western contexts, deploying their concepts from vitalist philosophy to sense and promote various animist ecologies (see Descola, 1994; Ingold, 2011; Raffles, 2002; Sullivan, 2010).

Meanwhile a rich and heterogeneous collection of techniques has emerged in geography and science studies for opening up the scientific knowledge controversies that increasingly characterize our multinatural condition. These include mechanisms for interdisciplinary and artistic collaboration, public engagement and

the redistribution of expertise (for reviews, see Davies and Dwyer, 2008; Dwyer and Davies, 2010). For example, Gross draws on Latour to present deliberative methods for ecological restoration cast as 'public experiments'. These take place within an 'experimental cycle' that involves:

> The continual renegotiation of the course of the experiment among heterogeneous actors, including nature as an actor; the inclusion of potentially all citizens as active co-designers and co-researchers; and, finally, a process in which surprising events ... are processed in such a way that they lead to new knowledge. (Gross, 2010b: 69)

The epistemological pluralism at the heart of this model connects with concepts and techniques developed in work by: Burgess et al. (2007) in the experiments with 'deliberative mapping'; Ellis and Waterton (2004) in their work on 'amateurs as experts' in biological recording; and Stengers' experimental methodology of the 'competency group', as developed by Whatmore and co-researchers to provide deliberative approaches to flood-risk modelling (Lane et al., 2011; Whatmore, 2009). Many of these authors acknowledge that thinking about affect and emotion is vital for the success of such public experiments.

IV Multinatural biogeography and capitalist ecology

For a range of theoretical and disciplinary reasons this emerging literature on multinaturalism has had very little to say about political economy and the relationships between the shifts it identifies and the ascendance of neoliberal capitalism. As a consequence there has been remarkably limited interchange between the approaches reviewed above and the vibrant body of critical work in geography, anthropology and elsewhere on capitalist ecology and the neoliberalization of environmentalism (e.g. Castree, 2008a, 2008b; McCarthy and Prudham, 2004) – including a growing body of research on neoliberal biodiversity conservation (e.g. Brockington and Duffy, 2011; Igoe and Brockington, 2007). It is beyond the scope of this paper to provide a comprehensive review of this work or to fully explore its diverse ontological, epistemological and political contrasts and intersections with multinaturalism. Instead, in this final section I want to pick out three themes that flag both the risks and the potential contribution of a multinatural approach to wider efforts to develop a political ecology for the Anthropocene. These relate to questions of immanence, justice and affect.

The first connecting theme relates to the risks of advocating on behalf of fluidity, immanence and non-equilibrium in nature conservation. For a range of critics – both on the left and on the right – the ecological irrationalities and contradictory character of neoliberal capitalism relate to a significant degree to the fluidity of rapacious mobile capital and the transformative logics of market fungibility. For a group of conservative critics the fluid dynamics of global capitalism are out of sync with traditional societies and associated harmonious forms of human-environment relations (e.g. McKibben, 1990). The environmental historian Donald Worster (1995) notes the political convenience of a fluid ecology of non-equilibrium for capitalist destruction; in the same volume that eminent conservation biologist Michael Soule (Soule and Lease, 1995) asserts that some forms of poststructuralist philosophy are as ecologically damaging as chainsaws.

In contrast, political ecologists on the left see the potential of non-equilibrium ecology for challenging colonial and capitalist state science and authority. For example, Sullivan and Homewood argue that:

> Non-equilibrium ideas demote the expert, superior positioning of the scientist by emphasising unknowability in terms of predicting the behaviour of complex systems. They create problems for

> conservationists wishing to clear (purify) landscapes of people and livestock in order to return these spaces to a desired, imagined original undisturbed state of nature. And by emphasizing the significance of local and historical contexts and knowledges they affirm devolved land use and management as the most appropriate match between people and environment, thus reducing the legitimacy of state-centric, expert-led, top-down policy and planning. (Sullivan and Homewood, forthcoming: 15)

However, for other eco-Marxist critics of capitalist ecology and the neoliberalization of conservation, the pervasive mantra that in order to save nature we have to privatize and sell it (McAfee, 1999) is grounded in an ontology that transforms biodiversity into fungible non-human equivalents ready for market exchange over unprecedented spatiotemporal scales. A fluid political ecology without equilibrium is ideal for a capitalist Anthropocene to be governed by expanding markets in biodiversity and carbon offsets (Bumpus and Liverman, 2008).

