2 From Arks to ARKive.org: Database, Epic, and Biodiversity

1. From Elegy to Enumeration

Much as the elegiac mode dominates verbal and visual representations of endangered species, it is often accompanied by a sense that the mourning for individual species cannot adequately capture the magnitude of a crisis that affects thousands of species and the entire globe. To convey a more panoramic view of mass extinction, artists and writers often resort to lists or catalogs. The structure of the travelogue, common in nonfiction books and films on endangered species, sometimes gives such enumerations a narrative progression by juxtaposing different species and locations in successive chapters, and photography collections often consist of dozens or even hundreds of photos of different species. In other cases, lists alternate with more focused accounts of individual species. David Quammen, for example, who makes up an elaborately sentimentalized death scene for the imaginary last dodo hen on Mauritius in 1667 (1996, 275; cf. chapter 1), simply ticks off lists of species at other moments: "The Laysan honeycreeper is extinct. The lesser koa-finch is extinct. So are the greater koa-finch and the Kona grosbeak and the Hawaiian rail. The greater *amakihi* is extinct, as are the Oahu *nukupuu* and the *amaui* and the *kioea* and the Oahu *oo* . . . and at least three out of four subspecies

of *akialoa*" (321). And again, just a few pages later: "Then the Guam flycatcher went extinct. Blip. The bridled white-eye disappeared. Blip. The rufous fantail, the white-throated ground-dove, the Mariana fruit-dove, the Micronesian honeyeater: blip blip blip blip. Of the eleven forest-dwelling species, these six all vanished from Guam during the mid-1980s" (323). This impulse to catalog species as a means of valuing biodiversity, which alternates with other strategies in Quammen's book, informs other books of popular science as a basic organizational tool, for example Michael Gleich et al.'s *Life Counts: Cataloging Life on Earth* (2002).

Elegiac impulses also combine with this enumerative drive in fictional texts about endangered species. William Burroughs's novella *Ghost of Chance* ([1991] 2002), for example, features a "Museum of Lost Species" that one of the characters encounters on the island of Madagascar. This discovery leads to a lengthy if narratively fractured meditation on the extinct species that humans long to revive and those they rejoice in having eliminated, such as viruses causing dangerous disease. In Puerto Rican novelist Mayra Montero's *Tú, la oscuridad* (In the palm of darkness; 1995), the main plot about an American herpetologist searching for a rare Caribbean frog species with his Haitian guide is interspersed with brief vignettes enumerating amphibian extinctions around the world. In texts such as these, the catalogs that accompany and complement the narrative evoke a numerical sublime of sorts, numbers too large to be contained by conventional storytelling procedures that focus on a discrete set of events, scenes, and characters.

Canadian novelist Margaret Atwood's trilogy of speculative fiction, *Oryx and Crake* (2003), *The Year of the Flood* ([2009] 2010), and *MaddAddam* (2013) also features extinctions on such a large scale that only databases can adequately reflect their magnitude. In *Oryx and Crake*, the two young male protagonists, Jimmy and Crake, often play a computer game, Extinctathon,

> an interactive biofreak masterlore game [Crake]'d found on the Web. *EXTINCTATHON, Monitored by MaddAddam. Adam named the living animals, MaddAddam names the dead ones. Do you want to play?* . . . Then some challenger would come on-line, using his own codename—Komodo, Rhino, Manatee, Hippocampus Ramulosus—and propose a contest. *Begins with, number of legs, what is it?* The *it* would be some bioform that had kakked out within the past fifty years—no T-Rex, no roc, no dodo, and points off for getting the time frame wrong. Then

> you'd narrow it down, Phylum Class Order Family Genus Species, then the habitat and when last seen, and what had snuffed it. (Pollution, habitat destruction, credulous morons who thought that eating its horn would give them a boner). . . . It helped to have the MaddAddam printout of every extinct species, but that gave you only the Latin names, and anyway it was a couple of hundred pages of fine print and filled with obscure bugs, weeds, and frogs nobody had ever heard of. Nobody except, it seemed, the Extinctathon Grandmasters, who had brains like search engines. (Atwood 2003, 80–81)

The deliberately vulgar language, meant to reflect male teenagers' dismissive attitude, both evokes and overwrites the mourning that a catalog of extinction would otherwise elicit. But in spite of the reduction of extinction to a game, it is crucial to the novel. Both of the title characters, Oryx and Crake, derive their pseudonyms from extinct species (from *Oryx beisa,* an East African antelope, and the red-necked crake, an Australian bird). The game itself functions as an inverted genesis: Adam named the living animals, MaddAddam names the dead ones, with the doubled "dd" punning on addition in ironic contrast to the subtractions extinction implies. As plants and animals go extinct at a rate that only digital search engines can keep track of, Crake, who becomes an accomplished bioengineer, creates a virus that exterminates most of humankind so as to halt the ecological crisis. At the same time, he designs a new species of posthumans, named "Crakers" after himself, whose genome incorporates human, animal, and plant genes. In this vision of the future, the database of extinct species functions as the master trope and framing device.

Lydia Millet's trilogy of novels *How the Dead Dream* (2008), *Ghost Lights* (2011) and *Magnificence* (2012) focuses, especially in its first and third volumes, on characters who are not biologists or bioengineers like Crake, but who are drawn into reflections on species extinctions quite against their own intentions. *How the Dead Dream* revolves structurally around the dialectic of singular and local experiences, on one hand, and the global cataloging of endangered species, on the other. The protagonist of this meditative novel, Thomas Stern, called T for short, proves adept at business ventures even while he is still at school and becomes a highly successful real estate developer later on. Unencumbered by any environmentalist awareness, T experiences several human tragedies: his father leaves the family, his mother lapses into senile dementia, and his partner, Beth, dies prematurely. These traumatic separations from loved

ones gradually attract his attention—perhaps triggered by an incident in which he runs over a coyote in his car and watches her die—to the animal species that his construction projects displace and endanger. He begins to research species extinction and visits zoos with the explicit purpose of seeing endangered animals. After Beth's untimely death, this interest evolves into a peculiar obsession: T serially breaks into zoos to spend time with animals who are the last of their kind, "terminal animals," as the novel calls them. He spends a night in the enclosure of a Mexican gray wolf, for example, tries to imagine the thoughts of a female Sumatran rhino, and meditates on the spatial experience of a swarm of pupfish in a concrete tank. All of these attempts to connect to beings who are isolated from their habitats and social ties rely quite transparently—if rather originally—on the genre template of the elegy, since it is his mourning of Beth that leads T to endangered species.

T himself is conscious of this connection, which surfaces, for instance, in a meditation on whether the killing of a rat by a fox would turn into anything other than a routine act of predation if the rat were the last of its kind:

> Was it different then? Did the world feel the loss?
>
> The field stayed a field, the sky remained blue. . . . And yet a particular way of existence was gone, a whole volume in the library of being. . . . It was time that would show the loss, only time that would show how the world had been stripped of its mysteries, stripped by the hundreds and thousands and millions. But it was not the domino effect he considered most often, simply the state of being last. Loss was common, a loss like his own; he couldn't pretend to the animals' isolation, although he flattered himself that he could imagine it. He was aware that in his search a certain predictable need was being answered. Still he thought he had a glimpse of something in losing Beth. If a being could be so singular to another, there was no doubt that there was singularity elsewhere, that the irreplaceable nature of being was not limited to his own small circle. (Millet 2008, 166)

Mourning leads T from the human to the nonhuman and from singular experiences of loss to the reflection on serial biological disappearances. Even if the horizon of experience the novel portrays remains resolutely individual, the multiplication of T's objects of mourning and sympathy takes the reader relentlessly to a global panorama of loss and disaster.

