



Environment & Society



White Horse Press

Full citation:

Youatt, R. "Counting Species: Biopower and the Global Biodiversity Census." *Environmental Values* 17, no. 3, (2008): 393-417.
<http://www.environmentandsociety.org/node/6045>

Rights:

All rights reserved. © The White Horse Press 2008. Except for the quotation of short passages for the purpose of criticism or review, no part of this article may be reprinted or reproduced or utilised in any form or by any electronic, mechanical or other means, including photocopying or recording, or in any information storage or retrieval system, without permission from the publisher. For further information please see <http://www.whpress.co.uk/>

Counting Species: Biopower and the Global Biodiversity Census

R. YOUATT

*Department of Political Science
Reed College
Eliot Hall 204B
3203 S.E. Woodstock Boulevard
Portland, OR 97202-8199, USA
Email: ryouatt@reed.edu*

ABSTRACT

Biopolitical analyses of census-taking usually focus on human censuses and consider how human experience is shaped by the practice. Instead, this article looks at the proposed global biodiversity census, which aims to take inventory of every species on earth as a response to anthropogenic species extinction. I suggest that it is possible to extend and modify Foucault's concept of biopower to consider contemporary human-nonhuman interactions. Specifically, I argue that an ecologically-extended version of biopower offers a useful way to conceptualise how power circulates in the practices that surround the biodiversity census, and that it points us towards thinking about how analyses of power, authority, and community can consider ecological, rather than purely human, locations and networks.

KEYWORDS

Biodiversity, biopower, nonhuman agency, environmental governance

Driven both by the global loss of biodiversity and by the lack of knowledge about the vast majority of species that are being lost, conservation biologists and some of their allies in the environmental movement have called for and started a massive global census of biodiversity.¹ Most prominently, E.O. Wilson has proposed a new mobilisation of scientific resources to complete a global survey of species.² The identification of biodiversity 'hotspots' is the first step in a cascade of biodiversity investigation, Wilson hopes, which will culminate in a full inventory of global biodiversity and of the places where it is being lost. With complete information about the global population of biological species, Wilson is optimistic that we can undertake more refined conservation measures and ultimately move towards greater sustainability.

In this article, I take the position that the global biodiversity census is as much about power and political life and the boundaries between nature and society as it is about scientific information gathering for conservationist ends. Drawing on Foucault's concept of biopower, I suggest that the biodiversity census provokes us to think about the ways that biological nonhumans are embroiled in, and challenge, the technologies of power that see life itself as a political object. To the extent that the 'action' in the biodiversity census seems to rest largely with the human scientists who do the categorising, naming, counting, and labelling of nonhuman species, one analytic stance towards this scientific practice is an anthropocentric one. Here, the focus is on considering the field of social power in which scientific efforts take place, and asking questions about the discourses, resources and networks that make a biodiversity census plausible and possible.

But what if nonhumans can be legitimately considered to be active participants in the field of biopower, just as human subjects who are censused are? Can nonhumans be sites of resistance to biopower, and disrupt its governing impulses? I argue that it is possible, and indeed necessary in the context of biodiversity, to extend the idea of biopower to include nonhumans as participants. Like human subjects, nonhumans are regulated and rationalised in matrices of knowledge and science, through which they are readied as productive resources for capitalism and mined as repositories of genetic information. Nonhuman participation in an ecological field of biopower also involves being part of an array of authority in environmental discourses, with effects for both humans and nonhumans, and constructing new possibilities for biosocial collectives.

However, because nonhumans generally lack the capacity to be self-regulating subjects but are nonetheless necessary authorities in figuring biodiversity truth discourses, I suggest that they hold a different kind of place in biopower than self-regulating human subjects do. More specifically, because nonhumans constitutionally (rather than intentionally) refuse to internalise the meanings of human language, they are able to resist becoming self-regulating subjects to a significant extent, relying instead on their own semiotic interpretations of the environment and acting accordingly: for example, through migrating, reproduc-

COUNTING SPECIES

ing, consuming resources and filling ecological niches in unexpected ways, biotic nonhumans are constantly challenging the normalising will of biopower. At the same time, because environmental interventions to save species come to be justified on the grounds of global environmental well-being, the health and continued existence of nonhumans becomes an increasing imperative. In spite of the fact the biodiversity census may extend the reach of an ecologically unfriendly capitalism, I conclude that it will, on balance, reap important ecological goods in hybridising political practice and acknowledging extra-human locations of power.

The article proceeds as follows. I start in Section 1 by reviewing the global biodiversity census proposal. In section 2, I consider how scientific power is extended through the census and what sources of power it draws on to do so. The science of censusing nonhumans requires a significant mobilisation of social power – financial, technological, institutional and discursive – in order to succeed. But because knowledge projects like demography have effects and techniques that reach beyond these sources of social power into life itself, I suggest that we cannot fully explain the importance of the biodiversity census through these means. In section 3, therefore, I extend Foucault's concept of biopower into the nonhuman world as a means to explain the productive power and regulatory qualities of the census. Because the subjects of the biodiversity census are mostly nonhuman, however, I also consider how the concept of biopower mutates in light of their participation.

1. THE GLOBAL BIODIVERSITY CENSUS PROPOSAL

Spurred by the problem of a major extinction event in which we do not even know what or how much is being lost, the basic knowledge-problem that the global biodiversity census is aimed at addressing is counting and describing all the species that currently exist in the world. According to the United Nations Environmental Program's (UNEP) Global Biodiversity Assessment, the best ecological estimates of extant species range from 3.5 million all the way to 111.5 million species, with the most likely figure at around 13.5 million.³ Only 1.75 million of those species are currently identified and described, however, or about 13 per cent.⁴ Each year, only 13,000 new species are formally described, a snail's pace given the magnitude of the task.⁵ Even when species have been described, the data often remains limited. Some species may have become extinct since being identified. May et al., for example, estimate that about 40 per cent of identified beetle species are known from a single examination in a single locality, sometimes an observation made decades ago.⁶

E.O. Wilson's census proposal includes training and deploying a cadre of thousands of specialists in systematics, taxonomy and classification. He calculates that given 40 years of productive classification work per scientist, at the pace of

ten species identified per year, approximately 25,000 professional lifetimes are needed, a number which 'falls well short of the number of enlisted men in the standing armed forces of Mongolia, not to mention the trade and retail personnel of Hinds County, Mississippi'.⁷ In the perfectly rational system that he hopes for, each expert would be assigned to a specific classificatory activity. While there are currently only three people in the world who are sufficiently expert in classifying termites, for example, Wilson would up their number proportionally to match the fact that termites comprise ten per cent of the total biomass of tropical regions.

Wilson also champions investment in new computer technology that can combine scanning-electron microscopes with image-recognition software. Its goal would be to process and identify species instantly and to flag new specimens as they are passed through. The data held in the GenBank project, a computer database aimed at collecting information on all known DNA and RNA sequences, could be folded into this process.

Given the massive numbers of species and the difficulty of resource mobilisation, other proposals suggest sampling procedures to get representative data on the global biopopulation. For example, Terry Erwin suggests that we aim for 'massive but achievable biotic inventories' that give us a relative fix on biodiversity.⁸ While it may not achieve Wilson's goal of describing all species, targeting specific taxa and sampling certain species would have the effect of rationalising what is currently an ad hoc process. In the face of an ever larger human population, the United States census now makes limited use of representative sampling procedures, which its proponents argue make it more accurate than a large-scale but flawed collection of data about every individual.⁹ A global biodiversity census would aim to do the same.

