Origins, Uses, and Transformation of Extinction Rhetoric

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ABSTRACT: The concept of extinction is at the heart of the modern conservation movement, and massive resources have been spent on developing models and frameworks for quantifying and codifying a phenomenon that has been described by American researcher and naturalist Edward O. Wilson as an obscure and local biological process. Scientists, environmentalists, and politicians have repeatedly used extinction rhetoric as a core justification for a global conservation agenda that seeks to influence a wide range of human activities despite the inherent difficulty and uncertainty involved in estimating current and future rates of extinction, or even in verifying the demise of a particular species. In this article we trace the historical origins of the extinction concept and discuss its power to influence policies, agendas, and behaviors. We argue that conservation needs to develop a more culturally meaningful rhetoric of extinction that aligns scientific evidence, cultural frames, institutional frameworks, and organizational interests.

KEYWORDS: climate change, conservation, crisis, extinction, frames, Red Lists, rhetoric

The death of a species is a more remarkable event than the end of an imperial dynasty. (Orton 1869: 540)

Extinction is typically viewed by contemporary conservation scientists as the logical endpoint of the process of population decline, that is, the point on the graph where the population size curve meets the x-axis and terminates abruptly and finally (Ladle and Jepson 2008). The operational definition given by the International Union for Conservation of Nature (IUCN) is that a species should be considered extinct “when there is no reasonable doubt that the last individual has died” (IUCN 2001: 14). This definition reveals one of the main stumbling blocks for field-based measurements of extinction: the difficulty of ascertaining the continued existence of a species that is certainly exceedingly rare and may also inhabit an isolated area that is difficult to survey effectively. The final death of a species, beyond the gaze of the scientists and conservationists, led Edward O. Wilson (1992: 255) to conclude that extinction is “the most obscure and local of all biological processes.”

The IUCN guidelines state that a species can be declared extinct only after exhaustive surveys fail to produce any observations within a time period and geographical range that are appropriate to its life cycle and life form—an unfeasible task for most species (Roberts 2006). Butchart

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and his colleagues have recently reinstated the defunct category of 'possibly extinct' to apply to those species that are, "on the balance of evidence, likely to be extinct, but for which there is a small chance that they may be extant and thus should not be listed as Extinct until adequate surveys have failed to find the species and local or unconfirmed reports have been discounted" (Butchart, Stattersfield, and Brooks 2006: 9). Interestingly, this necessary 'gray area' has not prevented many species from being prematurely labeled as extinct, allowing them to be 'rediscovered' and, in the process, generating many positive headlines (Ladle et al. 2009).

The above definitions of extinction are concerned with species that are known to science, have been collected and processed, and exist as physical specimens in the world's biological collections. However, there may be anywhere from 1 to 100 million species for which science has no official records at the present time (Lomolino 2004). Extinctions of these 'yet to be discovered' species have been of great importance in the construction of the 'extinction crisis', and they are claimed to outnumber documented extinctions many times over (Whittaker et al. 2005). Such 'unseen' or postulated extinctions are highly dependent on estimates of global species richness and are the source of most of the headline-grabbing figures that periodically appear in the media. Moreover, the majority of such extinctions are in poorly described taxa (groups of organisms) and ecosystems, such as arthropods in tropical forests.

Despite the inherent uncertainty associated with identifying, measuring, and forecasting extinctions (Ladle 2009), the concept of extinction is a prominent element of issues relating to the environment. It has been instrumental in the production of international conservation agreements and associated programs and, for more than a century, has been deployed to attract attention and motivate individual and collective actions that constrain our attitudes and behaviors toward the non-human world.

Extinction is the focal point of a vast scientific literature, concentrating mainly on the development of techniques to measure and forecast extinction rates (reviewed in Lawton and May 1995; see also Ladle 2009). These techniques are based on insights from diverse fields, including paleontology (Jablonski 2001; McKinney 1997), genetics (Keller and Waller 2002), island biogeography (Channell and Lomolino 2000), behavior (Courchamp et al. 1999), and taxonomy (Nee and May 1997). The wide variety of ways in which extinction can be defined, classified, and measured has (perhaps unsurprisingly) led to increasing levels of misrepresentation of this concept in the public domain (Ladle et al. 2005). In an attempt to clarify the diverse meanings of the term 'extinction' and to explain its power to influence institutional and individual behaviors, Ladle and Jepson (2008) presented a new typology of extinction concepts associated with different degrees of scientific certainty concerning the disappearance of a species and the potential for its re-emergence at some point in time. They briefly discussed the social influence and power of these different extinction 'types' in different settings and, in so doing, drew attention to the multiple and changing usages of the term.

In this article we present an extended review and discussion about the origins and agency of the term 'extinction' and examine its historical and contemporary impact in conservation discourse, policy, and management. To provide greater analytical traction, we draw on the concept of the 'frame' (Goffman 1974), which suggests that people make sense of and act within a complex world by gathering together an assemblage of ideas, objects, and practices in frames (i.e., mental models/schemas). The concept has been extended by new social movement theorists (e.g., Benford and Snow 2000) and is gaining popularity in science technology studies (e.g., Calлон 1998), policy studies (e.g., Triandafyllidou and Fotiou 1998), including conservation (e.g., Lorimer 2006), and environmental communication (e.g., Davis 1995). Frames are essentially stories constructed from concepts, metaphors, beliefs, and images interacting with the everyday practices and technologies through which we live our lives. While each person constructs his
or her own frame and is able to switch between multiple frames, frame construction is largely a social and cultural process. Frames develop over time and can be understood as the sedimented histories of particular ways of understanding and engaging with the world. When frames include collective actions that attract widespread consent, they become institutionalized, guiding policies and scientific, management, and cultural practices (Tarrow 1992).

The premise we explore in this article is that extinction—as a term, concept, fact, and possibility—organizes and assembles frames that incorporate individual and collective anxieties relating to loss, decline, crisis, and so forth. These frames help to explain and give meaning to events in the non-human world and motivate and legitimate ideas for collective action. At the same time, they enable conservation/environment issues to bridge and flow into numerous other frames. Further, we suggest that the rhetorical power and cultural agency of extinction enroll actors not directly concerned with avoiding species extinction, consciously or otherwise, into pronouncements and interventions in the environment/conservation issue frame. These processes serve to transform extinction from a key idea element within wider frames to a distinct issue frame that has come to have an immense influence on social decision making.

