

## Biodiversity

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When animals, birds, and plants vanish from the landscape, this raises public concern. Initially, the focus was on endangered species, which are still central, but in recent years attention has widened to other levels of biodiversity, such as types of ecosystems at a regional level, or genetic diversity at the microbiological level. Species are a more evident, mid-range, natural kind, which can be located in breeding populations. The US Congress, deploring the lack of "adequate concern (for) and conservation (of)" species, passed the Endangered Species Act (US Congress 1973, Sec. 2(a)(1)). The United Nations has negotiated a Biodiversity Convention, signed by more than 100 nations.

Such concern is unfamiliar to traditional philosophical analysis. John Rawls, for example, advocating his most perceptive contemporary theory of justice, admits that in his theory "no account is given of right conduct in regard to animals and the rest of nature." Nevertheless, he claims, "Certainly... the destruction of a whole species can be a great evil" (Rawls 1971, p. 512). But one will search past philosophical literature in vain for much help giving reasons why. This chapter first asks how far classical humanistic ethics can be applied to conserve biodiversity and then turns to explore novel problems in emerging human responsibilities of caring for endangered species.

The legislation to protect endangered species has often been used to protect as well the ecosystems of which they are part (such as the old growth forests of the Pacific Northwest, containing the spotted owl). An ecosystems approach is increasingly regarded as more efficient than a single-species approach. DNA sequencing and new possibilities in genetic technology have intensified concern for saving genetic diversity. At the same time, saving every genetic variant is evidently impossible even if it were desirable. Some recent studies find more diversity among microbes than among all the higher forms of life. Evaluating this spectrum of diversity, from genes through species to ecosystems to the biosphere, is one of the challenges in environmental ethics.

The implications of the Endangered Species Act have been unfolding over the last quarter century. The Act was passed mostly with the charismatic megafauna in mind (grizzly bears and whooping cranes), though the Act has always permitted listing less glamorous species. On rare inland dunes in California, the Delhi Sands Flower-loving Fly (*Rhaphiomidas terminatus abdominalis*), a huge and unusual fly, on the US endangered species list, is said (in the rhetoric of debate at least) to stand in the way of industrial development that would create 20,000 jobs, although the fly only needs about 300 acres of habitat (Booth 1997).

In later amendments Congress has increasingly extended protection to plants. Court decisions have protected habitat as essential to the survival of species. When the Act is applied to private lands, this has raised the "takings" issue, with landowners claiming that compensation is due, and environmentalists replying the rights to land do not include the right to extinguish species.

Ethics is a matter of duty, in classical categories, or of appropriate caring, as some now prefer to say. Whether humans have duties to endangered species is a significant theoretical and an urgent practical question. Why ought we to care? In the larger picture, the question of duties to ecosystems will arise. It would seem awkward to ask about duties to genes, although proper to ask why we should care about preserving genetic diversity. We will focus on the species question, as this opens up these philosophical issues.

Few persons doubt that humans have some obligations concerning endangered species, because persons are helped or hurt by the condition of their environment, which includes a wealth of wild species. Taking or jeopardizing listed endangered species is illegal and, many think, immoral. But these might be all obligations to persons who are benefited or harmed by species as resources. Is there a human duty directly to species? An answer is vital to the more comprehensive question of the conservation of biodiversity.

### **Saving species for people**

A rationale for saving species that centers on their worth to humans is anthropocentric, where species have instrumental values. A rationale that includes their intrinsic and ecosystemic values, in addition to or independently of persons, is naturalistic, sometimes said to be biocentric. "The preservation of species," by the usual humanistic utilitarian account, reported by Stuart Hampshire, is "to be aimed at and commended only in so far as human beings are, or will be emotionally and sentimentally interested" (Hampshire 1972, pp. 3-4; see also *NORMATIVE ETHICS*).

This includes duties to future humans. Joel Feinberg says, "We do have duties to protect threatened species, not duties to the species themselves as such, but rather duties to future human beings, duties derived from our housekeeping role as temporary inhabitants of this planet" (Feinberg 1974, p. 56; see also *FUTURE GENERATIONS*). Persons have a strong duty not to harm others (a duty of non-maleficence) and a weaker, though important, duty to help others (a duty of beneficence).

Many endangered species – which ones we may not now know – are expected to have agricultural, industrial, and medical benefits. Loss of the wild stocks of the cultivars leaves humans genetically vulnerable, so it is prudent to save the native materials. In an interesting example, an obscure Yellowstone thermophilic microbe, *Thermophus aquaticus*, was discovered to supply a heat-stable enzyme, which can be used to drive the polymerase chain reaction (PCR), used in a revolutionary gene-copying technique. The rights to the process sold in 1991 for \$300 million, and the process is now earning \$100 million a year.

According to this reasoning, the protection of nature is ultimately for the purpose of its enlightened exploitation. Norman Myers urges "conserving our global stock" (Myers 1979). But critics reply that examples of high economic value obtained from

rare species are anomalous and that, on statistical average, most endangered species have little probability of significant economic value. Debates have also followed about who owns wild species, if anyone, or who owns rights to them or to products derived from them. These issues are especially problematic in many relatively species-rich and technologically poor developing nations, when wealthier nations come prospecting, or when development is curtailed to save biodiversity.