Some of the questions that surround the biodiversity census are scientific ones, such as concerns over the basic species concepts it employs and the problems of scale involved in identifying micro-species like bacteria.¹⁰ Given that the activities of science are not self-contained but always embedded in social relations, additional kinds of questions need to be asked, however. Yet little scholarly attention has been paid to what this biodiversity censusing effort means in political or social terms.

Political ecologists have usefully inquired into the general effects of biodiversity discourses and the ways in which they are intertwined with regimes of power and governmentality,¹¹ but they have not asked whether there is anything specific about the language and practice of censusing nonhuman bio-entities that is politically important. Environmental ethicists seem to have ignored the ethical dimensions of the topic altogether.¹² Anthropologists and ethnobotanists have looked increasingly at the relationship between biological and cultural diversity, finding strong geographical and evolutionary correlations between the two and suggesting that a broader biocultural value linking nature and humans might be found in diversity complexes.¹³ However, they have not inquired into the

COUNTING SPECIES

importance of censusing as a technique by which the differences in biocultures might be constituted. Political scientists have written extensively and insightfully about the practice and effects of censusing human populations,¹⁴ but have not taken up how censusing nonhumans relates to political questions about power. The rest of the article aims to fill some of these gaps, particularly with respect to questions of how power functions in contemporary environmental science and politics.

2. THE BIODIVERSITY CENSUS AND THE SOCIAL POWER OF SCIENTISTS

Taken as a socially-embedded activity, the production of successful scientific knowledge necessarily requires mobilisation of economic resources, expansion of institutional power, and discursive legitimation.¹⁵ Successful science, in other words, must be socially forged. This point does not suggest that the status of scientific truth-claims is fully dependent on social interests; rather, the point is that thinking about a scientific activity like the biodiversity census requires attending not only to activities of classification and arguments over species concepts, but also to how those activities are made possible in the first place. In short, what kind of social power does the biodiversity census draw on, depend on and reproduce? What makes the use of a biodiversity census seem intuitively obvious as the right tool to address biodiversity loss?

Here, I consider two forms of social power, both crucial to the census project. First, I ask what financial and institutional resources are necessary to allow agenda-setting power and the capacity to steer future resources in advantageous ways.¹⁶ Second, I suggest the allure of the census rests partly on the way that biodiversity scientists are able to tap into discursive power, particularly the seductive power of discourses like panopticism and discovery.¹⁷ I consider these forms of power in turn.

The institutional push for a global biodiversity census is centred in the United States, where it has harnessed major sources of funding, including the National Science Foundation (a \$14 million fund for 'planetary biodiversity inventories'), the Packard Foundation and Harvard University. It has created a network of scientific-political organisations mainly based in the United States and Europe dedicated to censusing different parts of the natural world and promoting the 'completion of the Linnaean enterprise'¹⁸ into a 'Catalogue of Life' – the Census of Marine Life, NatureServe, the Global Taxonomy Initiative of the Convention on Biodiversity, Species 2000 and the All-Species Foundation. There has been increased funding for the academic fields of taxonomy and bioinformatics.¹⁹ New professional lives have opened up around these resources – 'each species merits careers of scientific study and celebration by historians and poets', as Wilson puts it.²⁰ The biodiversity census makes these possible first through the

act of species identification and then through the subsequent study of species behaviour, ecological roles and potential uses for humanity.

The key institutions of the global biodiversity census are organised around information and communications technologies, which worm their way right into the names and missions of the organisations involved. The Global Biodiversity Information Facility (GBIF) and the Integrated Taxonomic Information System (ITIS) (in partnership with US federal agencies including the Environmental Protection Agency (EPA) and the United States Department of Agriculture (USDA)) are two of the global clearinghouses for establishing quality species-level data, aiming to be 'open portals' of biodiversity data.²¹ GBIF's mission is to 'develop methods for sustainably using biodiversity ... [by] rapidly, openly, and freely delivering primary data about biodiversity to everyone in the global community, using digital technologies'.²² The political intent is universal access, while its method of delivery is technological. The universally-wired nature of 'the' global community is taken for granted, even as a global digital divide and the barriers of expertise suggest that no such community exists.

One critical role that information technology plays in organising the global biodiversity census is in its ability to suggest a panoptic biological future.²³ 'Imagine an electronic page for each species of organism on Earth', Wilson asks us, 'available everywhere by single access on command'.²⁴ Genealogically related to projects like Diderot's *Encyclopedie*, the modern 'Encyclopedia of Life' is the endpoint and ultimate goal of the censusing project, organised in a technology that claims to outrun space and time.

The rhetoric of 'achieving' a global biodiversity census also taps into complex Western narratives of discovery and conquest of nature (ironically, since the conservation agenda of the census is aimed in part at preserving the wildness of nature). This rhetoric also draws on the position of social power held by the modern sciences to reveal the unknown to human publics. Wilson exhorts supporters of the census to have 'faith in the sprint to the finish of the global census', promising that 'unknown microorganisms ... will be revealed' and that 'never again, with fuller knowledge of such extent, need we overlook so many golden opportunities in the living world around us'.²⁵ Similarly, the All-Species Foundation tells us that the global biodiversity census 'offers an unsurpassable adventure: the exploration of a little-known planet'.²⁶

Finally, the discursive power of the census is connected to economic life, in the way that it renders nonhuman agents ready for postmodern capitalism as semiotic constructions (as in genetic codes for bioprospectors or images in nature videos).²⁷ As Arturo Escobar argues, whereas 'nature' marked modern capitalism's attitude towards the nonhuman, 'biodiversity' is a term of postmodern capitalism, in the way that it readies nonhuman nature for semiotic use rather than material use.²⁸ Indeed, postmodern capitalism may protect nature materially even as it commodifies it semiotically, as in the case of protecting the Amazon rainforest for its pharmaceutical potentials.²⁹ Yet, as Escobar argues, 'once the

COUNTING SPECIES

semiotic conquest of nature is completed, the sustainable and rational use of the environment becomes imperative'.³⁰ That is, once biodiversity discourses help conserve an area as a biodiversity reserve which is made valuable in terms of code-commodity, it also becomes part of a political system of global environmental governance that continues to manage it for capitalism.

Thus, conservation biologists have mobilised an expanding pool of financial and institutional resources, drawing in part on the seductive qualities of the dream of panopticism and the historical glory of exploration. To the extent that the agenda of global environmental governance is steered by their expertise, consensus and public statements,³¹ they have also garnered increased authority in speaking about matters of conservation, ecotourism and economic development. While these forms of social power (institutional, financial, technological, discursive) explain some of what is at stake in the biodiversity census, I want to suggest that the power of a global biodiversity census also rests in its hybridising force. It introduces nonhumans into the discursive heart of an otherwise anthropocentric modern human politics, economy and knowledge that has generally denied that nonhumans have formed a part of these projects.³² It creates a framework through which humans interact with, pattern and position the diversity of natural nonhumans. Understanding the importance of the biodiversity census therefore extends questions of power past its traditional human context into an ecological context.

The important questions, then, are: for whom does this extended politics and power work?³³ What happens to anthropocentric understandings of power upon the participation of nonhumans in the process? Does the (re)introduction of nonhumans tell us anything about the 'whereabouts of power', to use John Allen's phrase?³⁴ Can power be nearly everywhere, or does it have a specifically local character in relations between things and thus an uneven distribution? To answer these questions, I turn to the idea of Foucaultian biopower, which considers how power works at the micro-levels of individual life, in relation to the more traditional forms of power considered thus far.