The enumerative logic that emerges from T's serial zoo break-ins resonates even more forcefully in the somewhat peculiar acknowledgments that follow the novel's ending. Millet thanks friends, family, and supporters in the usual fashion, but then she proceeds to dedicate the book to an alphabetical list of endangered species:

> To the memory of the West African black rhinoceros, which disappeared from the world in the time it took to write this book. And in honor of the rarest species in the United States, any of which may vanish in the blink of an eye: the Alabama beach-mouse, Alabama lampmussel, Alabama sturgeon, Attwater's greater prairie chicken, Berkeley kangaroo rat, Buena Vista lake ornate shrew, Cahaba pebblesnail, Carolina elktoe, Catspaw, Devils Hole pupfish, Florida panther, Florida salt marsh vole, Fosberg's love grass, Franciscan manzanita, giant Palouse earthworm, Guam Micronesian kingfisher, Hawaiian crow, Hawaiian monk seal, interrupted rocksnail, Key Largo woodrat, Lange's metalmark butterfly, and Miami blue butterfly. (Millet 2008, 245–246)

With these concluding words, the novel has fully transitioned from the genre of the elegy to that of the Red List of endangered species, with an emergent database aesthetic gradually reshaping the novel's prevalent tropes of loss and mourning. That the list stops mid-alphabet at M may indicate that it could potentially go on ad infinitum. Or it might be an underhanded pointer to Millet's own name, which could be next in this list, raising the question of humans' own endangered future. Whatever the reason for this endpoint, the dedication of the novel to a Red List of endangered species links *How the Dead Dream* to Millet's work as a writer for the Tucson-based Center for Biological Diversity, a nonprofit organization that advocates for endangered species and has often initiated the legal procedures to have them protected under the Endangered Species Act.

Magnificence, the third novel in Millet's trilogy, follows one of T's employees, after she, too, has suffered a devastating personal loss. Susan Lindley, a former school teacher who does clerical work for the charitable foundation T starts, loses her husband, who is killed in a street mugging during a trip to Central America. She feels partly responsible for his death, since it was her marital infidelity that made him go on the trip that ends his life. In the midst of her mourning, she inherits an old mansion

in Pasadena from an uncle she knew very little. The house, she finds, is chock-full of taxidermied animals, hunting trophies that she finds repellent at first and simply wants to get rid of. But as she learns more about them, she discovers that some of them are rare artifacts, and she gradually begins to like and restore them. She visits museums to learn how to curate her involuntary collection and decides to display the animals by geographical region, so that the house becomes a microcosmos of the globe:

> The main part of the ground floor would be given over to North American mammals, each order with its own section. . . . Rodents would live in the music room, rabbits and hares in the ballroom. . . . The wide hallway . . . [on the second floor] turned into Africa. . . . The birds seemed to demonstrate a lack of interest in her personal business, so she put her bed in Birds of the World, which once had been Russia. . . . When the project was finished the house had a globe-like aspect in its sectioning off, its variety of scenes, its separation by palette. It was multicolored like a globe, and also like a globe it represented reality only partly, with the failure of all maps but also the same neatness, the same quiet satisfaction . . . the happy captivity of precious things. (Millet 2012, 148–150)

She also discovers her uncle's long devotion to hunting and to something that an old friend of his mysteriously calls "The Legacy," without explaining what it refers to.

Eventually, Susan discovers a vast basement storage area underneath the house that contains specimens of rare and extinct species: the coat of a quagga, the skeleton of a dodo, taxidermied auks, and Newfoundland wolves. The house is in fact an ark of the extinct, the dark legacy of humans' impact on other species. And white humans' impact on nonwhites: Susan's amazement at her uncle's vast collection of extinct animals turns to revulsion when she discovers, in a remote basement room, human remains that belong to members of vanished indigenous tribes—labeled carefully, just as the animals are, by their place of origin and the cause and approximate date of their extinction. Overwhelmed and horrified, Susan nevertheless decides in the novel's last scene to keep the collection and care for it: it becomes her way of accepting responsibility for a legacy of violence that has targeted both humans and nonhumans. Her belief that she is at least indirectly responsible for her husband's death here widens into the acceptance of a much broader accountability

for extinction on a global scale. Elegy gives way to database in the transition from individual mourning to the confrontation with global loss: the database here is, on one hand, associated with genocide and the trauma of pervasive violence and, on the other, linked with the possibility of taking full stock of and responsibility for this traumatic past.

Fiction and nonfiction are not the only media in which catalogs of endangered or extinct species have surfaced as a recurrent strategy in recent years. Travis Threlkel and the filmmaker Louie Psihoyos projected serial images of endangered species onto the facade of the Empire State Building in New York City in the summer of 2015 as a way of drawing attention to mass extinction (Roston 2015). In Brazil, where murals and visual art have long played an important role for environmentalist art, those media have also addressed the biodiversity crisis through the form of the catalog. A mural at the Humanidade 2012 exhibit that accompanied the Rio+20 summit in 2012 showed human accomplishments on one side of the gallery and on the other side a panoramic drawing of biodiversity, which a machine smudged and blurred to highlight the losses (McNee 2014, 151–153). The artist Siron Franco contributed to the Rio+20 convention a video presentation called *Brasil-Cerrado,* which highlighted biodiversity loss through fires and agriculture in Brazil's savannah region. Franco also exhibited a video-installation of a wall with cut-out silhouettes of animals displaced from Brazil's savannah biome, again using the enumerative power of the catalog, this time through serial cut-outs, to highlight the disappearance of species.

The Internet offers artists and writers additional means of combining narrative and catalog. The installation artist Maya Lin, best known for her Vietnam War Memorial in Washington, DC, an artwork whose central challenge arguably was to combine a sense of large-scale loss of human lives with the memorialization of individuals, has turned her attention to species loss over the past decade. Her website, What Is Missing? (2010), which Lin refers to as her last memorial (Toomey 2012), features on its home page a world map that is populated by a multitude of clickable dots. Each one leads the web user to images and stories of endangered or extinct species, as well as to Lin's own biodiversity-related installation artworks around the globe. In its attempt to zoom in to the local and back out to the global, to move the user back and forth between highly particular circumstances and a global panorama of endangerment, What Is Missing? diverts the aesthetic and functionality of Google Maps and Google Earth to the purposes of conservation.

Even more explicitly, the list as a way of expressing environmental concern has translated into digital biodiversity databases and Red Lists

of endangered species. These tools of scientific classification and record-keeping, insofar as they serve as the basis for laws and treaties protecting endangered species, also possess palpable legal and political power beyond the indirect one that might be associated with the affect of melancholy. While such databases seem at first sight far removed from the narratives of film documentaries or popular-scientific books about biodiversity loss, I will seek to show in what follows how narrative—and, in fact, in some cases even the genre of the elegy—continues to inflect the encyclopedic project of databases and Red Lists, while conversely, the database aesthetic pushes environmental art and writing beyond melancholy and mourning.

2. *The Red List and the Narrative Imagination*

The rapid pace of species loss has been one of the impulses in the creation of global biodiversity databases over the past two decades, an effort originally spearheaded by E. O. Wilson in 1992 (Wilson 1992): the All Species Foundation, ARKive.org, the Catalogue of Life, the Consortium for the Barcode of Life, the Encyclopedia of Life (EoL), the Global Biodiversity Information Facility, and the International Nucleotide Sequence Database Collaboration, among others. These digital databases typically seek to inventory the totality of biological life on Earth, at least in terms of the 1.8 million species that have been scientifically named and classified. Accessible on the Internet, they aim to make information available to scientists and conservationists worldwide as a basis for structuring and coordinating their efforts. Other biodiversity databases that are global in scope focus on particular taxa or groups of species: BirdLife International focuses exclusively on the approximately ten thousand species of known birds, and the recently completed Census of Marine Life sought to document all marine species. Species+ makes available information on species listed in the appendices to CITES (the Convention on International Trade in Endangered Species of Wild Flora and Fauna), CMS (the Convention on the Conservation of Migratory Species of Wild Animals), and other multilateral environmental treaties. Yet other databases focus on invasive species for particular regions.

Putting together global biodiversity databases by assembling information from tens of thousands of sources and formats is arduous, time-consuming, labor-intensive, and expensive. It sometimes involves compiling information from two-hundred-year-old journal issues or obtaining information from countries that do not archive scientific data in digital form or are unwilling to share it across borders. Not all of the database

projects have the funding they require to complete their task (Thomas 2009, 1632), and inevitably the documentation of some forms of biodiversity continues to open up new questions and areas for research. "The age of discovery is still with us," Ian Poiner, the marine ecologist who chaired the Census of Marine Life's scientific steering committee, commented in an interview (Normile 2010, 25), highlighting the open-endedness of database projects—but also, perhaps unwittingly, their historical connection to the colonial and encyclopedic strands of eighteenth-century thought. The construction of biodiversity databases, as this comment hints, is a scientific but also a cultural venture defined by the tension between the attempt to create a total knowledge base and the awareness that this task is not likely ever to reach its goal.