In considering these ideas, this article is organized into three sections. The first section presents a brief review of the origins and historical context of the extinction concept. The second section focuses on the power of this concept to transform intentional collective or individual actions (sensu Engeström 2006; Eskola 1999) and examines the interplay between the domains of scientific practice, the media, and conservation policy and governance institutions. In the concluding section, we take stock of the influence of extinction on decision-making frames and explore areas of further investigation that would extend our understanding of the cultural, social, and political dimensions of this concept.

**The Origins of the Extinction Concept**

The history of the concept of species extinction has two separate components. The first involves the realization during the nineteenth century that it is possible for a species to cease to exist. The second entails the recognition that the decline and eventual disappearance of a species can be directly or indirectly attributable to human impacts on the environment (Lowe 1983). Neither of these processes occurred rapidly or completely, and it was probably not until the first decades of the twentieth century that a scientific consensus emerged on the role of humans in extinction, following the high-profile disappearance of several formerly abundant and highly visible species, such as the passenger pigeon.

The slow emergence of a concept of extinction is unsurprising, given the almost complete lack of biogeographical knowledge and the strict biblical interpretations that dominated Western thinking in the natural sciences until the middle of the nineteenth century. Perhaps the best candidate for the first documented extinction is a plant referred to as 'silphium' by Pliny the Elder in AD 77, who commented that its resin was a valuable and effective remedy against illnesses ranging from fevers, coughs, and warts, not to mention its role as a useful contraceptive (Parejko 2003). Pliny goes on to describe a drastic decline in silphium availability and that, within his own lifetime, the plant had not been seen in its native habitat for many years, the last known stalk, valued at its weight in gold, having been sent to the emperor Nero (ibid.). However, it was not until detailed analysis of the fossil remains of species such as the mammoth in the late eighteenth century that extinction emerged as a socially important theme with potential theological implications. The central figure in establishing extinction as an undeniable fact was Georges Cuvier (1769–1832), a professor of animal anatomy at the French National Museum
of Natural History in Paris. Cuvier’s careful reconstructions of fossil elephants led him to con-
clude that (1) they were very different from any living species; (2) given their size and dramatic
appearance, it was very unlikely that they still existed; and (3) the probable cause of extinction
was some form of periodic catastrophe (Rudwick 1997).

By 1859, the year Darwin published his seminal work, extinction was already widely accepted
among the academic community, although great doubts still remained about what could have
driven enormous animals such as dinosaurs and mastodons out of existence. These doubts
extended to more contemporary examples of extinction where, in hindsight, human involve-
ment seems obvious and decisive. A good example is the Great Auk (Pinguinus impennis), a
large and impressive seabird that was hunted into extinction by European fisherman. According
to nineteenth-century accounts, the last specimens were collected by a party of Icelanders in
1844 (Bengtson 1984). Although in hindsight overhunting was clearly to blame for the demise
of the Great Auk, contemporary writers had great difficulty accepting the pivotal role of human
action. As James Orton (1869: 540) expressed it: “The upheaval or subsidence of strata, the
encroachments of other animals, and climatal revolutions—by which of these great causes of
extinction now slowly but incessantly at work in the organic world, the Great Auk departed this
life, we cannot say.”

This reluctance to attribute human causes to the contemporary extinction of species lasted
into the twentieth century, with many (but by no means all) commentators being reluctant to
point the finger of blame at fellow humans for playing an important role in extinctions. The rea-
sons behind the decline of the passenger pigeon (Ectopistes migratorius)—a heavily hunted spe-
cies that has become iconic to the modern conservation movement—were also actively debated
in the scientific literature of the time. In a publication of the American Ornithologists’ Union,
G. C. Tremaine Ward (1901: 191) stated: “I am not aware of any satisfactory explanation of the
phenomena [i.e., the decline of the passenger pigeon]. It is not improbable, some epidemic
disease, spreading more rapidly on account of the immense number of individuals, nearly exter-
minated the species.”

As with the acceptance of the fact of extinction, the scientific community slowly coalesced
around the idea that this new wave of extinctions was most likely being driven by human action,
often through direct persecution. This new understanding mobilized the formation of influen-
tial societies, notably the Boone and Crockett Club in New York, founded in 1887 by Theodore
Roosevelt, and the Society for the Preservation of the Wild Fauna of the Empire in London,
originally founded in 1903 in Africa by British naturalists and American statesmen. These orga-
nizations and others like them promoted the social value that the “human conquest of nature
carries with it a moral responsibility to ensure the survival of threatened life forms” (Whittaker
et al. 2005: 4) and were a driving force behind the creation of wildlife sanctuaries and refuges
in North America and colonial territories (Jepson and Whittaker 2002). This social value, along
with the reality of extinctions, aligned with and was informed by nineteenth-century Western
humanitarian preoccupations relating to cruelty to domestic animals (Thomas 1984) and their
extension to practices of “bird slaughter for millinery ornament” (Doughty 1975: 103), market
hunting (e.g., for bison tongues), and recreational hunting (Trefethen 1961).

These social trends of the late nineteenth century coincided with the rise of the print media,
and newspaper reportage of such events constructed the concepts of human-induced extinc-
tion and associated moral responsibilities in the minds of European and East Coast American
readerships. In conjunction with the debates surrounding the publication of Darwin’s Origin
of Species, they transformed Western framings of nature by downplaying the organizing role
of religious ideas and introducing new scientific notions. Furthermore, the awful loss of life during
World War I promoted associations in the public mind between the senseless killing of humans
and that of wildlife, further enhancing the legitimacy of collective action to govern the processes leading to extinction (Jepson and Whittaker 2002). Thus, by 1931, the influential American biweekly magazine, *Science News-Letter* (now *Science News*) was prompted to write the following with respect to the rapid demise of the thylacine (*Thylacinus cynocephalus*), also known as the Tasmanian tiger: “Australia, which has had a development more or less analogous to that of the American West, is now passing through a phase also experienced in America—the realization that reckless slaughter is threatening extermination of many of its unique animal species.” The article goes on to report how the government of Tasmania had recently taken steps to preserve the remaining thylacines by banning the exportation of pelts. The last known thylacine died in Tasmania’s Hobart Zoo on 7 September 1936 (Bulte et al. 2003).