3. BIOPOWER AND THE CENSUS

In this section, I start by considering how human censuses are understood to relate to politics and governing institutions, specifically through the Foucaultian idea of biopower. Because biopower is concerned with the ways that techniques like censusing operate on the terrain of 'life itself', it is particularly suited to thinking about the biodiversity census, which similarly involves a strategy for administering and rationalising life in ways that reach into nonhuman biological life as such.³⁵ The consideration of censusing nonhuman life through the lens of biopower involves a basic trade-off. On one hand, the extension of biopower into nonhuman realms raises the spectre of a more subtle, but nonetheless corrosive,

form of human power over the natural world. On the other hand, because power and resistance are always co-existent, nonhumans may disrupt the functioning of environmental governance in new and distinct ways. Specifically, biopower faces difficulty in creating self-regulating nonhuman subjects who internalise conditions of subjection.

3.1 Self-regulating subjects and the justification of power

In contrast to absolute power commanded by the Hobbesian sovereign to 'take life or to let live', Michel Foucault argues that the modern form of biopower which replaced it in the nineteenth century was a regulatory and disciplinary form of power that involved 'the administration of bodies and the calculated management of life'.³⁶ Biopower organised and administered life, through a variety of techniques or methods of power that dragged human life itself into the grid of power-knowledge. Institutions such as universities, public health agencies and the army, and regulatory forms of knowledge, such as demography and modern medicine, not only analysed life-processes but permeated them as well.

Yet it was not just the use of these techniques or the presence of these institutions that characterised nineteenth-century biopower. Two parallel political shifts made biopower distinct from sovereign power. The first shift was that the right of the sovereign to have power over life and death was no longer justified based on protecting the sovereign from external threat (as in conscription in cases of war) or internal threat (as in the death penalty). Rather, the power over life and death was now justified in terms of the population itself, in modern democratic language. When war was waged, it was not to protect the sovereign, but in the name of the people and their continued existence.

The justification for biopower's interventions into the details of life – reproductive health, the ways in which we die, normalising vaccinations – was similarly made in the name of the population. One effect of this shift, Foucault notes, is that the death penalty became more difficult to sustain logically: 'how could power exercise its highest prerogatives by putting people to death, when its main role was to ensure, sustain, and multiply life, to put this life in order?'³⁷ In other words, the justifications for power's activities have social effects that exceed the justifications themselves. What effect, then, will extending 'protecting life' to 'protecting biodiversity' have, if we consider the biodiversity census as an extended example of the logic of biopower?

Part of the answer is that direct resource exploitation becomes more difficult, since power over life/death of animals, plants, insects or trees can no longer be justified by needs of the human population/sovereign to fight natural necessity with all its might.³⁸ Ecological biopower thus involves both broader social trends like the rise of modern ecological consciousness and the emergence of conservationist ethics as part of it structural logic. At the same time, what becomes easier is both the management and regulation of nonhuman biological life by

COUNTING SPECIES

humans and the direct intervention in, and mutation of, biological and ecological life-processes, all in the name of bio- or eco-systemic 'health'. Here, biopower can be understood as a logic of eco-governance that simultaneously subverts the resource-driven agenda of modern capital by trying to conserve material nature *and* enables and rationalises an entirely new form of intervention in life itself. The ecological sciences, on this reading, are one of the crucial institutions through which interventions into life are enacted, and the biodiversity census is one of its primary power-knowledge techniques.

Thinking about biopower as involving nonhumans also has the consequence of changing the population in whose name power's exercise is justified. If the idea of biopower adequately describes the intrusion of scientific, economic and regulatory techniques into the lives of nonhumans, then administering nonhuman life must be justified in the name of an expanded population as well – in this case, in the name of a global ecological population of species (and their genes), guided by an ethic of preserving and fostering biodiversity. In sum, in the name of planetary health (a metaphorical extension of modern biopower's concern with human public health to a planetary scale), a new population is configured into which biopower intervenes, one explicitly composed of human and nonhuman members participating in ecosystemic communities.

The second, parallel shift that Foucault notes was involved in the move from sovereign to regulatory power was that there was an unsettling effect on the practice of governing. Unlike sovereign power, regulatory biopower had the imperative to promote life, to 'optimise forces, aptitudes, and life in general', and its 'highest function was perhaps no longer to kill, but to invest life through and through'.³⁹ Yet, crucially, it had to do so in ways that did not make the population more difficult to govern.⁴⁰ In other words, however life was politically managed, it had to be done in ways that ensured governability. This aspect of biopower was aimed at producing self-regulating subjects who internalised the qualities that promoted life but did not fundamentally disrupt social functioning. Self-regulating subjects were both efficient for power (since subjects did power's work for it) and governable.

Yet in this respect, the movement of nonhuman entities into the population in whose name biopower acts represents a potential location of freedom, or at least resistance, precisely because many nonhumans are constitutionally incapable of being self-regulating subjects who can internalise the conditions of subjection in biopower's own terms. Nonhumans do not 'know' that they are a species or a member of a specific phylum, in those terms, or that they have a particular gene-sequence; rather, they have their own frameworks of understanding the moments of interaction with scientists and modes of environmental experience that guide their actions. In this respect, biotic nonhumans differ from the human subjects of biopower, who, as Foucault's analysis suggests, become self-regulating subjects partly in virtue of the way that their consciousness is structured by biopower – by its language, its categories, and the techniques of self-making.

When one looks at the minority of bio-entities that could be made partially self-regulating – genetically modified crops, pet clones, lab-grown tissue replacement, gene therapy and pre-selection, regulated game preserves in which species are fenced in or are trained to learn the boundaries of safe haven from human predators – they form a small fraction of the bio-population. Even in those cases, moreover, there are significant doubts over whether they can be made into self-regulating subjects in the same sense as humans. Their ability to accede to and internalise the normalising effects of power is limited by their biological constitution. Though they have varying kinds of subjective experience, they cannot be said to have the self-reflexive kind of subjectivity that humans do. Whereas human subjectivity is marked by the dual ability to be a distinct Self in contrast to the environment and to have the reflexive thought that ‘I am a Self’, nonhumans are generally limited to the former possibility.

If biopower cannot make most nonhumans into self-regulating subjects, then their governability rests solely on whether they can be controlled indirectly through the patterned grids of scientific prediction. Yet as groups and individuals, biological nonhumans routinely confound predictability, within their own kinds of subjectivities. They respond to ecological change by unexpectedly shifting migration patterns and locations. They expand in unanticipated ways into ecological niches that humans open directly (e.g., suburbs as feeding grounds for raccoons; rabbits introduced in Australia for hunting who subsequently overran the countryside; garbage dumps as sources of food for omnivorous bears) and indirectly (e.g., red-tailed deer population explosions in New England upon the over-hunting of deer-predators, causing substantial economic damage and fatal car accidents). Some species mutate at evolutionary speeds that far exceed those of humans (e.g., pesticide resistant strains of bugs or penicillin-resistant viruses). They sometimes form new relations with other species to the detriment of humans (e.g., birds as carriers of Asian bird flu). They remake ecosystems into new stabilities and undermine others.

In short, while the lack of subjectivity and reflexivity in nonhuman populations is usually read as a source of acquiescence to human interrogation, it seems to also have an opposite effect, in that it constitutes them as ready sources of resistance and disruption to the desires of biopower to establish governable populations. Foucault says of biopower: ‘it is not that life has been totally integrated into techniques that govern and administer it; it constantly escapes them’.⁴¹ Nonhuman agents effect some of the very same escapes simply by living. Life itself escapes biopower.