Global biodiversity databases typically derive a great deal of their information from other databases, thereby layering different database systems and creating networks of information whose structure is sometimes more and sometimes less obvious to the user. These databases also differ in terms of their institutional anchoring, their internal structure, their emphasis on different media, their mode of access, and their intended audience. The International Nucleotide Sequence Database Collaboration, for example, draws on three national and regional databases in Europe, Japan, and the United States, focuses on identifying species by their gene sequences, and is clearly intended for the use of scientists. The IUCN's Red List of Threatened Species, which has increasingly included non-endangered plants and animals over the past two decades and thereby has transmuted into a biodiversity database, combines textual information with spatial data for use by scientists and conservationists. Its endangerment classifications are widely used and quoted in scientific literature as well as in public media. ARKive.org, now under the auspices of the nonprofit organization Wildscreen, aims at an even more general audience of "educators, schools, communities, conservation organizations and anyone with a passion for nature" (www.arkive.org/about/story-so-far). Its goal is to "use the power of wildlife imagery to inspire the global community to discover, value and protect the natural world" (www.arkive.org/about/). Biodiversity databases, then, range from specialized and expert to broad public uses.

The Encyclopedia of Life (EoL) pursues "the bold idea to provide 'a webpage for every species' " (http://eol.org/info/the_history_of_eol) so as to enable "global access to knowledge about life on Earth" (http://eol.org/about). Unlike the IUCN Red List, which synthesizes information from a variety of sources, the EoL simply aggregates information about each species from numerous sources and provides digital links without

any attempt at synthesis or reconciliation. Even though it was initiated in 2007 by E. O. Wilson, the most prominent biologist in public advocacy on behalf of biodiversity, the EoL in fact does not focus on endangered species in the way ARKive and the IUCN Red List do. Instead, it foregrounds above all "organisms [that] have an immediate impact on humans . . . commercially valuable species, invasive pests and disease organisms, charismatic and familiar animals, popular ornamental plants, newly discovered species, and plants, animals and fungi on which we rely for food." Species that feature in the news or whose pages are most often visited on the EoL website are given higher priority than those that command less public attention (http://eol.org/info/priority_taxa_on_eol), so that the EoL in fact molds itself after structures of human attention rather than patterns of biological life or ecological crisis alone. The EoL invites participation from average users in a way that is not possible with more scientifically oriented databases, where all information is carefully vetted by specialists before it is allowed to appear on the website. It also includes comment and ratings mechanisms for each information unit, such as those now common on Amazon.com and other commercial websites. No doubt the most democratic of the global biodiversity databases, EoL is also the one that to date has the least marked profile of its own, as each entry dissolves into a cloud of textual, numerical, and visual information bits gleaned from other databases and websites.

With the exception of the purely genetic inventories, digital biodiversity databases bring together text, statistics, spatial data, maps, photography, video, and hyperlinks. Global biodiversity databases differ considerably in the degree to which they integrate these varied types of information. The IUCN's explicit goal of classifying species according to their risk of endangerment provides a framework for combining data and media—text and spatial data, above all—in such a way that they deliver evidence for each classification. But projects such as EoL or the Map of Life (mol.org) function in practice less as structures for organizing data of their own than as portals that dynamically collage data from other publicly accessible sources through Application Programming Interfaces, following a more general trend in database design toward architectures for organizing "Big Linked Data."[1] A few decades in the past, an older style of literary criticism sought to describe the transfer and linkage of themes, tropes, idioms, plots, and characters between texts of different periods and genres by means of the notion of "intertextual-

1. I am grateful to Elijah Meeks for pointing out this trend to me.

ity," a concept that proved particularly fertile in the description of seemingly fractured modernist works of art and literature. At a vastly larger scale and with the involvement of different media, some contemporary databases similarly function on the basis of what one may want to call "interdata" or "convergence data," the collation and rearrangement of data drawn from a wide range of different sources and connected via the Internet.

Global digital biodiversity databases, then, can be understood to emerge from the conjunction of two tendencies: an encyclopedic, centripetal impulse that reaches back to the Enlightenment and seeks to inventory the entire known world, and the hyperlinked, centrifugal architecture of the Internet, which seeks to approximate a representation of this world through the constant movement between data sites. Umberto Eco, in his exploration of lists and catalogs across the ages, has pointed out that certain kinds of lists foreground their own incompletion as a way of pointing toward those things that exceed them, that cannot be listed or enumerated (2009, 15–17). Digital databases, to which new items can always be added, have this incompletion hardwired into their basic structure. The specific project of biodiversity databases, inventorying all life forms on Earth, can be understood in analogy to what Franco Moretti has called "modern epic" (1996). Ancient epics, from Homer's *Odyssey* and Virgil's *Aeneid* to the Finnish *Kalevala* and the Mayan *Popol Vuh,* all attempted to grasp the entirety of the world as it was then known to the community that produced the epic—not infrequently by means of long lists whose apparently antinarrative nature tends to stymie modern readers. Modern epic as Moretti analyzes it has sought to encompass the modern capitalist world system for the past two centuries, but unlike its ancient predecessors, such "world texts" proceed with the awareness that this system can in fact not be captured in the way the premodern world could be. A certain shortfall of the epic project, "a discrepancy between the totalizing will of the epic and the subdivided reality of the modern world," according to this analysis, is built into the modern version of the genre (5).[2] Biodiversity databases and Red Lists of endangered species can be understood as a new variant of the modern epic or world text and as a new form of nature writing: the forever

2. In tracing a continuing epic tradition in the modern novel, Moretti takes a position that contradicts earlier theories that had cast the epic as the antithesis of the novel, for example those of Lukács ([1920] 1971), Auerbach ([1953] 2003), and Bakhtin ([1975] 1981). This also implies a different view of the connection between epic and empire from the one outlined by David Quint, for example (1993).

incomplete attempt to map the entirety of biological life and classify it according to its risk of extinction, as part and parcel of a battle of heroic scientists and conservationists against ignorant authorities and indifferent masses. In this battle, the future of planet Earth itself is at stake, as biologists and conservationists regularly claim—an epic view of contemporary environmentalism if ever there was one!

This approach to biodiversity databases resonates with media theorists' claims that the database is in fact an emergent cultural genre of its own, "a new symbolic form of the computer age . . . a new way to structure our experience of ourselves and of the world," as Lev Manovich has argued in his seminal book *The Language of New Media* (2001, 219). "As a cultural form, the database represents the world as a list of items, and it refuses to order this list. In contrast, a narrative creates a cause-and-effect trajectory of seemingly unordered items (events). Therefore, database and narrative are natural enemies," Manovich continues (225). Casting database and narrative as "enemies" has drawn fire from literary scholars such as Jerome McGann, who has accused Manovich of using his central terms far too loosely (2007, 1589), and Katherine Hayles, who has argued that, so far from excluding each other, database and narrative condition each other: "Because database can construct relational juxtapositions but is helpless to interpret or explain them, it needs narrative to make its results meaningful. Narrative, for its part, needs database in the computationally intensive culture of the new millennium to enhance its cultural authority and test the generality of its insights. If narrative often dissolves into database . . . database catalyzes and indeed demands narrative's reappearance as soon as meaning and interpretation are required" (2007, 1603). Manovich himself, in an argument that is far more nuanced than his most quoted claim suggests, has proposed a structuralist analogy whereby narrative derives its meaning syntagmatically, by ordering data in a sequence, whereas the database is in its fundamental structure paradigmatic, an inventory of all possible data in a particular field. Narrative, in this view, becomes a particular way of drawing on or "traversing" a database. The distinctiveness of contemporary culture in this respect would be that "database (the paradigm) is given material existence, while narrative (the syntagm) is dematerialised. . . . Paradigm is real; syntagm, virtual" (Manovich 2001, 231). Concretely, this implies that the data assembled in a database can be mobilized for a variety of cultural forms and aesthetic, administrative, or scientific genres—narrative among them.