Further critical work that draws Deleuze into conservation with Marx and other critical scholars has cautioned against the co-option of non-human immanence and invention by new forms of biopower associated with capitalist modes of biotechnology, including those geared towards conservation. For example, in reflecting on the speculation upon and exploitation of novelty and innovation by pharmaceutical companies, Mikulak notes an emergent 'rhizomatics of domination' in which new scientific practices provide 'inroads for corporations to claim ownership of life by setting a precedent for bioengineering in the very heart of evolution, and thereby naturalizing a deeply colonial and parasitic relationship' (Mikulak, 2007: no page). Kaushik Sunder Rajan and Melinda Cooper critique the biopolitics of the neoliberal life sciences in similar ways, documenting unequal political economics for profiteering from the generative potential of 'biocapital' (Sunder Rajan, 2006) and 'life as surplus' (Cooper, 2008). Such critiques of the capture and commodification of inventive life are echoed in critical work examining efforts to promote bioprospecting and markets in ecosystem services as the solution for biodiversity loss (e.g. Hayden, 2003). While this research is not primarily concerned with the ecological consequences of such schemes, it challenges the destruction of non-rational kinship systems and the universalizing of western notions of property rights associated with their implementation, noting the likely and actual unequal distributions of their benefits (see Castree, 2003, for a review).

Such critiques sound important words of caution to the more ebullient celebrations of fluid ecologies among neovitalist multinatural geographers and free-market environmentalists. They highlight the need to attend to the character and operations of rhizomatic political alliances and the likely beneficiaries of moves to release particular natures from fixed ontologies. They argue that it may be necessary to shore up boundaries and territories when it is clear that important time-deepened biodiversities will be erased. This is not a novel insight. Deleuze and Guattari cautioned that one should 'never believe that a smooth space will suffice to save us' (1987: 551) and the growing body of geographical work on biosecurity demonstrates that order, forms and fixities are all necessary for vibrant inhabited ecologies (e.g. Braun, 2007). A multinatural approach to biodiversity would guide environmental governance through this fixity-fluidity continuum by stressing that what matters are not actual, existing extensive differences (species, genes, habitats, etc) but the heterogeneity of intensive differences that are generative of them. Organisms, species, genes and habitats offer a redoubt – strategic essentialisms in the face of destructive fluidity – but we should not let them fix the generative processes that give inhabited ecologies their resilience, vitality and health (see Seastedt et al., 2008, for a discussion of similar thinking

in conservation biology on the management of 'novel ecosystems').

The second connecting theme relates to concerns for social and distributive justice, which have been at the centre of work on the political ecology of nature conservation in the global South (e.g. Duffy, 2010; Zerner, 2000). This research takes conservation biology and modes of market-based and neocolonial conservation to task for their tendency to blame powerless local people for ecological change and to instigate or support unjust regimes of 'fortress conservation' (Brockington, 2002). While such concerns are not inimical to the multinatural politics outlined above, the term 'justice' does not feature prominently in their political lexicon. There are a number of reasons for this, which I want to detail here, before reflecting on the risks and benefits associated with giving up on this term. Concerns for justice in conservation are grounded in political philosophies that place the human subject at the centre of claims for political status and develop general, rational, rights-based frameworks to guide political and economic action towards Nature understood as resources. Frequently, appeals for justice were employed by political ecologists to counter claims for natural limits or to challenge a perceived anti-humanism among conservation biologists advocating solely on behalf of Nature or Wilderness (e.g. Guha, 1989). Work on capitalist ecology in general and on justice in conservation specifically thus has had little to say about non-human agencies or human responsibilities towards non-human forms.