3.2. Array of authorities

A second component of biopower is ‘one or more truth discourses about the “vital” character of living human beings, and an array of authorities competent to speak that truth’.⁴² In the context of the nineteenth-century societies that

COUNTING SPECIES

Foucault was analysing, these truth discourses about living beings included fields like demography and medicine. In the context of twenty-first-century biopower, Paul Rabinow and Nikolas Rose suggest that they might be extended to include fields like genomics, cloning and reproduction.⁴³ What is critical to the truth discourses surrounding these fields is that there be an array of authorities, like the human sciences, public health agencies or social theorists, that both problematise a certain issue and endeavor to intervene in the field raised by that problematisation. These authorities both render the issue socially visible and strive to rationalise solutions.

Just as scientists play a central role as authorities in the truth discourses of human sciences, so too are they central to the truth discourses of biodiversity loss. The project of the biodiversity census involves conservation biologists as a critical part of the authorities competent to create a truth discourse around species loss and conservation, through the rationalisation of species into an ordered catalogue of nonhuman life. But the involvement of nonhumans in this truth discourse exceeds a simple presence as scientific objects, and raises questions about whether we can think of biopower as authoritative about nonhumans without any account of how nonhumans might themselves testify to those truth claims, resist them, or actively participate to some degree in the making of scientific knowledge.

An alternative account of scientific practice that moves towards such a distributed model of authority comes from Bruno Latour and others involved in theorising an actor-network approach, in which human and nonhuman agents are seen as collaboratively involved in the construction of scientific truth claims.⁴⁴ On this account, scientific authority depends in part on the (nonlinguistic) 'testimony' of nonhumans who are marshalled by scientists to establish the veracity of scientific accounts.⁴⁵ While it is still human scientists who problematise the field of biodiversity loss, then, the array of authorities competent to 'speak' the truth discourses surrounding that field is distributed among both human and nonhuman.

This line of argument about authority has three consequences. First, it speaks to the question of the 'whereabouts of power'. One of the criticisms of Foucault's analytic of power is that once it is taken past a specific institutional site into the broader practices of governing, it seems to be everywhere and nowhere.⁴⁶ In a broader sense, space and place themselves seem to disappear from power. In the case of biodiversity sciences, at least, extending the participants in the biopower formation to nonhumans gives power concrete locations – in the places where data is collected, in the laboratories where representative samples are brought under the microscope, and in the bodies of species who experience different life-possibilities and pathways because of the process of classification. What makes biodiversity discourses potent at all, in other words, is the marshalling of human and nonhuman authorities to its truth-claims in particular places and particular biological bodies.

Second, the intrusion of nonhuman life into authority-generating processes like the biodiversity census disrupts the human subject at the centre of modern biopower by forcing a new set of constituents into the political field who cannot quite be captured by it in the same way. Because the biopower depends on the relative flourishing of life, biopower cannot speak and act authoritatively on behalf of the health of global biopopulations *and* simultaneously extinguish them. The necessity of nonhuman life for biopower both enables its extension and increases the living things that disrupt biopower's desire for smooth governing. To return to Foucault's analysis of the death penalty, if biopower (in contrast with sovereign power) complicated the state killing its own citizens, then so too should ecological biopower be seen to complicate the domination of nonhumans (in modern relations with nature), including the ongoing anthropogenic species extinction event.

Finally, if the Latourian understanding of authority as distributed between both scientists and scientific objects is correct, this critique should also apply to humans, in the human sciences that Foucault was considering. The authority of scientific claims depends not only on scientists, academics and public servants, but on the very human subjects that make authoritative claims possible. Not only is resistance coexistent with power within human subjectivity, as Foucault claimed,⁴⁷ but a more distributed kind of authority also resides in the practices of biopower, among the subjects who take part in its data collections, experiments and interventions.

3.3. Biosocial collectivities

In Foucault's historical analysis, the formation of biopower occurs within the context of the rise of the modern nation-state. Yet the biodiversity crisis, which I have been thinking of here in terms of an extension of human biopower into biodiversity-power, presents a political situation in which there is a veritable state of emergency (species loss), and yet there is no state in which to declare such a state of emergency. This observation is true in two senses. It is true, first, in a spatial sense, in that the biodiversity crisis is global, yet there is no global state in which such a crisis could effectively be addressed.⁴⁸ While a layer of global environmental governance may be growing and even using environmental problems as a way through which its expansion is made plausible,⁴⁹ it does not yet have the logical or practical means to resolve the wider problems of social justice and development involved in the biodiversity crisis.⁵⁰

In a second sense, there is also no political formation that accepts the *participation* of nonhumans within its confines. The nation-state is a modern, secular and thoroughly human mode of organisation, one that is based around a community of humans who in turn decide what is right or good for themselves and their environment. Its reasoning is decidedly and openly anthropocentric, as ecologists who advance biodiversity's cause almost all accept as a necessary

COUNTING SPECIES

part of communicating the biodiversity crisis to human publics.⁵¹ Similarly, the discourses of global governance draw on a thin kind of global political community,⁵² but they do not grasp nonhumans as participants in their ideological vision. Global governance is hardly democratic with respect to humans, much less politically inclusive of nonhumans.⁵³ Understood in this way, when global governance discourses address biodiversity loss, they do so either as the next logical step in the postcolonial mission (moving from ‘civilisation, progress, poverty, [to] environmental sustainability’),⁵⁴ or as simply another problem area for governance to address.⁵⁵

In the context of biopower that I have been considering, what then is the effect of global biodiversity census without a global state? If the modern census was part of a power-knowledge formation that was both organised by and constitutive of the nation-state as part of biopower, then a global biodiversity census should have some transformative effects in constituting political forms. The hypothesis that I want to suggest is that a biodiversity census will help construct new ideas of a multi-layered and multi-species global community.

As a way into this hypothesis, consider the effect of the modern human population census on ideas of community. Benedict Anderson, for example, argues that the modern census was integrally related to the creation of the categories necessary for the creation of postcolonial nation-states. Anderson argues that the ‘(confusedly) classifying mind of the colonial state’ created identities through the census that might not have been recognised as such by those who were censused and classified.⁵⁶ The census involved a ‘totalising classificatory grid, which could be applied with endless flexibility to anything under the state’s real or contemplated control’.⁵⁷ Yet by undertaking this project, the conditions of postcolonial nationalism were shaped and forms of intelligibility were constructed (and imposed) that were not otherwise there. For present-day aspirants to statehood, a census remains an important marker of a consolidated national citizenry, as in the push for a Palestinian census as a way towards achieving a de facto Palestinian state.⁵⁸ Similarly, then, a global biodiversity census might be understood as part of constructing a global biocitizenry and in forming a global ecopolitical community.

Rabinow and Rose suggest that biopower must include ‘strategies for intervention in the name of life or health, initially addressed to populations that may or may not be territorialised upon the nation, society or pre-given communities, but may also be specified in terms of emergent bio-social collectivities’.⁵⁹ Like Foucault, Rabinow and Rose are concerned with human populations, but their use of ‘bio-social collectivities’ that are not necessarily dependent on a territorial population suggests the possibility of forms of community that are not tied to the nation-state. If the nation-state is not necessarily the right analogy for biosocial collectivities of humans and nonhumans, then Michael Hardt and Antonio Negri’s expansion of biopower past Foucault’s state-bound apparatuses of governing points towards how a de-territorialised collectivity might

be theorised.⁶⁰ If Foucault's use of biopower was used in the concrete historical analysis of the transition in nineteenth-century Europe from the sovereign state of absolute power over life and death to one 'in the name of the people' of disciplinary and regulatory power, Hardt and Negri push the historical analysis forward another step by drawing from Gilles Deleuze the idea of a transition from a Foucaultian disciplinary society to a society of control.