Such high-profile extinctions and the fear that colonial expansion into Africa would result in the decimation and extinction of large mammal populations did much to galvanize the nascent global conservation movement. One notable result was the 1933 Convention Relative to the Preservation of Fauna and Flora in Their Natural State, which was signed in London and became known as the London Convention. This treaty, which established a set of African parks and wildlife sanctuaries (Hingston 1931; Jepson and Whittaker 2001), convinced Harold Coolidge, a leading conservationist of the time, that extinctions could no longer be treated as singular and unfortunate events. Coolidge mobilized the funds to commission the first two global reviews of extinction (Allen 1942; Greenway [1958] 1967), which played a significant role in promoting the view of individual extinctions and declines as indicators of a much larger pattern of global extermination.

A more catastrophic view of nature’s trajectory came to the fore in the 1970s in the context of Malthusian worries over the population bomb (Ehrlich 1971), anxieties due to the oil crisis, and dire forecasts about the fate of tropical forests (see, e.g., Myers 1979). Arguably, it was during this period that the term ‘crisis’ became attached to the extinction concept and began to be used more systematically and strategically as an advocacy device by both scientists and conservationists—a trend that reflected the extent to which the concept had become embedded within Western societies.

### The Transformative Power of the Extinction Concept

Those who believe that the rate [of extinction] is several times higher than normal often talk of a biodiversity or extinction “crisis.” Crisis talk has tremendous rhetorical value in the political terrain of the North. (Sarkar 2005: 6)

Due to a combination of inherent scientific uncertainties and deeply held but frequently undisclosed beliefs about the intrinsic value of other species, extinction rhetoric occupies a unique space in contemporary science discourse where estimates and forecasts of species loss can vary dramatically in magnitude and certainty, depending upon the intended audience and the communication media. Following Sarkar (2005), here we define the extinction crisis as the belief that the current rate of extinction is several times higher than the normal background rate (from the geological past). It is difficult to pinpoint the beginnings of the crisis framing of extinction, but some members of the scientific community were certainly making claims of this nature by the late 1960s and early 1970s. For example, Iltsis (1970) quotes S. Dillon Ripley of the Smithsonian Institute as saying that the majority of the world’s animal species will be extinct by the year 2000.

One of the first and most widely disseminated estimates of the current rate of global extinction was produced by Norman Myers (1979) in his influential book, *The Sinking Ark: A New
Look at the Problem of Disappearing Species. In this book, Myers made the claim that, on average, 40,000 species per year would become extinct over the course of twenty-five years (ibid.: 5). Although this figure was clearly a first-cut estimate based on circular reasoning and very little hard information, it has frequently been quoted by environmental organizations, politicians, and other interested groups. Myers’s claim has also been used as an illustration of misrepresentation and scaremongering and was a key example in Lomborg’s (2001) *The Skeptical Environmentalist*, a highly publicized critique of the global environmental movement. Recently, Myers (2001) admitted that the estimate of 40,000 extinctions per year was “preliminary and exploratory, and advanced primarily to get the issue of extinction onto scientific and political agendas.” In this respect, he certainly achieved his aim, as testified by the publication of *Global 2000 Report to the President of the United States*, in which it was estimated that 500,000 to 2,000,000 species could become extinct between the years 1980 and 2000 (Barney 1980).

During the 1990s, the notion of an extinction crisis was extended and given added gravity by dubbing it the ‘sixth extinction’ event (Leakey and Lewin 1995). This frame amplification constructs extinction as a major present-day phenomenon—one that has not happened for 45 million years and one that, in contrast to the last five extinction events, which were caused by physical changes, has been caused by anthropogenic influences (Eldredge 2001). The sixth extinction rhetoric has been widely deployed by leading scientists and is popular with the media. We suggest that in this guise the concept of extinction is constitutive of processes to adopt the term ‘anthropocene’ for the current geological epoch.3

Scientific Practice

The first systematic scientific account of extinction was made by Walter Rothschild, a scion of the Rothschild family who was a zoologist, as well as a banker and politician. His paper presented at the 4th International Ornithological Congress (Rothschild 1905) and his subsequent book (Rothschild 1907) compiled accounts of extinct species that had appeared in lists of the faunas of regions and islands since 1580. The book can be understood as part of the broader scientific effort to document forms of life, but Rothschild’s treatment of the causes of extinction and his unequivocal statement—“the melancholy fact … that man and his satellite dogs, cats, rats and pigs are the worst and indeed only important agents of destruction of the native avifaunas wherever they go”—helped establish the idea in scientific circles that human expansion into new territories needed governing. Interestingly, there are three features of Rothschild’s account that have virtually disappeared from contemporary scientific discourse on extinction.

The first is the use of the present continuous tense of the verb ‘to vanish’. This was prominent in the title of early reviews of extinct and nearly extinct birds and mammals (e.g., Allen 1942; Greenway [1958] 1967; Harper 1945), but seems to have fallen out of vogue in the 1960s and 1970s, with the notable exception of Tim Halliday’s (1978) book *Vanishing Birds*. The replacement of ‘vanishing’ with the terms ‘threatened’, ‘endangered’, and ‘vulnerable’ represents a shift in the logic of extinction rhetoric, a move toward representing extinction as a risk that could be managed through the proper execution of governance technologies and techniques.

The second change in authoritative accounts of extinction—nowadays framed as the assessment of threatened species—is the absence of anecdotal accounts provided by non-expert travelers and residents of the regions. Rothschild regularly quoted from letters that provide descriptions of field observations. Indeed, Greenway ([1958] 1967) included a list of ‘hypothetical’ extinct species known only from eyewitness accounts. However, over time, such local ecological knowledge has gradually been replaced by evidence published in scientific papers and reports or collated through networks of experts developed and managed by conservation
institutions. This increasing ‘scientification’ of extinction risk accounts has presumably served to strengthen the authority of extinction-related information in official policy circles.