Manovich here articulates a core principle of the database that undoubtedly distinguishes it from earlier forms of printed inventories or

catalogs. But he understates the way in which the encoding of the data defines and constrains what kinds of mobilizations or traversals of the data collection are possible. Typically, items in a database are tagged with so-called metadata, classificatory tags, in such a way that they can be found and retrieved.[3] Information about biological species is no exception to this rule. Historian of science Geoffrey Bowker, an impassioned critic of many of the classification and archiving systems that characterize contemporary science, has pointed out that biodiversity databases typically include information on taxonomy, ecology, and conservation measures, but no category under which indigenous forms of knowledge about the natural world could be stored. This critique does not aim at which individual data do or do not get included in a particular database, but what is recordable as a matter of principle, and how these structural inclusions and exclusions shape the available information and cultural memory. As Bowker points out, the character of an archive "comes down to the question of what can and cannot be remembered. The archive, by remembering all and only a certain set of facts/discoveries/observations, consistently and actively engages in the forgetting of other sets" ([2005] 2008, 12). He elaborates:

> In general, what is not classified gets rendered invisible. . . . The negative telling is that things that do not get classified are not considered of economic, aesthetic, or philosophical importance—weeds, noncharismatic species, and indigenous knowledge in turn. The positive telling is that our databases provide a very good representation of our political economy broadly conceived: that which we can use through our current modes of interaction with nature and other cultures is well mirrored in our data structures. What gets excluded as the "other" is anything that does not support those modes of interaction. (153)

A more optimistic perspective on biodiversity databases has been proposed by political scientist Rafi Youatt, who argues that "a biodiversity census helps construct new ideas of a multilayered and multispecies global community" (2015, chap. 2). Youatt bases his argument on the French historican Michel Foucault's theory of "biopower," the classification and administration of human life that emerged in nineteenth-century societies with new forms of demographics, health management, insurance practices, and penal codes, among other things. Much more

3. Direct-text searches circumvent such tagging.

intrusively than the disciplinary regimes of earlier societies, biopower sought to shape modern citizens and to generate a psychologically interiorized system of self-regulation that made many of the overt demonstrations of power and punishment of earlier centuries superfluous. Foucault was most centrally concerned with the modern state's modes of exerting power over its citizens. Biodiversity databases can be understood as an extension of biopower to nonhumans, Youatt argues. But he also emphasizes that this makes central assumptions of the biopower concept problematic, since animals, plants, and microorganisms cannot be induced to think of themselves in terms of the species taxonomies that modern science and its databases privilege; the element of self-regulation, therefore, does not extend to them. And nonhuman subjects often exceed or contradict the scientific predictions made about them: Youatt mentions unexpected migrations, adaptations, and mutations, though not, oddly, hybridizations, which most obviously defy species categorizations as envisioned by biological databases. "Life itself escapes biopower," he therefore claims (chap. 2), and this resistance of the nonhuman to total human classification, which he theorizes in terms of Latour's Actor-Network-Theory, allows him to envision the role of biodiversity databases more constructively than Bowker does. Rather than functioning mostly as instruments of exclusion, in his view, they create a political space that does not correspond to any state: "A global biodiversity census might be understood as part of constructing a global biocitizenry and in forming a global ecopolitical community" (chap. 2).

These analyses of how the exclusions and inclusions of species databases are shaped by underlying cultural and political impulses have particular relevance for understanding Red Lists of endangered species as a specific subtype of biodiversity database. Red Lists, in addition to the usual biological and ecological information contained in general biodiversity databases, classify species according to their risk of extinction. As opposed to purely descriptive databases, they typically have normative and legal force in a state or country: for example, a species that is included in a Red List can be hunted or harvested only within certain limits, it cannot be traded, its habitat cannot be altered in any major way, and measures for its protection have to implemented. States, nations, and supranational organizations such as the European Union all maintain such Red Lists as the basis for endangered species laws and international treaties. Because of the economic impacts and cultural implications that listing or delisting a species can have, the process is dynamic and sometimes politically embattled, as national conflicts over the status

of wolves in some western states in the United States and international conflicts over the status of particular whale species at the International Whaling Commission have vividly demonstrated in recent years. Additions to and subtractions from a Red List or changes in the status of a species register a history of such conflicts and of conservationist successes and failures.[4]

Arguably the most influential current Red List is that of the IUCN (International Union for the Conservation of Nature). As a global database that in 2015 included approximately seventy-seven thousand species, the IUCN Red List of Threatened Species is an unusual hybrid: with no legal force in and of itself, it has nevertheless become a standard reference work in conservation research and planning all over the world.[5] Through this process, it has acquired an indirect legal influence that has led its administrators to draw up meticulously detailed guidelines on how to use global information in local contexts (see Gärdenfors et al. 2001; Miller et al. 2007; Rodríguez 2008). While it focused originally only on endangered species, the IUCN Red List has over the past decade increasingly included "Least Concern" or LC species, that is, nonthreatened ones. As a consequence, it is gradually becoming a global biodiversity database, a "barometer of life," as the IUCN itself calls it (http://cmsdata.iucn.org/downloads/iucn_red_list_barometer_of_life.pdf).

But it retains from its original character as a Red List the classification of each species according to its risk of endangerment (see fig. 3). On the IUCN Red List website, the category that a particular species belongs to appears highlighted in a red drop shape at the top of the entry, as in figure 4.

As is clear from figure 3, the taxonomy includes two categories, Not Evaluated and Data Deficient, referring to species for which no data have been collected or data are insufficient to determine the species' risk status; two categories, Least Concern and Near Threatened, for species that are faring well; three categories of endangerment, Vulnerable,

4. One of the most often discussed cases of conflict over the addition of a (conspicuously uncharismatic) species to a Red List was the listing of the snail darter, a small fish, just after the creation of the Endangered Species Act. Protracted battles ensued around a major dam construction project on the part of the Tennessee Valley Authority. For detailed accounts, see Ehrlich and Ehrlich (1981, 218–222) and Murchison (2007). For a brief analysis of how Red Lists have functioned in the German context and how their changes reflect cultural values, see Reichholf (2005, 223–224).

5. See Hoffmann et al. (2008, 114) for a discussion of the rapidly increasing citation of the IUCN Red List in conservation research.

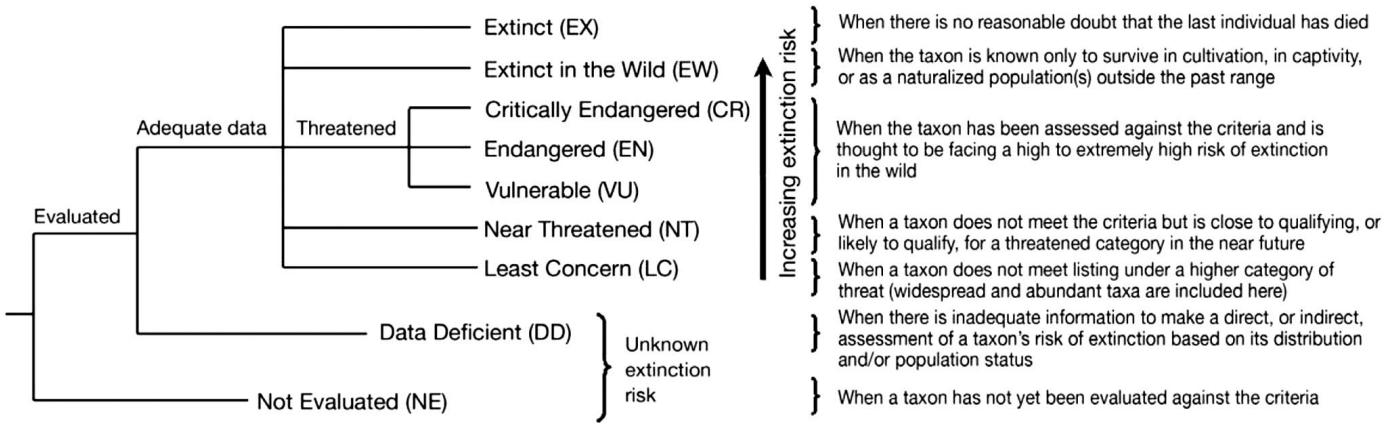

FIGURE 3 IUCN Red List classification of species according to risk. *Source*: Hoffmann et al. (2008, 115).