Disciplinary society exists in relation to individual subjects, setting the parameters of what is normal and deviant, prescribing the rules of social behaviour, and constructing the boundaries of the social space in which its citizens rattle around. Power in disciplinary society is concentrated in institutions. By contrast, a society of control moves into the very interior of its subjects. It regulates not from outside but through its distribution and internalisation into 'brains and bodies'.⁶¹ It is a form of power that exists in networked interiorities (i.e., the linked, self-regulating consciousness of subjects), not in external impositions, limits, sanctions or structurings. Power in a society of control is also unique in the way that it is able to make biopower its exclusive terrain of reference. For Hardt and Negri, it is also a more totalising form of power than disciplinary power – it 'extends throughout the depths of the consciousness and bodies of the population – and at the same time across the entirety of social relations'.⁶² It is such an organising power that Hardt and Negri see as globally operative in the social production of subjects.

But Hardt and Negri are critical of the way in which the global society of control has been considered in a disembodied way. They argue that the abstractions of language, communication, and intellectual ideas have been given productive precedence over the material and corporeal.⁶³ In their neo-Marxist reading, the potential of a biopolitical analysis rests with its study at the level of labour, production and bodies. If Marxist analysis of modern capitalism understood communication as external or secondary to the material relations of production, Hardt and Negri want to read it as internal and immanent to production in postmodern capitalism. The semiotic reconfiguration of postmodern capital that Escobar suggests is thus the very productive activity in Hardt and Negri's framework, and biopower is a Foucaultian/Marxist hybrid.⁶⁴ In such a framework, biodiversity is something produced, and the 'things' of biodiversity – the individuals, the species, the communicative fabric of science around which knowledge of them is built, the development projects of which biodiversity is a component – are implicated in a global society of control.

Like Foucault's conceptualisation of power, Hardt and Negri's vision of biopower as a field or fabric of social and capitalist production is an image that makes us see a total matrix of power. Yet their relative exclusion of nonhumans is curious, since there is a slew of nonhuman agents outside of that productive field. There is a multitude of nonhumans, so to speak, that includes the 'bacterial proletariat', in E.O. Wilson's colourful metaphor⁶⁵ and the nomadic animal populations who routinely exceed national borders.

COUNTING SPECIES

Moreover, if biotic nonhumans have a kind of interiority, in the sense that they are experiencing entities capable of semiosis and embodied knowledge, then the amorphous and diffuse nature of biopower moves through those interiorities as well. This movement takes biopower beyond a Cartesian focus on the human body, mind and social relations, and into an ecological view. Whereas biopower tends to take nonhumans as a kind of cinematic 'bluescreen' against which human dramas unfold, an ecological view of biopower gives nonhuman actors active roles.

Nonhumans, in short, participate in the relations of biopower in interface with humans. They are constituted by those relations, and they also are sites of resistance against them, by the very fact that they do not live like human subjects. The 'society of control' that operates through networked interiorities is a hybrid society, one with material embodiment in sprawling networks of human and nonhuman agents. Biopower moves into the subjective lives of biological species, and their actions and transmutations in turn transform biopower.

For different reasons than mine, Rabinow and Rose argue that Hardt and Negri's biopower is a much too broad concept. Their critique is that it operates at a level of generality that is not useful for analysis. It is able to 'describe everything but analyze nothing'.⁶⁶ What they commend about Hardt and Negri's concept is the attempt to 'extend the scope of traditional analyses of economic exploitation and geopolitics to encompass their relation to the living character of the human species, and *perhaps to all living beings*'.⁶⁷ Although I disagree that 'living beings' is necessarily the place at which a line of political regard should ultimately be drawn, I do agree that extending the analysis of biosocial collectivities past the human species is important in order to understand the work that phenomena like the global biodiversity census are doing.

What kinds of biosocial collectivities might be formed or be reinforced through the global biodiversity census? First, the global biodiversity census could reinforce but also subtly transform existing forms of political identity. The centrality of the species concept to the biodiversity census reinforces the biological basis of 'humanity' in human rights discourses or global cosmopolitan identity – that is, 'humans' are related not just through politically constructed discourses, but through material-semiotic networks of meaning that include similarities in bodies and biological capacities.⁶⁸ Yet the very category of 'human' owes a large part of its meaning to the existence of the plethora of nonhumans who are its Other. However, pushing the species-basis of 'human' also offers a way of remaking that Otherness, by foregrounding the category within which difference is made (species) and a new context in which they relate (ecosystems), rather than taking the difference itself as self-evident or made exclusively through human discourse. If ecosystems (global, regional, local) function by virtue of a multitude of species of which humans are one, then the terms of radical human/nonhuman difference are altered from one comparing differences in capacities between species to one of difference in ecological function.

This move certainly carries political risks, as some of the dubious deep ecological claims to making the global ecosystem the primary unit of allegiance highlight.⁶⁹ But the global biodiversity census also offers the potential for a consideration of interspecies difference within new biosocial collectivities that are not only global but also regional and local. Contra the deep ecological claim, there is no inherent primacy to a global or regional ecosystem over a local one.⁷⁰ As such, the use of the species-concept to frame 'humanity' need not only mean a global eco-politics that erases local difference; it can also be a progressive way to build local identities that are linked ecologically to one another and to an emergent global ecosystem. In short, the global biodiversity census offers a way of re-territorialising the category of 'human', grounding it relative to other species and to the wide variety of local ecosystems that make up the global ecosystem.

Second, then, in those local and regional ecosystems, the identification of species contributes to building political units that are bioregional in nature. In one way, it can reinforce existing political units like the nation-state that coincide with ecosystemic boundaries. The island ecosystems of New Zealand or Madagascar are bioregional but also national. Without resorting to the tired warhorses of 'biologically-determined' communities, bioregional identities can involve a human openness to building political community around the perceived meanings and boundaries of watersheds, mountain ranges and ecosystems. Arguably, at least, these bioregional identities can involve a more responsible treatment of local environments, since they involve a greater sensitivity to the places in which humans live and to the nonhumans on which we depend.

In some cases, the global biodiversity census assists in building bioregional identities that are internationalist in nature – for example, the ecosystemic complex of the North Americas, with its migrating human and nonhuman multitudes and interlinked ecosystems makes a mockery of the aluminium-siding fence separating Canada, US and Mexico.⁷¹ In this particular instance, the overlap of a North American bioregional identity with free-trade agreements like the North American Free Trade Agreement (NAFTA) can offer a critique of the ecological effects of free trade. For example, understanding the movement of transgenic corn from the United States to Mexico or determining water-use in the international watershed of the Rio Grande may be better served by embedding free trade into ecological thinking rather than by relying on the rather more narrow principles of Ricardian trade theory. Identifying the species that make up the Rio Grande ecosystem and understanding the ecological relations between them offers a source of moral consideration that goes beyond economic thinking.