Where not directly useful, wild species may be indirectly important for the roles they play in ecosystems. They are "rivets" in the airplane, the earthship in which we humans are flying (Ehrlich and Ehrlich 1981). The loss of a few species may have no evident results now, but the loss of many species imperils the resilience and stability of the ecosystems on which humans depend. The danger increases exponentially with subtractions from the ecosystem, a slippery slope into serious troubles. Even species that have no obvious or current direct value to humans are part of the biodiversity that keeps ecosystems healthy. One team of economists estimates the value of the world's ecosystem services, though largely off the market, to be in the range of \$16-54 trillion per year, compared to the global gross national product total of \$ 18 trillion per year (Costanza et al. 1997). Even those doubtful of the numbers concede that the aggregate benefits are huge (see ECONOMICS).

Some benefits are less tangible. Species that are too rare to play roles in ecosystems can have recreational and aesthetic value. Biodiversity enriches the landscapes on which humans reside; people enjoy variety in wildlife and wildflowers. Those who see bears or wolves in Yellowstone report that this is the highlight of their experience. The aesthetic experience of nature differs importantly from that of artworks; seeing whooping cranes in flight is unlike visiting an art museum. The wealth of species is aesthetic, an amenity value, as much as it is economic, a commodity value. At least in developed nations, where consumer goods are not in short supply but opportunities to experience nature are diminishing, it seems probable that, in the decades ahead, the quality of life will decline in proportion to the loss of biotic diversity (see AESTHETICS).

Species can be curiosities. The rare species fascinate enthusiastic naturalists and are often key scientific study species. They may serve as indicators of ecosystem health. They can be clues to understanding natural history. Destroying species is like tearing pages out of an unread book, written in a language humans hardly know how to read, about the place where we live. This is the Rosetta Stone argument (named after the obelisk found at Rosetta in Egypt in 1799, which enabled the deciphering of forgotten languages of the ancient past). Humans need insight into the full text of natural history. They need to understand the evolving world in which they are placed.

Following this logic, humans do not have duties to the book, the stone, or the species, but to themselves - duties both of prudence and education. Such anthropogenic reasons are pragmatic and impressive. They are also moral, since persons are benefited or harmed.

### **An ethics for species?**

Can all duties concerning species be analyzed as duties to persons? Many endangered species have no resource value, nor are they particularly important for the other

reasons given above. Beggar's ticks, with their stick-tight seeds, are a common nuisance weed through much of the United States. However, one species, the tidal shore beggar's tick (*Bidens bidentoides*), which differs little from the others in appearance, is increasingly endangered. It seems unlikely that it is either a rivet or a potential resource. Its extinction might be good riddance.

Are there completely worthless species? If so, is there any reason or duty to save them? A primary environmental ethics answer is that species are good in their own right, whether or not they are any good for humans. The duties-to-persons-only line of argument leaves deeper reasons untouched. Those calling for a more objective, or biocentric, environmental ethics argue that the deeper problem with the anthropocentric rationale is that its justifications are submoral and fundamentally exploitive and self-serving, even if subtly so. This is not true intraspecifically among humans, when out of a sense of duty an individual defers to the values of fellow humans. But it is true interspecifically, since, under this rationale, *Homo sapiens* treats all other species as rivets, resources, study materials, or entertainments.

Ethics has always been about partners with entwined destinies. But it has never been very convincing when pleaded as enlightened self-interest (I ought always to act in my best self-interest), including class self-interest (we ought always to act in our group self-interest). This is true even though ethics makes a place for self-interest (myself and my group being treated justly, fairly). Ethics brings benefits to those who are ethical; it conveys mutual advantage; it is good for people. But it also enlarges spheres of care and concern. To value all other species in our human group's self-interest is rather like a nation arguing all its foreign policy in terms of national self-interest. Neither seems fully moral.

Nevertheless, those who try to articulate a deeper environmental ethic often get lost in unfamiliar territory. Natural kinds, if that is what species are, are obscure objects of concern. Species, as such, cannot be directly helped or hurt, though individual tokens of the species type can be. Species, as such, don't care, though individual animals can care. Species require habitats, embedded in ecosystems that evolve and change. Of the species that have inhabited earth, 98 percent are extinct, replaced by other species. Nature doesn't care, so why should we?

All the familiar moral landmarks of classical ethics seem to be gone. One has moved beyond caring about humans, or culture, or moral agents, or individual animals that are close kin, or can suffer, or experience anything, or are sentient. Species are not valuers with preferences that can be satisfied or frustrated. It seems odd to say that species have rights. Tom Regan says, for example, "The rights view is a view about the moral rights of individuals, and the rights view does not recognize the moral rights of species to anything, including survival" (Regan 1983, p. 359).