Finally, contemporary accounts of threatened species rarely mention the possibility that extinction might be the result of natural phenomena. By contrast, Rothschild (1907) talked about natural cataclysms and devastated populations losing their vitality when discussing the demise of the New Zealand moa, a large flightless bird, whose extinction coincided with the arrival of humans on the islands. Perhaps unsurprisingly, given the widespread transformations in ecosystems since Rothschild’s day, contemporary extinction discourse focuses almost exclusively on the anthropogenic causes of extinction, thereby emphasizing the need for governance of human behaviors and societal systems.

A more distinct science of conservation started to take shape in the late 1970s and early 1980s when conservation biology was recognized as a sub-discipline ‘worthy’ of academic study in its own right, with university courses, textbooks, and peer-reviewed journals. The first international conference dedicated to conservation biology took place as recently as 1978 at the University of California, San Diego. However, the study of conservation biology noticeably accelerated with the founding of the US-based Society for Conservation Biology in 1986 and the publication of the first edition of its influential journal, *Conservation Biology*, in 1987. Founded and supported by some of the ‘giants’ of modern conservation and ecology—Edward O. Wilson, Ernst Mayr, Michael Soulé, Paul R. Ehrlich—the society has led the development of conservation science into the twenty-first century and has been instrumental in both legitimizing conservation as an academic discipline and providing the hard data and strong concepts that underlie modern conservation practice. From its beginnings, conservation biology was framed as a crisis discipline. Indeed, Soulé (1985) went so far as to state that this characteristic primarily distinguishes conservation biology from related disciplines.

One of the major components of this crisis was the belief, based on a variety of scientific evidence, that the current rate of extinction was many times greater than normal background rates (Sarkar 2005). Much of this evidence was strong, especially the rates of documented extinctions on oceanic islands, and there was a justifiable consensus among the scientific community about the reality of unusually high extinction rates (Pimm 2002). The evidence came from two main sources: (1) historically documented extinctions, and (2) models, simulations, and frameworks that relate environmental change (e.g., habitat loss and transformation) to probabilities of the extinction of individual species or to rates of extinction within specified areas and time frames (Lawton and May 1995). It is this second source of evidence, especially with respect to estimates and predictions of future global extinction rates, that has been the foundation for many of the most high-profile claims of the extinction crisis and the sixth extinction event discussed above.

There are many ways to forecast extinction (reviewed in Ladle 2009), but probably the most widely used (and misused) method is based on the observation that the relationship between the size of an oceanic island and the number of species it contains can be effectively captured by a simple mathematical relationship, known as the species-area curve. Scientists have used this relationship to calculate how many fewer species should be found in ecosystems such as tropical forests after large areas have been cleared. An example of this is Wilson’s (1992: 268) ‘conservative’ prediction of approximately 27,000 species going extinct every year, based on the rate of tropical deforestation. There is nothing fundamentally wrong with such extrapolations, but without an appreciation of the underlying assumptions, such crude statements may give a false impression of certainty to non-scientists and—potentially more damaging to the conservation movement—may also result in scientists being accused of hyperbole. In the case of the species-area relationship, the key assumptions are that (1) the number of species and the proportion of endemic species prior to habitat destruction are known; (2) the slope of the species-area
relationship has been correctly determined; (3) terrestrial islands such as fragments of rainforest act like oceanic islands; (4) the number of species in the original habitat was already in equilibrium; and (5) when the area of the habitat is reduced, the species do not go extinct immediately but are slowly lost due to a range of demographic, genetic, and environmental effects (Ladle 2009; Whittaker et al. 2005).

Of these assumptions, the estimated total number of species has the most scope for influencing the figure for global extinctions (Whittaker et al. 2005). There are anywhere between 1 and 100 million species that are yet to be formally described by science, many of which are represented by arthropods in tropical forests. Choosing a higher number gives a higher number of total extinctions and thus a higher rate (Pimm 2002). It also means that when scientists speak about extinction in terms of thousands or millions, they are mainly referring to species that are yet to be discovered. From a rhetorical perspective, calculations such as Wilson’s gave the scientific community shockingly high numbers that were guaranteed to attract the attention of the world’s polities and strongly supported the narrative of environmental crisis.

This type of reasoning and extrapolation has been taken up enthusiastically by science-based conservation non-governmental organizations (NGOs) such as the World Wide Fund for Nature (WWF), and Conservation International (CI). Indeed, CI has arguably transformed the Wilsonian extinction crisis into a modern multimedia interactive experience through its constantly running ‘extinction clock’, which is introduced in the following way: “Every 20 minutes, one species is pushed to extinction as more than 1,200 acres of forest are destroyed. At the same time, over 180,000 tons of carbon dioxide is released into the atmosphere. Protecting and restoring forests is a key solution to climate change and is vital to the survival of all life on Earth. Indeed, 2,000 species are at risk of disappearing forever each month."4

CI’s extinction clock gives several interesting insights into the legitimization of extinction rhetoric through scientific reasoning and the strategic alignment of extinction with the currently dominant frame of climate change in public discourse. First, it should be noted that these extinctions are forecast on the impacts of habitat loss and climate change and assume that global species richness is 4 to 6 million (i.e., 2 to 4 million more species than have currently been documented). As a consequence, of the three species “pushed to extinction” every hour, two are currently unknown to science. In addition, the uncertainties involved with extinction estimates based on the reduction of a habitat’s area and, even more so, with predictions based on climate change scenarios mean that any such estimates need to be treated with extreme caution (Ladle 2009; Whittaker et al. 2005). Second, the narrative strongly links extinction with the discharge of carbon dioxide and deforestation—two themes with arguably more relevance and traction in high-level policy circles. It is also interesting (and perhaps not coincidental) that the annual predicted rate of extinction from CI’s clock is almost identical to Wilson’s (1992) estimate of 27,000 species per year, based solely on habitat loss (but assuming a slightly higher global species richness). Such congruence can reinforce the validity of the statistics in the public consciousness. Finally, CI states that “[o]ur clock is based on the best science,” 5 a claim for scientific legitimacy that may not hold up to close scrutiny. Indeed, given the uncertainties involved, the word ‘best’ probably has little meaning when applied to extinction forecasting (Ladle 2009).