Third, species identification can be a biological peg for local social movements. For example, the identification of heirloom tomatoes and the particular qualities that those strains offer to humans is a source of political leverage to the organic food movement in the United States. Similarly, the Chipko peasant movement in India to assert local eco-rights and indigenous rights is based

COUNTING SPECIES

around the relation of a local human community to its local ecosystem and the particular tree species on which it depends for livelihood.⁷² Local social identities need not always be progressive or ecologically sound, of course. The Corn Belt in the United States, composed almost entirely of the relationship between one species of corn and a chain of agricultural production, is a biosocial collectivity at the heart of the industrial food chain.⁷³ Nothing about species-identification is inherently conservative or progressive, which is perhaps what makes it so worrisome to modern notions of ideology, identity and politics. But those species undeniably shape the life-conditions of the biosocial collectivities in which we live, and progressive movements must both take heed of them and endeavour to ally with them where possible if they do not want to cede their power to others.

In sum, the global biodiversity census constitutes in human minds the category of species with which we necessarily have relations and, arguably, to which we have responsibilities given their sentience, conativity and capacity for interior experience.⁷⁴ It highlights our embeddedness in the ecosystems in which we always participate and have effects. And, it creates a sense that the diversity of life-forms is both an ethical good and a prerequisite for long-term sustainability of human and planetary life.

CONCLUSION

As I have tried to extend the concept, biopower is no longer something that exists purely in human populations and communities. Rather, biopower can be thought of as a form of ecologically distributed power that involves interventions in human and nonhuman lives and is enacted by human and nonhuman subjects. Nonhuman entities are both active and complicit in these practices of power. The self-regulation of human subjects is even partly made by nonhumans, as in the nonhuman battle between vaccinations and viruses upon which social medical practices are built. Nonhumans are required to testify to the truth claims of biodiversity science and constitute part of its authority. They constitute and transform the biosocial collectivities upon which ecological interventions take place. They have their own strategies for intervention in those collectivities (adaptability, migration, reproduction), and they shape the kinds of human strategies for intervention that are possible and desirable. In analyses of power, authority and community in environmental politics, the 'bio' in biopower should be taken seriously as involving all of life.

NOTES

¹ Raven and Wilson 1992, Wilson 1992, Kelly 2000, Lawler 2001, Wilson 2003

² Wilson 1992: 318.

³ Heywood and Watson 1995.

⁴ Gaston and Spicer 2004: 43.

⁵ Hayden 1998: 39.

⁶ May, Lawton and Stork 1995.

⁷ Wilson 1992: 318.

⁸ Takacs 1996: 85. See also Stork 1997 and Harmon 2002, chapter 2, on the debates over methods for gauging biodiversity.

⁹ Political controversy has dogged the effort to change the United States census from an effort to achieve a direct head-count to use of statistical methods to make it more accurate. The Supreme Court ruled in 1999 that statistical sampling could not be used to determine Congressional apportionment; however, it allowed the use of statistical sampling for other uses such as distribution of funds for federal programs. Partisan debates over the effects of statistical adjustments have also hindered the full implementation of sampling procedures to overcome chronic undercounting. See Peterson 1999. I thank Andrew Dilts for clearing this up for me.

¹⁰ Lovejoy 1994, May, Lawton and Stork 1995, Wheeler 1995, Dobson 1996, Decker and O'Dor 2002, Harmon 2002.

¹¹ Luke 1995, Escobar 1998, Escobar 1999, Goldman 2001.

¹² As far as I am aware, there are no articles in the environmental ethics literature on the ethical implications of the global biodiversity census.

¹³ Maffi 2001.

¹⁴ Foucault 1978, Anderson 1983.

¹⁵ Latour 1999.

¹⁶ Duvall and Barnett 2005 offer a useful framing of four kinds of power, which I use to organise the discussion here. The first kind of power, compulsory power (i.e., direct control or coercion), is largely not applicable to the kinds of power at use in the biodiversity census. The second form of power, institutional power, and the third form, structural power, inform the discussion in Section 2. While more diffuse than compulsory power, these two forms of power are nonetheless identifiable in their effects and structures. By contrast, fourth face power, productive power, which Duvall and Barnett call 'the socially diffuse production of subjectivity in systems of meaning and signification' (4), is more difficult to pin down. I therefore use Foucault's work on biopower as a way into understanding how productive power relates to the biodiversity census in Section 4.

¹⁷ The idea of seductive power having particular dynamics of its own comes from Allen 2003. I thank the anonymous reviewer who steered me towards considering the implications of Allen's work for this article. Unlike forms of power like domination, coercion and manipulation, seduction 'leaves open the possibility that a subject can opt out' (30). In this respect, seduction resembles authority, which is also based on the recognition of power as legitimate by a subject, and thus holds the potential for refusal. The power of seductive power, paradoxically, lies partly in that right of refusal – what allows someone

COUNTING SPECIES

to be seduced by a panoptic discourse is the sense that there is nothing dominating or coercive about its appeal.

¹⁸ From <http://www.all-species.org/>, accessed June 15, 2006. See <http://www.sp2000.org> for the current publicly available data in the Catalogue of Life.

¹⁹ Stein 2002.

²⁰ Wilson 2003.

²¹ See <http://www.gbif.org> and <http://www.itis.gov>.

²² http://www.gbif.org/GBIF_org/bg1#whyneed, accessed 15 June 2006.

²³ On panopticism, see Foucault 1995. Also, see Debrix 1999.

²⁴ Wilson 2003.

²⁵ Wilson 2003.

²⁶ <http://www.all-species.org/>, accessed 15 June 2006.

²⁷ The distinction between modern and postmodern capitalism comes from O'Connor 1993.

²⁸ Escobar 1995: 195–208.

²⁹ Bamford 2002.

³⁰ Escobar 1996: 57.

³¹ On the role of scientists in steering global environmental governance, see Haas 1990, Haas 1992.

³² Latour 1993. As an anonymous reviewer pointed out, the force of human/nonhuman hybridity is not in introducing the nonhuman into the human; it is pointing out that it is already there and always has been. The matter is one of undoing discursive denials.

³³ The question is Donna Haraway's, Haraway 1997: 113.

³⁴ Allen 2004.

³⁵ Although most biopolitical analyses do not consider nonhuman subjectivities, see the wonderful work by Lewis Holloway (Holloway 2007, Holloway and Morris 2007), where he uses the biopower frame to consider bovine subjectivities in the context of farming techniques.

³⁶ Foucault 1978: 140.

³⁷ Foucault 1978: 138.

³⁸ Escobar 1996.

³⁹ Foucault 1978: 139.

⁴⁰ Foucault 1978: 141.

⁴¹ Foucault 1978: 143.

⁴² Rabinow and Rose 2003: 2.

⁴³ Rabinow and Rose 2003.

⁴⁴ Among many, see Callon and Latour 1981, Pickering 1993, Latour 1996, Latour 1999, Law and Hassard 1999, Latour 2005.

⁴⁵ On the testimony of nonhumans, see Latour 1993.

⁴⁶ Allen 2004. Also see Allen 2003, chapter 4, where Allen questions whether it truly possible to see 'almost anything and everything... as a technique or relation of power' (68). For Allen, even if power is immanent rather than a capacity or an external force, it cannot be everywhere. Rather, he suggests that we need topologies or cartographies

of power that show 'specific diagrams' of power in particular institutions or sites (68). Pushed beyond these sites, however, descriptions of immanent power start to become metaphorical, and in Allen's view, they start to lose sight of the ways that spatiality intervenes in and mediates the practices of power.

⁴⁷ Foucault 1978: 95:

Where there is power, there is resistance, and yet, or rather consequently, this resistance never in a position of exteriority in relation to power. Should it be said that one is always 'inside' power, there is no 'escaping' it, there is no absolute outside where it is concerned, because one is subject to the law in any case?... This would be to misunderstand the strictly relational character of power relationships. Their existence depends on a multiplicity of points of resistance... These points of resistance are present everywhere in the power network. Hence, there is no single locus of great Refusal, no soul of revolt, source of all rebellions, or pure law of the revolutionary. Instead there is a plurality of resistances, each of them a special case...