This point has been made most clearly in a recent review article in this journal by Karen Bakker (2010). Bakker encouraged political ecologists concerned with neoliberalism to engage with relational approaches to human/non-human interactions, noting that this engagement would challenge the centrality of 'distributive justice' in political ecology. As I outlined above, the more-than-human philosophies at the heart of multinaturalism decentre the human subject as the sole vessel of agency and ethical status. Early radical appeals for generalized symmetry in approaches like actor-network theory (Latour, 2005) flattened out ontological differences reducing all humans and non-humans to 'actants' on a single plane. Recent work acknowledges consistent material differences between groups of agents, including 'specific human competencies' (Thrift, 2007), but argues that these are relational achievements, not essential properties (Whatmore, 2002). More-than-human approaches acknowledge that these competencies and their associated affective responses can be shared between similar organisms (Davies, 2010; Greenhough and Roe, 2011). However, they can be differentiated from recent appeals for 'animal justice' in critical animal studies which grounds its appeals for animal rights on the comparable existence of essential human characteristics in non-humans (e.g. Twine, 2010) – extending the franchise to certain privileged others. In contrast, through their ethnographic work, multinatural geographers advocate context-specific forms of posthumanist ethical and political responsibility that emphasize respect for the radical alterity and unpredictability of organisms, their ecologies and the multiple constituencies who have a stake in their conduct (e.g. Hinchliffe et al., 2005; Lorimer, 2010a).

The risks and drawbacks of this approach are numerous when seen from the perspective of justice that is familiar to political ecology. More-than-human approaches deploy political categories alien to the hard-fought taxonomies of modern legislation and representation – including human rights. Appeals for flourishing and conviviality are vague and context-specific. They do not offer general ethical frameworks or overarching structural causes. Furthermore, existing work has tended towards affirmative relations and has yet to focus on examples in which the interested parties – human and non-human – are engaged in lethal and antagonistic

relations in which any solution will significantly comprise the welfare of one or other party (though see Beisel, 2010). In such situations the utility of general principles of humanist justice are clear. Further empirical and theoretical work is required to draw more-than-human work together, to map and compare relations and to reflect upon the possibility of general frameworks for multinatural environmental politics. Anthropologists like Anna Tsing (2005) have been leading the way in this regard developing critical immanent ecologies that map the 'frictions' where the globalizing knowledges of biodiversity rub up against non-western alternatives.

The third point to make relates to the previous. More-than-humanist approaches to conservation also differ from those concerned with rational human justice in their willingness to consider the political and economic significance of embodiment, affect and non-human agencies. These dimensions have not concerned political ecologists to date but, as Bakker predicts in her review article, existing work on the neoliberalization of nature has much to gain from 'integrating the multiple dimensions of neoliberalization – affective, libidinal, and cultural, as well as political, ecological, and economic' (Bakker, 2010: 3) to map the patterns and causes of various 'actually existing neoliberalisms'. The techniques and insights developed by multinaturalists in their detailed ethnographic work would help political ecologists ground their investigations of resource use by tracing the difference that non-human difference makes to the ways in which neoliberal conservation and other modes of environmental governance take shape. For example, recent work on non-human charisma (Lorimer, 2007), chthonic volatility (Clark, 2011) and environmental knowledge in practice (e.g. Hayes-Conroy and Martin, 2010; Roe, 2006) could help develop recent efforts by political ecologists to attend to the materialities of natural resources (Bakker and Bridge, 2006; Boyd et al., 2001). This might include investigations of the tractability of the different entities to be traded in emerging environmental markets – from carbon molecules to wetland acres – or explorations of the affective and libidinal economies of ecotourism, advertising and fund-raising (Besio et al., 2008; Cloke and Perkins, 2005; Lorimer, 2010b). Nigel Thrift (2005) has argued for some time that all such activities emerge from skilful, embodied and emotional entanglements between people and non-humans in which the material and aesthetic properties of organisms and their ecologies influence the emergent patterns of regulation, science and political economy.

As Dan Brockington and others are discovering in their ongoing work on celebrity and 'spectacular environmentalisms',[2] affect matters in propelling and configuring the global political economies and geographies of environmental and developmental concern (Boykoff and Goodman, 2009; Brockington, 2009; Goodman, 2010). These are shaped less by a rational evaluation of the rights of fellow humans and more by mediated passions for charismatic icons, the fickle fashions of celebrity and the subtle strategizing of big international NGOs and their corporate partners. These investigations of affect – including the careful construction of emotional responses to iconic representatives of a pristine wild Nature – are significantly enhancing political ecologists' abilities to comprehend and engage with the political present. Recent work in more-than-human geography informed by the work of political philosophers like William Connolly (2002, 2008) and Jane Bennett (2001) offers great potential to take this critical engagement further. Echoing work by feminist geographers Gibson-Graham (2006), it argues that engaging with affect offers potential modes of 'affirmative critique' that present new styles for addressing powerful modalities of environmental politics. This offers a different tone for political ecology that is less certain (and dogmatic) about what bodies in multiplicities are and will