It would be wrong, however, to portray the scientific conservation community (academic, NGO, and governmental) as united in its perspective on current rates of extinction or how these should be communicated to the public. There is an increasing realization among some conservation scientists that (1) a serious lack of concordance exists between the robust language of early conservation scientists (e.g., phrases such as the ‘sixth mass extinction’ and the ‘extinction crisis’) and the slow (in human terms) rate of documented species loss, and (2) the very
notion of an extinction crisis is becoming increasingly counterproductive. Reflecting on the successes and failures of conservation scientists in the global conservation movement, Redford and Sanjayan (2003: 1473) express the following lament: “Our focus on crisis has hampered conservation biology in achieving a scale of action required to match the world’s environmental problems. Despite our best efforts to launch our cause into the mainstream culture, the world is suffering from crisis fatigue.”

There are even some mainstream scientists who are challenging the consensus on the current and future rates of extinction. Two highly respected tropical forest scientists, S. Joseph Wright and Helene Muller-Landau, recently argued that current human demographic trends, including slower population growth and the migration of rural populations into urban centers, strongly suggest that tropical deforestation will slow, natural forest regeneration through secondary succession will accelerate, and that “the widely anticipated mass extinction of tropical forest species will be avoided” (Wright and Muller-Landau 2006: 287). This rather politically naive prognosis may be unlikely, especially given the spread of oil palm plantations in Southeast Asia, but it does signal an unusual break in scientific ranks.

**The Media**

The global media has always been a valuable source of publicity and rhetoric for conservation. This is beautifully illustrated by the publication of the special ‘shock issue’ of the *Daily Mirror* tabloid newspaper that coincided with the creation of WWF in 1961. The front-page headline, hovering over a photo of a black rhinoceros and its calf, boldly stated “DOOMED—to disappear from the face of the earth due to Man’s FOLLY, GREED, NEGLECT.”6 This strategy reaped rich dividends: the *Daily Mirror* appeal generated an unprecedented public response and was able to raise the equivalent of about £2 million (Jepson and Ladle 2010). Shock stories such as these can help keep an issue in the public consciousness, aid fund-raising, and potentially influence public opinion and policy. They illustrate the ease with which the topic of extinction can be aligned with the broadened moral and societal concerns that sell newspapers. Moreover, increasing pressures on academics to garner attention for their work means that the media are fed on a diet of publicity releases from university press offices or, not infrequently, directly from the scientists involved.

The global news media has a strong agenda driven by economic imperatives that make it ill-suited to communicate the intrinsically complex and uncertain science of extinction. Consequently, when extinction science has appeared in the traditional print media, it has often been badly misrepresented. This is clearly illustrated by the coverage of a recent high-profile article that appeared in the journal *Nature* concerning the possible impacts of climate change on global biodiversity (Thomas et al. 2004). The results of the study suggested that, given a number of key assumptions and under “mid-range” climate change scenarios, 15–37 percent of the 1,103 species considered within the study would be “committed to extinction” by 2050 (ibid.: 145). The authors described these percentages as being an estimate of “proportions of species committed to future extinction as a consequence of climate change over the next 50 years, not the number of species that will become extinct during this period.” Furthermore, they noted, “decades might elapse between area reduction (from habitat loss) [through climate change] and extinction” (ibid.).

After this article was published, Ladle et al. (2004) reviewed 29 reports in the UK’s national and local newspapers and found a systematic pattern of errors in 26 of them. The most significant misrepresentation of the study’s findings was the frequently repeated contention (in 21 reports) that over a million species would become extinct due to global warming by the year 2050, while two others went so far as to suggest that one-third of all the world’s species would
become extinct. Just two reports explained that only a few species would actually be extinct by 2050. Interestingly, the origin of the majority of the cruder generalizations and extrapolations in the media can be traced back to the original press release from the lead author of the study, which carried the headline “Climate Change Threatens a Million Species with Extinction.” It is here that the million species reference first appears, along with the unattributed claim that a quarter of land animals and plants may go extinct.

The power of such widespread media representations to influence political debate soon became clear as some senior politicians commented on the study, apparently using the erroneous newspaper reports as their source material (Ladle et al. 2004; Ladle et al. 2005). For example, then EU Environment Commissioner Margot Wallström (2004) wrote in the Guardian newspaper: “Many people had a lot to say about the recently published study that suggests global warming could wipe out a third of the planet’s species by 2050.” The discussion of the subject in the UK House of Commons was similarly inaccurate.7

The sensationalist coverage of the Thomas et al. (2004) article in the UK news media is perhaps to be expected, given the short timescales and circulation-driven mentality of most newspapers. It is also clearly characteristic of much science reporting in the media. What is perhaps more surprising is that representatives of CI felt obliged to support such misrepresentation. Hannah and Phillips (2004), writing in Nature, argued that sensationalism is acceptable if it brings an environmental message (e.g., about the potential extinctions caused by climate change) to the attention of the public and polity. Similar motivations are clearly responsible for the massively unrealistic predictions for the imminent extinction of orangutans (Pongo spp.) used by Friends of the Earth to discredit the oil palm industry,8 a strategy described as ‘blackwashing’ by Koh et al. (2010).

Scientists themselves are clearly important actors in the production of media-friendly stories about imminent extinctions, as are the well-known and influential journals that are willing to publish the articles on which the stories are based. The kudos associated with being responsible for research that gets extensive coverage in the global news media is clearly good for careers, tenure applications, research funding opportunities, and probably citations as well (Ladle 2004). At the time of writing, the article by Thomas et al. (2004) already had over 1,000 citations on the Web of Knowledge.9 The benefits also extend to the departments that host the scientists and, ultimately, to the universities and research institutions where they work. The degree to which such pressures influence scientists’ decisions to write press releases or to conceive research projects that will attract media attention is unknown, but this is clearly a fertile area for future research. Moreover, the perceived urgent need to mobilize conservation action may also draw acknowledged leaders of cutting-edge science out of their areas of expertise and encourage them to make poorly considered and inadequately researched statements about extinction, environmental crisis, and conservation imperatives.