⁴⁸ Although see Shaw 2000, Wendt 2003.

⁴⁹ Goldman 2001.

⁵⁰ The Convention on Biological Diversity (1992) is a start on addressing the interlinked dimensions of biodiversity, though the refusal of the United States to sign the treaty hampers its effectiveness (www.biodiv.org/default.shtml). See also the United Nations Environmental Program's work on biodiversity, (<http://www.unep.org>).

⁵¹ Takacs 1996.

⁵² Archibugi, Held and Kohler 1998, Linklater 1998.

⁵³ Wolf 1999. See Moravcsik 2002 for a contrary perspective on the democratic deficit.

⁵⁴ Goldman 2001.

⁵⁵ For example, Young 1997.

⁵⁶ Anderson 1983: 165.

⁵⁷ Anderson 1983: 184.

⁵⁸ Zureik 2001.

⁵⁹ Rabinow and Rose 2003: 2–3.

⁶⁰ Hardt and Negri 2000.

⁶¹ Hardt and Negri 2000: 23.

⁶² Hardt and Negri 2000: 24.

⁶³ Hardt and Negri 2000: 29–30.

⁶⁴ O'Connor 1993.

⁶⁵ Wilson 1992: 142. He uses the term in reference to the sheer numbers of bacterial species; however, his metaphor also gestures to the work that bacteria do in ecological terms, in breaking down vast quantities of organic matter. Perhaps the term overstates the Marxist analogy – bacteria, after all, do not have class consciousness – but it nonetheless seems to me to be a way to acknowledge their ecological importance relative to human scale.

⁶⁶ Rabinow and Rose 2003: 4.

⁶⁷ Rabinow and Rose 2003: 4, emphasis added.

COUNTING SPECIES

⁶⁸ In the material-semiotic perspective advanced by Donna Haraway (1991; 1997) and Bruno Latour (1993), meaning is made not only through language but also through bodies and biology – meaning literally circulates through materiality as well as language, moving from one realm into the other and back again. Material things are semiotic, both in the sense that they carry signs that human minds interpret and in the sense that they transform those signs through the very act of being. Similarly, for postmodern theorists of gender like Judith Butler (1993) who read bodies as texts, it is not just that bodies can be read ‘as’ texts in a metaphorical sense; rather, it is that texts and bodies share in the process of making meaning. Neither society nor nature determines gender; it is made through linked circuits of meaning that move through both realms in performed discourse. Discourse, in this postmodern sense, is not just ‘talk’, but is a series of practices that involve both speech/language and materiality, linking them into a structured regime of meanings. My concern here is with the category of ‘human’ and, particularly, with the way that its meaning is made in discursive practices that include biological and bodily similarities as well as linguistic constructions like cosmopolitanism and human rights.

⁶⁹ Devall and Sessions 1985, Fox 1990.

⁷⁰ Ecocentric thinking, as Robyn Eckersley points out (Eckersley 1992), takes ‘our [human] proper place in the rest of nature as logically prior to the question of what are the most appropriate social and political arrangements for human communities’ (28). For some deep ecologists, this perspective has meant considering the human species as a whole in relation to the global ecosystem, as in EarthFirst!’s infamous identification of human beings as a ‘cancer’ in the global ecosystem (Zimmerman 1991) or in taking the Gaia hypothesis to its logical extreme. The ‘wider self’ that Arne Naess proposes likewise finds its ultimate expression in the global ecosystem (Naess 1985). Nonetheless, many ecocentric thinkers, like Eckersley, are careful to safeguard some human interests and politics outside the perceived demands of the global ecosystem (see Dryzek 2000, chapter 6). I thank the anonymous reviewer who pointed this out.

⁷¹ See e.g., Flannery 2001.

⁷² On the Chipko movement, see Escobar 1995, though see Mawdsley 1998 for a critique that the Chipko movement has been over-romanticised as a neo-populist movement

⁷³ See Pollan 2006 popular account.

⁷⁴ See among many arguments for moral obligations on these grounds, Rolston 1988, Singer 1990.

BIBLIOGRAPHY

- Allen, J. 2003. *Lost Geographies of Power*. Oxford: Blackwell.
- Allen, J. 2004. ‘The whereabouts of power: politics, government, and space’. *Geografiska Annaler: Series B, Human Geography* **86B**(1): 19–32, doi:10.1111/j.0435-3684.2004.00151.x.
- Anderson, B. 1983. *Imagined Communities*. London: Verso.
- Archibugi, D., D. Held and M. Kohler, Eds. 1998. *Re-Imagining Political Community*. Stanford: Stanford University Press.

- Bamford, S. 2002. 'On being "natural" in the rainforest marketplace: science, capitalism, and the commodification of biodiversity'. *Social Analysis* 46(1): 35–50.
- Butler, J. 1993. *Bodies That Matter: On the Discursive Limits of Sex*. New York: Routledge.
- Callon, M. and B. Latour. 1981. 'Unscrewing the big Leviathan: How actors macro-structure reality and how sociologists help them to do so'. In K. Knorr-Cetina and A. V. Cicourel (eds.), *Advances in Social Theory and Methodology: Towards an Integration of Macro and Micro Sociologies* (Boston: Routledge).
- Debrix, F. 1999. 'Space quest: surveillance, governance, and the panoptic eye of the United Nations'. *Alternatives* 24: 269–294.
- Decker, C. J. and R. O'Dor. 2002. 'A census of marine life: unknowable or just unknown?' *Oceanologica Acta* 25(5): 179–186, doi:10.1016/S0399-1784(02)01208-2.
- Devall, B. and G. Sessions. 1985. *Deep Ecology: Living as If Nature Mattered*. Salt Lake City, UT: Peregrine Smith Books.
- Dobson, A. 1996. *Conservation and Biodiversity*. New York: Scientific American Library.
- Dryzek, J. S. 2000. *Deliberative Democracy and Beyond: Liberals, Critics, and Contestations*. Oxford: Oxford University Press.
- Duvall, R. and M. N. Barnett. 2005. 'Power and global governance'. In R. Duvall and M. N. Barnett (eds.), *Power and Global Governance* (New York: Cambridge University Press), pp. 1–32.
- Eckersley, R. 1992. *Environmentalism and Political Theory: Toward an Ecocentric Approach*. Albany: State University of New York Press.
- Escobar, A. 1995. *Encountering Development: The Making and Unmaking of the Third World*. Princeton: Princeton University Press.
- Escobar, A. 1996. 'Constructing Nature'. In R. Peet and M. Watts (eds.), *Liberation Ecologies: Environment, Development, and Social Movements* (New York: Routledge), pp. 46–68.
- Escobar, A. 1998. 'Whose knowledge, whose nature? Biodiversity, conservation, and political ecology of social movements'. *Journal of Political Ecology* 5: 5–82.
- Escobar, A. 1999. 'After Nature: steps to an antiessentialist political ecology'. *Current Anthropology* 40(1): 1–30, doi:10.1086/515799.
- Flannery, T. 2001. *The Eternal Frontier: An Ecological History of North America and Its Peoples*. New York: Grove Press.
- Foucault, M. 1978. *The History of Sexuality: Volume 1*. New York: Vintage Books.
- Foucault, M. 1995. *Discipline and Punish: The Birth of the Prison*. New York: Vintage Books.
- Fox, W. 1990. *Towards a Transpersonal Ecology: Developing New Foundations for Environmentalism*. Boston: Shambhala Publications.
- Gaston, K. J. and J. I. Spicer. 2004. *Biodiversity: An Introduction*. Malden, MA: Blackwell Publishing.
- Goldman, M. 2001. 'Constructing an environmental state: eco-governmentality and other transnational practices of a 'green' World Bank'. *Social Problems* 48(4): 499–523, doi:10.1525/sp.2001.48.4.499.