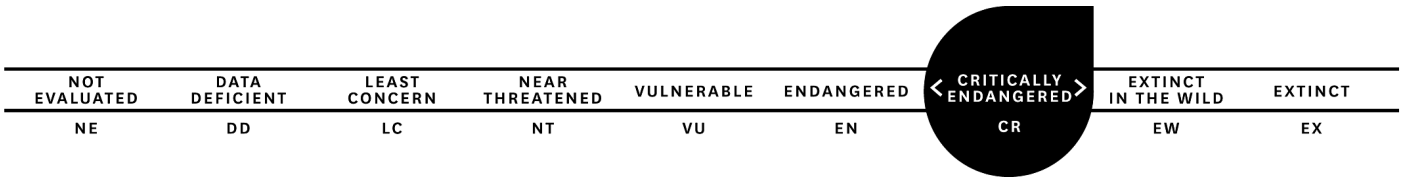

FIGURE 4 Risk Classification in the IUCN Red List. *Source*: Adapted from the IUCN Red List of Threatened Species, www.iucnredlist.org.

Endangered, and Critically Endangered; and two categories of extinction, Extinct and Extinct in the Wild. Obviously, a narrative of risk and of value attribution is hardwired into these very categories, where extinction and endangerment are defined positively, whereas species that thrive are tagged by means of negation or approximation: "near threatened" and "least concern"—as opposed to, say, labels such as "safe," "stable," or "increasing." In conservation biologists' jargon, a species that moves from Vulnerable to Near Threatened is "downgraded," whereas one that moves from Vulnerable to Endangered is "upgraded," in an odd reversal of the value judgments that usually come with upgrading and downgrading. Scientists have also pointed out that it is far easier to raise research funds for a species that is classified in any of the endangered categories than it is for one that is tagged "Data Deficient," although the latter may need research far more urgently. The metadata structure and the way in which it is socially used therefore imply a hierarchy of values that places the greatest investment in endangered species, with "Critically Endangered" at the top. The more endangered a species is, the more valued it becomes, in a logic that resonates both with the capitalist valuation of scarce resources and with the cultural fascination, inherited from the Romantic age, with impending death—the aura of "the last." The categorization structure of the IUCN's database, in other words, is underwritten by some of the same elegiac impulses that are also dominant in the literature and art concerning endangered species (see chapter 1).

An underlying narrative of decline shapes not only the IUCN's risk labels, but also the quantitative criteria that define them. The elaborate structure of nested risk classifications that the current IUCN Red List relies on did not, of course, come into being overnight. Red Data Books, when they were first conceived in the 1960s, listed species without much accompanying information and used simple numbered categories: Category 1, Category 2, with Category 1 being "Very rare and believed to be decreasing in numbers" (Hoffmann et al. 2008, 114; Mrosovsky 2003, 7). In 1968 the categories were changed to Endangered, Rare, and Depleted, with various modifications to the definitions of these labels and the criteria for their application following in the 1970s and 1980s. The classifications then were mostly based on experts' commonsense judgments, with no precise quantitative justifications required for placing a species into a particular category (Mrosovsky 2003, 7–8). In the 1980s, as biodiversity loss moved to the forefront of public awareness, this approximative approach increasingly came to seem unsatisfactory, and an elaborate quantitative system was developed and introduced in 1994,

including a new category, Critically Endangered, which was meant to draw attention to species on the brink of extinction (Hoffmann et al. 2008, 114; Mrosovsky 2003, 8). The five core classifications of endangered species are now accompanied by precise quantitative measures that are meant to reduce speculative judgments and ensure transparency, on one hand, and to minimize inconsistency across different experts' assessments, on the other, so that species can be compared more easily (Hoffmann et al. 2008, 114).

But narrative, in some cases, has returned through the back door precisely as the consequence of this quantification. While some species entries in the IUCN Red List provide only basic bare-bones data without much explanation, especially in the case of the numerous Data Deficient species, others include elaborate textual accounts. As table 1 highlights, many of the text-intensive species are mammals. Quite a few of the narratives that profile these species explore their spatial distribution in detail. The IUCN Red List's assessment system has to address endemic species with restricted ranges as well as globally distributed species, whose multiple populations may face radically different probabilities of extinction. Some of the species narratives therefore owe their length to the different populations that need to be covered. This is the case, for example, for the two marine turtles among the top twenty-five, the hawksbill turtle (no. 4) and the leatherback turtle (no. 17). But the entry for *Eretmochelys imbricata,* the hawksbill turtle, mainly owes its length to meticulously researched details of the history of the tortoise-shell trade in the nineteenth and twentieth centuries, especially in and around Japan. Why such a foray into history to determine the current status of a species?

As it turns out, the historical narrative is meant to compensate for unavailable quantitative data. A Critically Endangered species, according to the IUCN's criteria, is one whose population has declined more than 80 percent over the last ten years or three generations (whichever is longer), with a generation defined as time to maturity plus 10 years (IUCN Species Survival Commission [2001] 2012, 16). This rule, reasonable enough for many kinds of organisms, raises considerable difficulties in the case of sea turtles, whose longevity in some species includes a 30- to 40-year run-up to sexual maturity. To document an 80 percent decline over three generations, researchers would need to have population figures from 100 or even 130 years in the past at their disposal (Mrosovsky 2003, 14–17; Godfrey and Godley 2008, 156–157; Seminoff and Shanker 2008, 57–58). Needless to say, they do not; hawksbill turtles, with many globally dispersed subpopulations, are challenging to count even in the present day, let alone in the 1880s, when there was

Table 1 The IUCN Red List's 25 most text-intensive species

Rank	Character count	Common name	Species name	Family	Order	Class	Phylum	Kingdom
1	65081	sambar	*Rusa unicolor*	Cervidae	Cetartiodactyla	Mammalia	Chordata	Animalia
2	56790	West African manatee	*Trichechus senegalensis*	Trichechidae	Sirenia	Mammalia	Chordata	Animalia
3	49983	West Indian manatee	*Trichechus manatus*	Trichechidae	Sirenia	Mammalia	Chordata	Animalia
4	47352	hawksbill turtle	*Eretmochelys imbricata*	Cheloniidae	Testudines	Reptilia	Chordata	Animalia
5	44993	markhor	*Capra falconeri*	Bovidae	Cetartiodactyla	Mammalia	Chordata	Animalia
6	43549	hog deer	*Axis porcinus*	Cervidae	Cetartiodactyla	Mammalia	Chordata	Animalia
7	42653	argali	*Ovis ammon*	Bovidae	Cetartiodactyla	Mammalia	Chordata	Animalia
8	42068	large-antlered muntjac	*Muntiacus vuquangensis*	Cervidae	Cetartiodactyla	Mammalia	Chordata	Animalia
9	39706	island fox	*Urocyon littoralis*	Canidae	Carnivora	Mammalia	Chordata	Animalia
10	38963	gaur	*Bos gaurus*	Bovidae	Cetartiodactyla	Mammalia	Chordata	Animalia
11	38915	scalloped hammerhead	*Sphyrna lewini*	Sphyrnidae	Carcharhiniformes	Chondrichthyes	Chordata	Animalia
12	38398	Ganges River dolphin	*Platanista gangetica*	Platanistidae	Cetartiodactyla	Mammalia	Chordata	Animalia
13	38022	Eld's deer	*Rucervus eldii*	Cervidae	Cetartiodactyla	Mammalia	Chordata	Animalia
14	37569	American eel	*Anguilla rostrata*	Anguillidae	Anguilliformes	Actinopterygii	Chordata	Animalia
15	36678	waterwheel	*Aldrovanda vesiculosa*	Droseraceae	Nepenthales	Magnoliopsida	Tracheophyta	Plantae
16	35071	mouflon	*Ovis orientalis*	Bovidae	Cetartiodactyla	Mammalia	Chordata	Animalia
17	34942	leatherback	*Dermochelys coriacea*	Dermochelyidae	Testudines	Reptilia	Chordata	Animalia
18	34791	shortfin mako	*Isurus oxyrinchus*	Lamnidae	Lamniformes	Chondrichthyes	Chordata	Animalia
19	34559	spurdog	*Squalus acanthias*	Squalidae	Squaliformes	Chondrichthyes	Chordata	Animalia
20	34193	European eel	*Anguilla anguilla*	Anguillidae	Anguilliformes	Actinopterygii	Chordata	Animalia
21	33433	tope	*Galeorhinus galeus*	Triakidae	Carcharhiniformes	Chondrichthyes	Chordata	Animalia
22	31207	humpback whale	*Megaptera novaeangliae*	Balaenopteridae	Cetartiodactyla	Mammalia	Chordata	Animalia
23	29546	Patagonian huemul	*Hippocamelus bisulcus*	Cervidae	Cetartiodactyla	Mammalia	Chordata	Animalia
24	28896	Nubian ibex	*Capra nubiana*	Bovidae	Cetartiodactyla	Mammalia	Chordata	Animalia
25	27505	Clanwilliam sandfish	*Labeo seeberi*	Cyprinidae	Cypriniformes	Actinopterygii	Chordata	Animalia