Conservation Policy and Governance Institutions

Tarrow (1992) argued that when frames include collective actions that attract broad consent, they necessarily become institutionalized and thereby take a leading role in determining the future trajectory of policies and of scientific, management, and cultural practices. The institutionalization of extinction by the international conservation community began 50 years ago when the IUCN first attempted to codify different levels of extinction risk within their Red List of Threatened Species, published as the Red Data Book.10 The first Red Data Book, a list of 135 endangered mammals, was published in 1960 (see Epstein 2006). By 2009, a total of 47,677 species from all the major plant and animal groups had been assessed, including all known birds and mammals (IUCN 2009). At first, a rather subjective system founded on expert judgment
was used to categorize extinction risk, but this was replaced in 1994 by a much more quantitative approach, developed by Mace and Lande (1991), that is based on population and life history characteristics. At the heart of this system is a set of simple quantitative criteria—population sizes, population decline rates, range areas, and range declines—that are used to allocate species to one of several categories of extinction risk (e.g., endangered, critically endangered, extinct in the wild, etc.). It should be noted that the Red List employs different methods of assessing extinction risk, depending on the available data, and that some of the processes used to assess species status (e.g., population viability analysis) are also extinction risk forecasting methods. In this sense, it may be better to consider Red Lists as a framework for standardizing and communicating extinction risk (Ladle 2009). The act of defining and categorizing extinction risk has deeply affected what is measured, managed, discussed, and studied. In turn, this has fed back into endangered species policy and has influenced the degree to which it is meaningful to specialists and non-specialists.

This correlation is illustrated by the now widespread use of the rates of transition between IUCN categories as a means to forecast extinctions (Butchart et al. 2004). The key transition for extinction forecasting is between 'endangered' (where a population has a 'very high' risk of extinction in the wild) to 'critically endangered' (where the species is considered as having an 'extremely high' risk of extinction in the wild) (IUCN 2001). The criteria for inclusion in the latter category include very small populations and geographic ranges and a strong trend toward population decline. The category 'critically endangered' can thus be cautiously used as a surrogate for 'imminent extinction'. Brooke et al. (2008) tested this proposition by comparing the historical transition of bird species into the critically endangered category with verified extinctions at both a global level and within Australia. They concluded that species were actually going extinct at a rate that is 2 (Australia) to 10 (globally) times lower than predicted. The potential cause of this discrepancy was identified as the effectiveness of the global conservation community at rescuing bird species on the brink of extinction.

Red Lists are deployed and promoted as the global standard to (1) ensure consistency in conservation investment across taxa and regions; (2) inform national legislation and implementation; (3) guide the management of natural resources at multiple scales, including the identification of sites for conservation action; and (4) monitor changes in global biodiversity and the reasons for these changes (Rodrigues et al. 2006). Since 2004, Red Lists for birds (Butchart et al. 2004) and amphibians (Butchart et al. 2005) have been further reified into a Red List Index. The index is a quantification of the movement of sets of species (grouped taxonomically or geographically) through categories of the Red List (Butchart, Akçakaya et al. 2006). In essence, the indexing system conflates the complex realities of extinction into a single trend line. Such practices raise extinction (or extinction as an indicator of biodiversity) to a level of abstraction where it can be correlated with index data on the economy, population, and other major areas of policy concern. This helps maintain and elevate the international policy position of biodiversity conservation and the organizations producing such data.

The reification of continuous biological characteristics into extinction risk categories also provides an opportunity for manipulation to advance conservation aims. For example, the eminent Canadian zoologist and sea turtle expert, Nicholas Mrosovsky (1997), accused the IUCN’s Marine Turtle Specialist Group of upgrading the listing of the Hawksbill sea turtle (Eretmochelys imbricata) without making available the scientific evidence for this change in status, and then using it to influence proposals for the sustainable use of the species. Thus, it is possible that unconscious or conscious biases in the information accepted and used by specialist groups might influence the categorization of species and hence provide an unduly pessimistic prognosis of their future survival. This example also illustrates the perceived power of terms such as
‘endangered’ and ‘extinct’ to mobilize conservation action. More generally, it is clear that even the application of quantitative criteria can be subject to values-based biases with the ultimate aim of ensuring that a favored species maintains or achieves a label that reflects the highest possible level of extinction risk.

The extinction narratives exemplified by the pronouncements of the international conservation community demonstrate how, within this group of actors, extinction has become “locked within a more coolly constructed rationalistic argument” (Adams 2004: 25) that characterizes discourse about biodiversity. Moreover, like the rather technocratic term ‘biodiversity’, extinction has been increasingly subsumed into the dominating policy narrative of climate change. The shifting focus of the environmental polity has, inevitably, led to a certain amount of realignment and transformation of earlier agendas as a way of both maintaining their public visibility and accessing international funds focused on the ‘new’ threat of climate change. Thus, extinction narratives are increasingly being transformed and inserted into the climate change frame, providing a bridge between the two dominating conservation agendas of the last 30 years.

The impacts of this process of alignment pervade much of the current NGO and academic extinction rhetoric, such as CI’s previously mentioned extinction clock or the high-profile Thomas et al. (2004) Nature article that included authors from the Royal Society for the Protection of Birds and CI. Another notable example among many is WWF’s 2009 campaign to conserve the polar bear (Ursus maritimus), which clearly and effectively links traditional conservation themes of extinction to the threat of climate change: “The planet is rapidly moving towards a tipping point with climate change impacts on polar bears. Unless immediate action is taken by responsible governments, we may be relegating polar bears to extinction in the wild within the lifetime of our children.”

The above example indirectly illustrates one of the most interesting aspects of the insertion of extinction narratives into the climate change frame—the current lack of a conspicuous and unmistakable victim. Polar bears may or may not be threatened with extinction by anthropogenic climate change in the next 80 or so years, but for the time being they are still very much extant. Perhaps the best candidate, and a subject of some debate, is the Costa Rican golden toad (Bufo periglenes). This striking amphibian, which was discovered in 1964, had a known range of only a few square kilometers within the Monteverde Cloud Forest Reserve (Sarkar 1996). The toads were always elusive but could be reliably surveyed for a few weeks in April when they emerged from the dense undergrowth to mate in temporary pools. Their final demise was rapid and unambiguous: in 1987, more than 1,500 toads were observed, but in 1988 and 1989 only a single toad emerged (Crump et al. 1992), and there has been no verified sighting since then (Sarkar 1996).