COUNTING SPECIES

- Haas, P. 1990. 'Obtaining international environmental protection through epistemic consensus'. *Millennium* **90**: 347–364.
- Haas, P. 1992. 'Introduction: Epistemic communities and international policy coordination'. *International Organization* **46**(1): 1–35.
- Haraway, D. 1991. *Simians, Cyborgs, and Women*. New York: Routledge.
- Haraway, D. 1997. *Modest_Witness@Second_Millennium.Femaleman©_Meets_Oncomouse™*. New York: Routledge.
- Hardt, M. and A. Negri. 2000. *Empire*. Cambridge: Harvard University Press.
- Harmon, D. 2002. *In Light of Our Differences: How Diversity in Nature and Culture Makes Us Human*. Washington, DC: Smithsonian Institution Press.
- Hayden, C. 1998. 'A biodiversity sampler for the Millennium'. In S. Franklin and H. Ragone (eds.), *Reproducing Reproduction: Kinship, Power, and Technological Innovation* (Philadelphia).
- Heywood, V. H. and R. T. Watson. 1995. *Global Biodiversity Assessment*. Cambridge: Cambridge University Press.
- Holloway, L. 2007. 'Subjecting cows to robots: farming technologies and the making of animal subjects'. *Environment and Planning D: Society and Space* **25**(6): 1041–1060, doi:10.1068/d77j.
- Holloway, L. and C. Morris. 2007. 'Exploring biopower in the regulation of farm animal bodies: genetic policy interventions in UK livestock'. *Genomics, Society and Policy* **3**(2): 82–98.
- Kelly, K. 2000. 'All species inventory: a call for the discovery of all life-forms on Earth'. *Whole Earth*(Fall): 4–9.
- Latour, B. 1993. *We Have Never Been Modern*. Cambridge, Mass.: Harvard University Press.
- Latour, B. 1996. 'On Actor-Network Theory: a few clarifications'. *Soziale Welt* **47**: 369–381.
- Latour, B. 1999. *Pandora's Hope: Essays on the Reality of Science Studies*. Cambridge, MA: Harvard University Press.
- Latour, B. 2005. *Reassembling the Social: An Introduction to Actor-Network Theory*. Oxford: Oxford University Press.
- Law, J. and J. Hassard, eds. 1999. *Actor Network Theory and After*. Oxford, Blackwell Publishers.
- Lawler, A. 2001. 'Up for the count?' *Science* **294**: 769–770, doi:10.1126/science.294.5543.769.
- Linklater, A. 1998. *The Transformation of Political Community*. Columbia: University of South Carolina Press.
- Lovejoy, T. E. 1994. 'The quantification of biodiversity: an esoteric quest or a vital component of Sustainable Development?' *Philosophical Transactions of the Royal Society of London, B*. **345**: 81–87, doi:10.1098/rstb.1994.0089.
- Luke, T. W. 1995. 'On environmentality: geo-power and eco-knowledge in the discourses of contemporary environmentalism'. *Cultural Critique*: 57–81, doi:10.2307/1354445.

- Maffi, L. (ed). 2001. *On Biocultural Diversity: Linking Language, Knowledge, and the Environment*. Washington, DC, Smithsonian Institute.
- Mawdsley, E. 1998. 'After Chipko: from environment to region in Uttarnchal'. *Journal of Peasant Studies* **25**(4): 36–54, doi:10.1080/03066159808438683.
- May, R. M., J. H. Lawton and N. E. Stork. 1995. 'Assessing extinction rates'. In J. H. Lawton and R. M. May (eds.), *Extinction Rates* (Oxford: Oxford University Press), pp. 1–24.
- Moravcsik, A. 2002. 'Reassessing legitimacy in the EU'. *Journal of Common Market Studies* **40**(4): 603–625, doi:10.1111/1468-5965.00390.
- Naess, A. 1985. 'Identification as a source of deep ecological attitudes'. In M. Tobias (ed.), *Deep Ecology* (Santa Monica: IMT Productions).
- O'Connor, M. 1993. 'On the misadventures of capitalist Nature'. In M. O'Connor (ed.), *Is Capitalism Sustainable: Political Economy and the Politics of Ecology* (New York: The Guilford Press).
- Peterson, I. 1999. 'Census sampling confusion'. *Science News Online* **155**(10).
- Pickering, A. 1993. 'The mangle of practice'. *American Journal of Sociology* **99**(3): 559–589, doi:10.1086/230316.
- Pollan, M. 2006. *The Omnivore's Dilemma*. New York: Penguin Press.
- Rabinow, P. and N. Rose. 2003. 'Thoughts on the concept of biopower today'. <http://www.lse.ac.uk/collections/sociology/pdf/RabinowandRose-BiopowerToday03.pdf>
- Raven, P. H. and E. O. Wilson. 1992. 'A fifty-year plan for biodiversity surveys'. *Science* **258**: 1099–1100, doi:10.1126/science.258.5085.1099.
- Rolston, H. 1988. *Environmental Ethics: Duties to and Values in the Natural World*. Philadelphia: Temple University Press.
- Shaw, M. 2000. *Theory of the Global State*. Cambridge: Cambridge University Press.
- Singer, P. 1990. *Animal Liberation*. New York: Avon Books.
- Stein, L. 2002. 'Creating a Bioinformatics Nation'. *Nature* **417**: 119–120, doi:10.1038/417119a.
- Stork, N. E. 1997. 'Measuring Global Biodiversity and Its Decline'. In M. L. Reaka-Judla, D. E. Wilson and E. O. Wilson (eds.), *Biodiversity II: Understanding and Protecting Our Biological Resources* (Washington, DC: Joseph Henry Press), pp. 41–68.
- Takacs, D. 1996. *The Idea of Biodiversity: Philosophies of Paradise*. Baltimore: Johns Hopkins University Press.
- Wendt, A. 2003. 'Why a World State is inevitable'. *European Journal of International Relations* **9**(4): 491–542, doi:10.1177/135406610394001.
- Wheeler, Q. D. 1995. 'Systematics and biodiversity: policies at higher levels'. *BioScience* **45**: 21–28, doi:10.2307/1312439.
- Wilson, E. O. 1992. *The Diversity of Life*. Cambridge, MA: Harvard University Press.
- Wilson, E. O. 2003. 'The encyclopedia of life'. *Trends in Ecology and Evolution* **18**(2): 77–80, doi:10.1016/S0169-5347(02)00040-X.
- Wolf, K. D. 1999. 'The new raison d'état as a problem for democracy'. *European Journal of International Relations* **5**(3): 333–363, doi:10.1177/1354066199005003003.

COUNTING SPECIES

- Young, O., Ed. 1997. *Global Governance: Drawing Insights from the Environmental Experience*. Cambridge, MA, MIT Press.
- Zimmerman, M. 1991. 'Deep ecology, ecoactivism, and human evolution'. *ReVision* **13**(3): 122–28.
- Zureik, E. 2001. 'Constructing Palestine through surveillance practices'. *British Journal of Middle Eastern Studies* **28**(2): 205–227, doi:10.1080/13530190120083086.