no compelling social interest motivating such a census. To be credible, the quantitative assessment therefore turns to narrative history for data from the tortoise-shell trade, which stand in as a proxy for actual species counts.[6]

On this basis, hawksbill turtles are classified as Critically Endangered, even though about 2 million of them are thought to exist globally. While some regional populations are under threat, none of the experts believe hawksbill turtles are at any imminent risk of extinction. Nevertheless, the Critically Endangered category lumps them together with such species as the kakapo (*Strigops habroptila*), of which 126 individuals survived in 2012, or the Baiji dolphin (*Lipotes vexillifer*), whose numbers have dropped so low that it may already have gone extinct. Some scientists have therefore advised the Marine Turtle Specialist Group, which carries out these assessments, to discontinue using IUCN criteria: "Revised criteria for assessing risk of extinction of sea turtles are needed. They should not rely on unobtainable historical data; rather they should emphasize recent, current and perceived threats in the near future" (Godfrey and Godley 2008, 157). Precisely the quantification of risk assessment, in other words, sometimes forces scientists to generate a narrative of decline that may be of dubious value in evaluating which species truly face a risk of extinction in the present and determining which conservation measures are most urgently needed.[7]

A certain kind of narrative structure, then—a focus on nature in decline, on decrease, disappearance, and the past—is hardwired into Red List categories, criteria, and the stories they make scientists tell. While Red List data do not superficially seem to be structured so as to elicit the same kind of emotion that popular-scientific elegies for vanishing species in text or image aim at, they nevertheless invoke a similar storytelling template. The focus on species decline, on last specimens and the value of biological

6. As Seminoff and Shanker point out, the availability of historical data is even more limited for marine turtles that, unlike the leatherback and the hawksbill, have no widespread economic uses (2008, 57).

7. In some of its most recent revisions, the IUCN has begun to address this problem. The entry for the leatherback turtle, revised in 2013, acknowledges the lack of historical data from a century or more ago and instead assumes that the population abundance three generations ago was similar to the first observed abundance (www.iucnredlist.org/details/6494/0, under "Assessment"). As a consequence, the overall classification of the leatherback turtle has been "downgraded" to Vulnerable, compared to its assessments as Endangered in 1996 and Critically Endangered in 2000. The profile indicates, however, that different leatherback populations are facing very divergent degrees of risk that are difficult to sum up in one global label.

rarity, links the Red List to the species elegy and highlights that they are different cultural forms expressing the same underlying perspective.

Yet it would undoubtedly be too simplistic to read Red Lists as merely another version of elegy. Species databases also offer the potential of desentimentalizing extinction, especially when they do not limit their focus to endangered species but include a broader range of taxa. However fraught with difficulty the project of mapping all of the world's species with one set of criteria may be, it redirects our attention from the fate of individual species to developments that affect tens of thousands of them. Typically, this more general perspective takes the form of statistics (table 2).

Obviously, table 2 reflects the IUCN's focus on risk and endangerment, but it also seeks to open up a view of the panoramic whole. It tells two stories. One is the story of an epic struggle for the preservation of biodiversity that results from no fewer than 38 percent of assessed species being classified as endangered, a truly frightening number. The other story is about the focus on particular kinds of species: 77,340 out of the approximately 1.8 million of species scientists have identified had been studied by 2015 (and 22,784 of them classified by the IUCN as threatened with extinction) (IUCN Red List of Threatened Species 2015). "Around 41 000 (2%) of currently described species worldwide have been evaluated using the IUCN Red List categories and criteria. Only 4% of plants have been evaluated globally against the criteria," Hoffmann et al. pointed out in 2008 (121). The selection of species that have been assessed is subject to an obvious "taxonomic bias" that privileges certain kinds of species and disfavors others. As table 2 shows, all known mammal and bird species have been assessed for their risk of extinction—several times over in the case of birds. Amphibians have also fared well, but reptiles and fishes have received far less attention. Only very small fractions of the insect, arachnid, fern, and mushroom taxa have ever been evaluated at all: 1,259 out of 950,000 insect species, 32 out of 98,000 arachnid species, just 1 out of 30,000 mushroom species (the number of mushrooms had climbed to 18 by 2014—an improvement, but still a small fraction of the total number [http://cmsdata.iucn.org/downloads/iucn_red_list_barometer_of_life.pdf]). The IUCN itself is quite aware of this problem, stating in its *Strategic Plan 2013–2020* that "assessments of plants, fungi and invertebrates need to be substantially increased to represent the diversity of life adequately" and that this will require "reaching out to groups of biologists who are studying taxa that have not previously been included on the Red List" (IUCN Red List Committee 2013, 7).

Table 2 State of the world's species. Numbers and proportions of species assessed and species assessed as threatened on the 2008 IUCN Red List by major taxonomic group.

	Estimated number of described species	Number of species evaluated	Number of threatened species	Number threatened, as % of species described	Number threatened, as % of species evaluated
Vertibrates					
Mammals	5,488	45,488	1,141	21	21
Birds	9,990	9,900	1,222	12	12
Reptiles	8,734	1,385	423	5	31
Amphibians	6,347	6,260	1,905	30	30
Fishes	30,700	3,481	1,275	4	27
Subtotal	**61,259**	**26,604**	**5,966**	**10**	**22**
Invertebrates					
Insects	950,000	1,259	626	0	50
Molluscs	81,000	2,212	978	1	44
Crustaceans	40,000	1,735	606	2	35
Corals	2,175	856	235	11	27
Arachnids	98,000	32	18	0	56
Velvet Worms	165	11	9	5	82
Horseshoe Crabs	4	4	0	0	0
Others	61,040	52	24	0	46
Subtotal	**1,232,384**	**6,161**	**2,496**	**0.20**	**41**
Plants					
Mosses	16,000	95	82	1	86
Ferns and allies	12,838	211	139	1	66
Gvmnosperms	980	910	323	33	35
Dicotyledons	199,350	9,624	7,122	4	74
Monocotyledons	59,300	1,155	782	1	68
Green Algae	3,962	2	0	0	0
Red Algae	6,076	58	9	0	16
Subtotal	**298,506**	**12,055**	**8,457**	**3**	**70**
Others					
Lichens	17,000	2	2	0	100
Mushrooms	30,000	1	1	0	100
Brown Algae	3,040	15	6	0	40
Subtotal	**50,040**	**18**	**9**	**0.02**	**50**
Total	**1,642,189**	**44,838**	**16,928**	**1**	**88**

The IUCN's 2008 overview of species that have been evaluated for their risk status shows clear taxonomic bias toward certain kinds of vertebrates. *Source*: Hilton-Taylor et al. 2008, 17.