Catastrophic declines in amphibian populations have been observed around the world since the 1970s, and the general consensus is that it is a global phenomenon with multiple local causes, including shifts in weather patterns (Alford and Richards 1999). So why did the golden toad become synonymous with climate change–induced extinction? This is a difficult question to answer, not least because there is a large degree of uncertainty in the science, which primarily relies on correlational inferences. The two most high-profile hypotheses and the probable source of the golden toad’s status as a poster child for casualties of global warming are both complex and untestable. Pounds and Crump (1994) linked the toad’s probable extinction to the 1986–1987 El Niño that was responsible for very low rainfall during several critical life history stages. In a far more ebullient and polemical article published in Nature in 2006, Pounds and his colleagues propose that climate change–induced outbreaks of pathogenic fungus were responsible for the extinction. The underlying message is hammered home in the final line of the abstract: “With climate change promoting infectious disease and eroding biodiversity, the urgency of reducing greenhouse-gas concentrations is now undeniable” (Pounds et al. 2006: 161).
This direct tone and strong linkage between an extinction event and the general threat of climate change to the natural environment are echoed by widely used NGO narratives concerning the probable extinction of the golden toad and another amphibian, the harlequin frog, which disappeared from the Monteverde reserve at around the same time. On its Web site, WWF puts it as follows: “The golden toad (Bufo periglenes) and the harlequin frog (Atelopus varius) of Costa Rica have disappeared as a direct result of global warming.” CI also makes the link: “For Ticos, as Costa Rican natives are known, reducing greenhouse gas emissions and stabilizing the climate is personally important, as the extinction of their emblematic golden toad (Bufo periglenes) due to climate change and altered weather patterns is still fresh.”

The convergence of scientific and NGO narratives is perhaps unsurprising, given the increasingly close ties between NGO and university researchers, funding sources that have targeted ‘applied’ research on the biodiversity consequences of climate change, and the increasing number of multi-partner research projects that aim to generate regional or global-scale databases. However, the willingness of major journals to publish articles with increasingly bombastic rhetoric in relation to extinction and climate change seems to be a relatively new trend. It carries with it the threat of undermining the legitimacy and credibility of scientists while at the same time playing into the hands of the powerful anti-environmentalist lobbyists, who are quick to exploit perceived weaknesses in the underlying science (see Ladle et al. 2005).

Conclusions

Adams (2004: 25) wryly commented that WWF’s choice of the “cuddly” giant panda as an icon perfectly captures the “slightly mawkish public sentimentality about extinction,” which he also characterizes as having “both an anger and a desperation about it” (ibid.). It is certainly true that extinction continues to have a special rhetorical power within natural resource policy, probably because its focus on species simultaneously constructs nature as a domain in need of governance, provides specific targets (species and places), and allows for the compilation of statistics that provide direction on how to become “the best possible governor” (Foucault 1991: 87).

However, the strong emotional response that can be provoked by the use of the term ‘extinction’ suggests that it should be used wisely by conservation advocates and scientists alike. In this article, we suggest that because the term resonates with deeply held human fears (e.g., extinction of a life, of a fire and warmth, of hope), the extinction of species provides a powerful organizing concept for frames relating to humanity’s relationship with nature. The rhetoric of extinction as an expression of human failings (selfishness, greed, ignorance) and of human potential (compassion, morality, planning) creates a powerful rallying force for conservation action. The scientific act of systematically classifying extinction risks has resulted in a broadening of the frame so that extinction now refers to anything from the local disappearance of a cultural-valued species to the imagined extermination of masses of undiscovered species caused by global process of deforestation. This breadth creates the possibility for extinction frames to travel and align with a multitude of other frames—from deeply personal frames involving identity and place to big issue policy frames such as climate change and ecosystem services. This widening of the frame may, however, carry risks. Sarkar (2005) argues powerfully that the continued use of inflated rhetoric—some of which has been documented herein—is another way in which biodiversity conservationists may lose public credibility.

Given these comments, we argue for more research on the cultural agency of the concept of extinction. In particular, we suggest that it would be valuable to understand better where, when, and how the concept of species extinction has the capacity to produce a phenomenon or modify a
state of affairs. On one level, this might involve, for example, surveys to test whether the concept of extinction is universal. Our opportunistic and unsystematic surveys among rural people in parts of Asia suggest that it is not. If this is the case, it could have important ramifications for communication strategies aimed at building local legitimacy for conservation projects. On another level, studies of extinction that adopt, for instance, actor-network perspectives (Latour 2005) could reveal important new insights on the assembly, persistence, and power of conservation institutions. We favor the development of a more balanced, nuanced, and culturally meaningful rhetoric of extinction that accurately reflects long-term temporal perspectives and the considerable uncertainties involved in the act of declaring a species extinct. In a previous article (Ladle and Jepson 2008), we have argued that one possible approach is to delineate carefully the different meanings of the term ‘extinction,’ along with their varying powers and agency in society (see table 1).

The above typology of extinction recognizes that different meanings open up or enable entry to different governance spaces. For example, in the case of global extinction rates, derived from the species-area relationship in island biogeography (see table 1, Linnean extinctions), conservation scientists and NGOs have successfully used this meaning of extinction to attract the attention of the inter-state polity. The startling figures generated in support of the notion of a sixth mass extinction (see, e.g., Pimm and Brooks 1997; Thomas et al. 2004) bridge easily with political and bureaucratic worries about economic and social instability and the proposed macro-scale solutions, and they easily align with natural resource policy discourses favored by intergovernmental agencies. By contrast, ‘ecological extinctions’ (see table 1) clearly align with the interests of zoological gardens and seed banks because they provide an outlet and legitimation for their operations. In turn, these facilities bring conservation and endangered and exotic species into urban culture, creating links between cities and conservation sites around the world and thus effectively globalizing conservation culture.