become (Hinchliffe and Whatmore, 2006). This approach is hopeful of the role of affect in heralding new political futures, guided by 'a conviction that in any given situation more is needed than critique if (certain) events are to be tended to and cultivated' (Anderson and Harrison, 2010: 23). In turn this more-than-human work would benefit significantly from the sophisticated understandings developed by political ecologists of the political and regulatory contexts in and against which such affirmative styles must be founded and deployed.

V Conclusions

The diagnosis of the Anthropocene and the public death of the modern understanding of Nature that it represents constituted an important juncture for environmental geography. This paper builds on the discipline's distinguished history of critically engaging the politics of Nature. It has sought to review recent work in geography and cognate disciplines advocating for a multinatural or more-than-human approach that need not make recourse to Nature. Focusing on biodiversity conservation, it has drawn this work into conversation with recent thinking in both the life sciences and political ecology to summarize a new approach for thinking about conservation specifically and environmental politics more generally. In different ways this approach seeks to rescue biodiversity from the tyranny of Nature and to pluralize and animate conservation as a political ecology for a multiplicity of biodiversities. The paper identifies and cautiously promotes a vital materialist ontology that helps link recent work in the social and ecological sciences. It provides elements of a common conceptual vocabulary for considering the forms, dynamics, spaces and agencies caught up in debates over biodiversity in the Anthropocene.

It has been beyond the scope of this paper to translate these general principles into a comprehensive set of instructions for practical multinatural conservation after the failure of Nagoya. However, the case studies reviewed and the discussion of key substantive themes give some sense of what this might comprise. Conservation inherits complex assemblages of theories, technologies, laws, territories and practices from past eras with different politics and ecologies. Such assemblages change gradually, but they are increasingly anachronistic to the challenges of the warming globalized Anthropocene. National and supranational governments and non-governmental organizations are currently appraising and adapting their biodiversity regulations, practices and estates. In making this fresh start the multinatural approach reviewed here would suggest that it is imperative to look to the future as well as the past, to appreciate that multiple biodiversities could emerge from different political and ecological scenarios and to plan accordingly. Targets, icons and action plans are necessary, but they should give scope for non-human dynamics, multispecies deliberation and experimentation and forms of adaptive management.

Geography as a discipline – and biogeography as an intradisciplinary interface – is especially well placed for engaging with conservation and environmentalism in the Anthropocene. In spite of their epistemological, cultural and institutional differences, there are some important convergences at the contemporary juncture in the disparate efforts of social and natural scientists to write about the more-than-human character of the world. Whether is about territory and time, life and difference or knowledge and politics – biogeographers of different styles have much to gain from collaboration. A biogeography that need not make recourse to Nature would offer important critical resources for addressing preeminent hot topics in biodiversity conservation, including climate change, invasive species and land-use change, to give but a few examples. In developing such a biogeography there are fertile grounds for constructive engagement between emerging multinatural approaches and the rich

body of critical work on capitalist ecology. This paper agrees that the current disparate condition of these two fields preserves Castree's (2002) description of a 'false antithesis' between relational and dialectic approaches. This paper argues that there is rich potential for conversation and collaboration, if not perhaps synthesis. Multinatural approaches help animate, ecologize and render affective the humanist frameworks of political ecology. In turn such frameworks offer a healthy corrective to the exuberance of some neovitalists and help track the political and economic beneficiaries of different multinatural futures.

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Notes

1. I use the singular, capitalized term 'Nature' to refer to the modern dualistic understanding of the non-human world documented by Latour in his 1993 book *We Have Never Been Modern*. This is one of many powerful social constructions of the non-human world. Elsewhere in the paper I refer to biodiversity, wildlife and non-humans. All of these describe and enact different worlds; none should be taken to depict a universal objective reality. I use the term natures in the plural to represent this multiplicity of meanings and possible becomings.
2. 'Spectacular environmentalisms' is the title of an ongoing research network, funded by the Arts and Humanities Research Council. See http://spectacular-environmentalisms.co.uk.

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