As I pointed out in chapter 1, this means that broad claims about species decline rely on incomplete data, though that incompletion is hardly grounds for optimism. If more species were assessed, the overall picture might turn out to be worse than it seems now. A recent study that sought to assess, by means of alternative proxy procedures, extinction rates in taxa that are not well covered by the IUCN Red List suggested that "the

current Red List approach grossly underestimates the extinction crisis for invertebrates" (Régnier et al. 2015, 7765). Such comments underscore the potential and the limits of the logic of proxy or synecdoche, which assumes that species can stand in for biodiversity in general and that the species that have been studied convey a broadly accurate picture of the current status of nonhuman species at large (see chapter 1). Neither of these is an unproblematic assumption, as Régnier et al.'s study and many others indicate. Some scientists have suggested if not replacing, then at least complementing Red Lists of endangered species with green lists of stable or increasing ones (Imboden 1987) or blue lists of recovered ones (Gigon et al. 2000). In recognition of such issues, the IUCN has initiated a project called IUCN Red List of Ecosystems to complement the Red List of Threatened Species. The new list focuses not only on ecosystems that are at risk, but also those that do well as a result of successful management (CEM-IUCN & Provita 2012). The IUCN has also created a Green List of Protected Areas that foregrounds conservation successes.[8] Such projects begin to shift the proxy logic of endangered species discourse and to move it away from its elegiac tenor so as to emphasize more strongly its epic and encyclopedic elements.

3. Red List Art

Global biodiversity databases and Red Lists of endangered species, then, combine elements of the elegiac narrative of nature's decline, built into the basic metadata, with an epic aspiration toward documenting a global struggle in which the future of life and the planet itself are at stake. I showed at the beginning of this chapter how a combination of elegy and enumeration also occurs in fictional and nonfictional texts, even though the elegiac mode usually dominates. In the visual arts, the enumerative mode tends to take on an even more central role. Over the past two decades, painters and photographers have frequently created visual inventories to capture the magnitude of the biodiversity crisis, often reproducing them in coffee-table-size books that portray endangered and extinct species. Tim Flannery and Peter Schouten, for example, have documented such species in meticulously realist paintings in *A Gap in Nature: Discovering the World's Extinct Animals* (2001), while Susan Middleton and David Liittschwager's *Witness: Endangered Species*

8. In a textual analogue to such blue or green lists, Jane Goodall, Thane Maynard, and Gail Hudson's *Hope for Animals and Their World: How Endangered Species Are Being Rescued from the Brink* (2009) focuses on recovery stories.

of North America (1994) and *Remains of a Rainbow: Rare Plants and Animals of Hawaii* ([2001] 2003) portray endangered species through photography.[9]

The work of the painter Isabella Kirkland is also clearly inspired by scientific taxonomy and cataloging. One of her series of paintings, entitled *Nova,* portrays species newly discovered over the past twenty years. Another series, called *Taxa,* consists of six paintings, with the titles *Descendant, Ascendant, Trade, Collection, Back,* and *Gone,* which represent a total of about four hundred species. "Almost every plant or animal is measured, photographed, drawn, and observed first hand, either live or from preserved materials. All are painted at life-size to ensure accuracy of scale. . . . The paintings explore how current biodiversity science can inform art-making and how art objects contribute to both political and scientific dialogues," Kirkland explains on her website, in what amounts to a manifesto for science-inspired art (http://isabellakirkland.com/paintings/taxa.html).

Kirkland sometimes works in the tradition of John James Audubon. But in the *Taxa* series, she draws on the conventions of the still life, which usually captures objects—often fruits, flowers, and edible animals—in interior spaces. In the paintings entitled *Descendant* (1999) and *Gone* (2004), which portray endangered and extinct species, respectively, the genre of the still life or *nature morte* (dead nature), as it is called in French, acquires a particularly literal meaning. *Descendant* (plate 1) shows "plants and animals . . . in decline in the mainland United States, Hawaii, or Central America" (http://isabellakirkland.com/paintings/taxa-descendant.html). The stepped display suggests a staircase or a florist's shop window, and this impression is reinforced by the presentation of endangered plants as cut flowers in a vase. Even though the vase is barely visible among the greenery, it serves as a centering device for many other species, such as the snails crawling on it or the birds that are perched on the flowers. What looks at first glance like a fairly conventional painting of flowers in a vase in fact plays on the domestic conventions of the still life: so far from decorative garden flowers, the plants on display here are endangered wild ones, an emphasis that resonates with environmentalists' recent reflections on globally domesticated nature.

9. See also the two quite different editions of Errol Fuller's book *Extinct Birds* from 1987 and 2001, which are collections of illustrations and photographs of extinct birds species from a wide range of artists and historical moments. The photos of Mitsuaki Iwago in Bradley Trevor Greive's *Priceless: The Vanishing Beauty of a Fragile Planet* (2003) include both endangered and nonendangered species under the title's elegiac premise.

The aesthetic possibilities of the still life in the representation of extinction emerge even more clearly in *Gone* (2004; plate 2). The tabletop, the vase, the silver tray, and the glass containers all insistently foreground still-life conventions that, as in *Descendant,* bring the extinct species into the domestic realm. But within this stylistic framework, the different kinds of plants and animals—meticulously identified through a numbered species key on Kirkland's website—are presented in strikingly different fashion. Some of the birds, such as the Carolina Parakeet, the passenger pigeon, and the 'akialoa' are shown alive and perching as they would be in a natural-history painting. Other bird species are made visible through their eggs (the great auk, the pink-headed duck) or their feathers (the double-banded argus pheasant). The fish, by contrast, are dead and laid out on a tray as if they were meant to be served at dinner, with the exception of a few smaller species that swim in the vase as if it were simultaneously an aquarium, an impression that the mussels at the bottom reinforce. The Tasmanian tiger on the left is represented by a skull; dead reptiles with identifying tags on their legs float in two glass containers filled with a clear preserving liquid—both examples of what would usually be museum exhibits. But one lizard perches on the vase quite alive, along with frogs, shrews, and mice sitting on the table top. The blue buck, by contrast, is represented only by its horns.

This mixture of the living and the dead, of whole bodies and mere parts, combines realism with antirealism. In keeping with Kirkland's principle of painting to scale, species that are too large to fit on a table are symbolized by body parts. But the fact that the decorative vase doubles as aquarium gives a tinge of surrealism to the scene, as does the display of some animals in the manner of a dish and of others in the fashion of tagged museum specimens. These details allude to different social institutions and cultural habits, encouraging the viewer to reflect on the divergent taxonomies—scientific, gastronomic, historic, museal, aesthetic—that frame our perceptions of natural organisms and enable extinction to mean different things in the various contexts. In addition, the painting brings together species that would never encounter each other in any real ecosystem, through a cross-geographic collage of sorts. It combines, in other words, a reflection on the database of nature with a reflection on the database of culture and their different classifying systems of fauna and flora, and on the meanings of extinction in different cultural spheres.

Joel Sartore, whose work has often appeared in *National Geographic* and, in 2009, in a book called *Rare: Portraits of America's Endangered Species,* has taken thousands of photos and organized them in collec-

FIGURE 5 Joel Sartore, *Dusky Sea-Side Sparrow* (2009). Photograph © Joel Sartore, joelsartore.com. Reproduced by permission of the artist.

tions to document biodiversity and endangerment. Some of his photographs exhibit the power of elegy even as they point to the database as a different mode of engaging with species extinction, such as his photograph of the last dusky seaside sparrow from a series called *Last Ones: Threatened and Endangered Species*. The photograph appeared in a feature article in *National Geographic* in January 2009 (fig. 5).

The photo foregrounds how a living organism is transformed into a museum specimen, preserved in a jar and tagged for the archives; and the bird's isolation on the white background, in a jar and in fluid, visually concretizes the loss of habitat that caused its demise. At the same time, it is difficult not to feel compassion for this small, pathetic, dead bird, and Sartore's explanatory caption detailing that this male called Orange, the last dusky seaside sparrow, died in 1987, reinforces its elegiac appeal. "To see the last of any species in a glass jar of museum preservative is an absolute outrage to me. To know that it will happen again is truly heartbreaking," Sartore comments (2009, n.p.).