We would argue that public trust in the legitimacy of conservation action can be restored and strengthened only through the development of a more culturally meaningful and sophisticated rhetoric of extinction, one that aligns scientific evidence in the form of documented and predicted extinctions with cultural frames, institutional frameworks, and organizational interests. To achieve such alignment, conservation practitioners and advocates must develop a more sophisticated understanding of the different meanings of extinction and the power that each has to influence individuals and societies. For example, the documented local extinction of a previously abundant bird species may have little power to mobilize funds for an international conservation NGO, but it may provide a focal point for the development of new community-led conservation initiatives. Likewise, the latest projection of global extinctions based on tropical deforestation may have some traction with environmental policy makers, but it may lead to apathy and compassion fatigue if overused for conservation fund-raising in the developed world.

Finally, it should also be noted that extinction rhetoric has been strongly founded on the use of the species as the key unit of classification and measurement. This is understandable, given the widespread recognition of the term among the public, but it has perhaps limited the discourse about the wider evolutionary significance of extinction. Nee and May (1997) demonstrate that approximately 80 percent of underlying evolutionary history would be preserved even if 95 percent of species should be lost. Moreover, choosing the ‘survivors’ based on algorithms that maximize the amount of evolutionary history preserved was only marginally better than choosing the survivors at random. As yet, little progress has been made in translating such scientific understandings into conservation policy and practices. However, there are signs that conservation science is starting to take the preservation of evolutionary history more seriously (e.g., Davies et al. 2008; Forest et al. 2007), a move that will undoubtedly provide a rhetorical challenge and may call for a whole new vocabulary of extinction.
Table 1: Typology, definitions, and potential agency of the term ‘extinction’

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<tr>
<th>Extinction Type</th>
<th>Definition</th>
<th>Potential Agency</th>
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<tr>
<td>Linnean extinction</td>
<td>Extinctions of undiscovered species inferred from the species-area relationship and estimates of species diversity for a given ecosystem or region. The assumed losses of these inferred species are termed ‘centinelan extinctions’ by Wilson (1992).</td>
<td>• Construct and make credible the notion of a ‘sixth mass extinction event’.</td>
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<td>• The potential risks and opportunity costs associated with such an event make extinction relevant to a range of international policy areas (e.g., agriculture, forestry, and health), thereby contributing to the ‘mainstreaming’ of conservation/biodiversity in international policy.</td>
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<td>• Create a sense of urgency and crisis that can be used to raise funds and legitimize action.</td>
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<td>Wallacean extinction</td>
<td>Species that have not been documented for many years, but for which extinction is uncertain because populations might survive in areas that have not been surveyed within the potential distributional range.</td>
<td>• Inspire local action.</td>
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<td>• Promote field surveys and expeditions to remote areas.</td>
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<td>• Attract funding to specific localities.</td>
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<td>• Support NGO communication strategies by providing a steady stream of ‘good news’ stories.</td>
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<td>Phoenix extinction</td>
<td>Extinct in the wild, but genetic material is available in the form of stored material or a closely related conspecific or congeneric variety/breed/hybrid, allowing for the possibility of a future reintroduction of the same or a functionally equivalent form.</td>
<td>• Mobilize support for innovative conservation management strategies.</td>
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<td>• Create controversies by challenging fundamental precepts of the global conservation movement concerning issues of ecosystem composition, introduced species, and adaptive management.</td>
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<td>• Inspire innovative uses of technology.</td>
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<td>• Extend the range of actors participating in conservation (e.g., biotechnology laboratories).</td>
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<td>Ecological extinction</td>
<td>Extinct in the wild but with extant captive-bred population, or present in the wild but at such low densities that it no longer interacts to a meaningful degree with other species in the community (i.e., it is functionally extinct).</td>
<td>• Support and legitimize the actions of botanical gardens, gene banks, and zoological parks.</td>
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<td>• Create momentum for habitat restoration and reintroductions.</td>
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<td>• Effectively communicate the reality of extinction to the urban citizenry.</td>
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<td>Local extinction</td>
<td>Extinct in the wild within a clearly defined geographic area but with extant free-living populations outside that area.</td>
<td>• Mobilize local conservation action.</td>
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<td>• Reinforce local cultural identities.</td>
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<td></td>
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<td>• Legitimize restoration and reintroduction programs.</td>
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<td>True extinction 1:</td>
<td>Extinct since the birth of the international conservation movement (in the mid-nineteenth century). The last known population has been monitored and surveyed and is now considered globally extinct in the wild. No captive-bred population or genetic material is available.</td>
<td>• Create a moral imperative for conservation.</td>
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<td>Contemporary extinction</td>
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<td>• Legitimize and publicize actions aimed at specific drivers of extinction (e.g., climate change mitigation and the golden toad).</td>
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<td>• Mobilize action and support for global conservation initiatives.</td>
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<td>True extinction 2:</td>
<td>Extinct prior to the birth of the international conservation movement. No authenticated record of an extant population. No captive-bred population or viable genetic material available.</td>
<td>• Create a moral imperative for conservation.</td>
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<td>Historical extinction</td>
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<td>• Legitimize the existence and actions of the global conservation movement.</td>
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<td>• Create a ‘zero sum’ threshold for conservation—embed the notion of the finality of extinction.</td>
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Source: Modified from Ladle and Jepson (2008).
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Notes

2. Ibid., 308.
3. Coined in 2000 by the atmospheric chemist Paul Crutzen, the term ‘anthropocene’ is used by some scientists to describe the current era in the earth’s history in which humans have had a major impact on the earth’s ecosystems.
7. Reported in Hansard, the printed transcripts of UK parliamentary debates, on 8 January 2004.
9. Despite the limitations and uncertainties associated with Thomas et al. (2004), this article has been cited numerous times. See the Web of Knowledge’s ISI Web of Science site at http://wokinfo.com/products_tools/multidisciplinary/webofscience/ (accessed 24 June 2010).
11. Much of the ‘scientific evidence’ for Hawksbill sea turtles is actually derived from so-called gray literature (Mrosovsky and Godfrey 2008).
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