Most of Sartore's numerous photos of endangered or extinct species are more starkly desentimentalized. In the majority of cases, he presents the animals in crisp, beautifully detailed portraits against a stark black or white background—not, usually, in any kind of habitat. In *Rare,* he explicitly links this technique to the Endangered Species Act: "By photographing the most endangered of our plants and animals, I can make

FIGURE 6 Joel Sartore, *Delhi Sands Flower-Loving Fly* (2009). Photograph © Joel Sartore, joelsartore.com. Reproduced by permission of the artist.

the most dramatic plea to get folks to stop and take a look at the pieces and parts that we're throwing away. Putting them on black or white backgrounds gives all equal weight and consideration, from snail to sea turtle. . . . On the bright side, the United States has the Endangered Species Act (ESA). The law is designed to protect all our plants and animals, no matter how great or small" (2009, n.p.).

Sartore's zoological interests reach across taxa and include many invertebrates, sometimes also shot in a portrait style unusual for such species (fig. 6; plate 3). This technique pulls readers' emotion and attention in two different directions. Shooting an animal portrait-style, especially one that is not usually considered charismatic, generates the kind of attention that is usually reserved for humans and other primates, and it individualizes creatures that are not normally considered capable of individuality. But the equal treatment of vastly different species in Sartore's photos makes the viewer lose a sense of their size and proportion, and the empty backgrounds often isolate the subject to the point where it appears artifactual and decorative rather than biologically embedded. The photos give no sense of habitat or ecosystemic connectedness, a strategy that may seem at odds with the environmentalist emphasis on locality and rootedness. But that, I would argue, is the point: Sartore's photography seeks to deromanticize species and their disappearance by shifting

the conservationist appeal to a mostly aesthetic level. Sartore's work is a visual Red List, documenting the extent of the mass-extinction crisis through the juxtaposition of dozens, in some cases hundreds, of photographs. The individual photos in his series *Rare, The Vanishing: Amphibian Extinction,* and *Fragile Nature,* among others, are joined together less by an obvious elegiac narrative than by the logic of inventory and database that conveys its meaning more through the sheer accumulation of numbers, a sort of numerical sublime, than through the expressiveness of any individual datapoint.[10]

4. *ARKive.org*

As Sartore's work and that of other photographers such as Susan Middleton and David Liittschwager demonstrates, the boundary between database and database art becomes porous as artists seek to articulate their sense of nonhuman life pervasively at risk. As if to confirm this close association, Sartore's photographs have actually been included in a visual biodiversity database, a project called *ARKive: Images of Life on Earth*. This database was officially launched in 2003 as the brainchild of the (by then deceased) former head of the BBC Natural History unit, Christopher Parsons, and the documentary filmmaker David Attenborough. Focusing on species defined as endangered by the IUCN Red List, ARKive seeks to compile the best photographic and film material in existence that documents a species's appearance, habitat, and behavior, with the explicit goal of fostering conservation awareness, education, and engagement.

Attenborough's video introduction of the project (www.arkive.org /about) as well as the mission statement on the website do not define ARKive primarily as a repository of information about particular species, although many of the entries are in fact detailed and well-written portraits. Rather, Attenborough emphasizes the emotional and aesthetic impact of visual representations of biodiversity. Why should we care about endangered species? Attenborough himself never answers this question explicitly in the video, but the captions interpolated between his comments do, emphasizing the sense of wonder that visual portraits of wildlife inspire. The assumption is that the visual materials will defamiliarize

10. This database aesthetic in contemporary art is not, of course, limited to works with an environmental orientation. For perspectives on other types of artworks, see Vesna (2007).

nature so as to highlight its beauty and strangeness and thereby create the critical distance that enables new forms of awareness. This goal is quite different from the aims of other databases that seek to convey information and thereby to encourage familiarity rather than the estrangement that ARKive's mission statement implies. Given this framework, it is no surprise that some of Joel Sartore's photographs, which rely on a similar aesthetic, have made their way into this database, among the works of the thirty-five hundred photographers and filmmakers who have been selected by ARKive's Accessions Advisory Panel.

Attenborough's introductory video uses its own filmic devices to highlight this defamiliarization strategy. Juxtaposed shots of different species—mostly animals, even though the database also includes plants, fungi, algae, and other taxa—look at first like the standard sequences that introduce nature documentaries on television. But at a certain moment, they speed up so much that the individual species are no longer recognizable, and what is left instead is a general impression of astonishing variety based on the infinite numbers suggested by high speed. Google Earth–style zooming shots are similarly disorienting; they move too fast for the viewer really to grasp what part of the world, what location or habitat the camera moves in on. Quite intentionally, ARKive here articulates its own sense of the global through the alternation of shots of the planet as a whole with precipitous "falls" forward, of a frog in one case and a man in another, into particular locations and species.

ARKive's FAQ section gives another twist to this perspective. It defines the database's mission as a "'virtual' conservation effort—gathering together films, photographs and audio recordings of the world's species":

> Continued habitat destruction and the rise in extinction rates also mean that for many species, films, photographs and audio recordings may soon be all that remains. They are, therefore, important historical and scientific records of the species they depict.
>
> This material is, however, scattered around the world, held in a variety of commercial, specialist and private collections, much of it inaccessible to the general public and unavailable for scientific and educational use. Like the wildlife they depict, the images of these rare species are themselves endangered, with no guarantee that they will survive for future generations. Many records have already been lost forever, with companies basing storage decisions on commercial, rather than scientific, cultural or historical values. (www.arkive.org/about/faqs.html#qd1)

It is not just biodiversity that emerges as endangered here, but a whole cultural history of humans' engagement with fauna and flora that ARKive also seeks to preserve. Nature appears doubly endangered through the disappearance of biological forms themselves *and* of the records that preserved the memory of these forms, in a move reminiscent of Jennifer Price's comment on the loss of the passenger pigeon and the loss of stories about that loss (cf. chapter 1). ARKive could not express more clearly that the scientific venture of saving endangered species is itself part of a larger venture of understanding and remembering cultural frameworks for understanding other species.

5. The Red List and Homo sapiens

Scientific, popular-scientific, and aesthetic genres, as this analysis has sought to show, strive to represent the current mass extinction of species by means of two quite different modes, the elegiac narrative about nature's decline and the epic cataloging of species at risk. At the same time that elements of elegy shape certain aspects of the world's most influential Red List, the database mode has made its way into the visual and verbal arts, with often striking if sometimes uneasy or contradictory results. The broader implications of the database perspective emerge most strikingly when it becomes a way of looking at humans themselves, as it does when the IUCN includes Homo sapiens in its Red List with an entry of its own. The IUCN classifies our species as Least Concern, that is, not endangered: "Listed as Least Concern as the species is very widely distributed, adaptable, currently increasing, and there are no major threats resulting in an overall population decline." Under "Major Threats," the Red List informs us that "there are currently no major threats to humans, although some subpopulations may be experiencing localized declines as a result of disease, drought, war, natural disasters, and other factors." And under the heading "Conservation Actions," the IUCN assures us that "at present, no conservation measures are required. Humans are present in numerous protected areas throughout their range," a range that includes not only all continents on Earth but also the International Space Station (www.iucnredlist.org/apps/redlist/details/136584/0).

This inclusion of Homo sapiens in a biodiversity database, however counterintuitive it may seem at first sight, is a significant gesture politically and philosophically in an age that is now increasingly referred to as the Anthropocene or "Age of Humans." When I have shown this Red List entry in presentations, the audience invariably started to laugh; the

laughter seemed equal parts amusement and unease at this unexpected perspective on humans and the leveling of differences between humans and other species that it implies. As Rafi Youatt has argued at a theoretical level, "the global biodiversity census offers a way of reterritorializing the category of 'human,' grounding it relative to other species and to the wide variety of ecosystems that make up the global ecosystem" (2015, chap. 2). The IUCN's Homo sapiens entry in particular signals that the challenge confronting humans in the face of the global biodiversity crisis is to reconceive themselves posthumanistically as a species among species, a process begun with Darwin's theory of evolution but at this point requiring a new translation into multispecies ethics and politics. Millet's novels and Sartore's photographs, as well as databases such as the IUCN Red List of Threatened Species and ARKive.org, all directly or indirectly seek to articulate such a new sense of humans' relation to other species beyond the story of nature's decline. Databases may be one of the most useful tools we have in this effort, in that they make it obvious that narratives of decline are only one way of traversing or mobilizing the life data they inventory. The data themselves, these works make clear, are deeply informed by narrative through their metadata structuring, and what they mean emerges only through the stories we tell about them.