It seems odd to say that species need our sympathy, or that we should consider their point of view. Nor is it clear that species have interests. Nicholas Rescher says:

Moral obligation is thus always interest-oriented. But only individuals can be said to have interests; one only has moral obligations to particular individuals or particular groups thereof. Accordingly, the duty to save a species is not a matter of moral duty toward it, because moral duties are only oriented to individuals. A species as such is the wrong sort of target for a moral obligation. (Rescher 1980, p. 83)

So it is hard to figure concern for species within the coordinates of prevailing ethical systems.

In fact, ethics and biology have had uncertain relations. An often-heard argument forbids moving from what is the case (a species exists) to what *ought to be* (a species ought to exist); any who do so commit, it is alleged, the naturalistic fallacy. On the other hand, if species are of objective value, and if humans encounter and jeopardize such value, it would seem that humans ought not to destroy values in nature, not at least without overriding justification producing greater value. A species is of *value* – this may be the intermediate premise. We might make a humanistic mistake if we arrogantly take value to lie exclusively in the satisfaction of our human preferences. What is at jeopardy and what are our duties?

### **The threat of extinction**

Although projections vary, reliable estimates are that about 20 percent of earth's species may be lost within a few decades, if present trends go unreversed. These losses will be about evenly distributed through major groups of plants and animals in both developed and developing nations, although the most intense concerns are in tropical forests (Wilson 1992; Ehrlich and Ehrlich 1981). At least 500 species, subspecies, and varieties of fauna have been lost in the United States since 1600. The natural rate would have been about ten. Islands have been a special concern. In Hawaii, of 68 species of birds unique to the islands, 41 are extinct or virtually so. Half the 2,200 native plants are endangered or threatened. Covering all states, a candidate list of US plants contains more than 2,000 taxa considered to be endangered, threatened, or of concern. A candidate list of animals contains about 1,800 entries. Humans approach, and, in places, have even exceeded the catastrophic rates of natural extinction spasms of the geological past.

### **Questions of fact: what are species?**

There are problems at two levels: one is about facts (a scientific issue – about species), one is about values (an ethical issue – involving duties). There are several differing concepts of species within biology. By some accounts any species concept is arbitrary, conventional – a mapping device that is only theoretical. Darwin wrote, "I look at the term species, as one arbitrarily given for the sake of convenience to a set of individuals closely resembling each other" (Darwin 1968 [1872], p. 108). Is there enough factual reality in species to base duty there?

No one doubts that individual organisms exist, but are species discovered? Or made up? Indeed, do species exist at all? Systematists regularly revise species designations and routinely put after a species the name of the "author" who, they say, "erected" the taxon. If a species is only a category or class, boundary lines may be arbitrarily drawn, and the species is nothing more than an artifact of the classifier's thoughts and aims. Some natural properties are used – reproductive structures, bones, teeth, or perhaps ancestry, or genes, or ecological roles. But which properties are selected and where the lines are drawn are decisions that vary with systematists.

Botanists are divided whether *Iliamna remota*, the Kankakee mallow in Illinois, and *Iliamna corei* in Virginia, which are both rare, are distinct species. Perhaps all that exists objectively in the world are the individual mallow plants; whether there are two species or one is a fuss about which label to use. A species is some kind of fiction, like a center of gravity or a statistical average. Almost no one proposes duties to genera, families, orders, phyla; biologists concede that these do not exist in nature, even though we may think that two species in different orders represent more biodiversity, with more genetic distance between them, than two in the same genus. If this approach is pressed, species can become something like the lines of longitude and latitude, or like map contour lines, or time of day, or dates on a calendar. Sometimes endangered species designations have altered when systematists decided to lump or split previous groupings.

A debate has continued over whether the red wolf is a species or a long-established hybrid of the gray wolf and the coyote. The distinction affects the considerable efforts to save this wolf in the southeastern United States. The tuatara is a large, iguana-like reptile with a third eye in the center of its head, which survives on a few islands off the coast of New Zealand. Because systematists earlier recognized one species rather than the three now claimed, tuataras have received inadequate protection, and one of the three species is now extinct. Depending on the degree to which species are or are not artifacts of those doing the taxonomy, duties to save them can seem more convincing or unconvincing.

There are four main concepts of species: (1) morphological, asking whether organisms have the same anatomy and functions; (2) biological (so-called), asking whether organisms can interbreed; (3) evolutionary, asking whether organisms have the same lineage historically; and (4) genetic, asking whether they have a common genome. But these concepts are not mutually exclusive; organisms that have enough common ancestry will have a similar morphology and function; they will be able to interbreed, and they can do so because they have similar genomes.

All these concepts combine for a more realist account. A species is a living historical form (Latin: *species*), propagated in individual organisms, which flows dynamically over generations. Species are dynamic natural kinds, historically particular lineages. A species is a coherent, ongoing natural kind expressed in organisms that interbreed because that kind is encoded in gene flow, the genes determining the organism's morphology and functions, the kind shaped by its environment. In one sense, the genes are what is reproduced, if one chooses to focus on that level; but in another sense the natural kind (species) is what is reproduced. There is genome producing genome, with genetic variation. There is also tiger producing tiger producing tiger. The coding is at the genetic level; the coping is at the native range level of organisms with adapted fit in ecosystems. A gene is an information-bit about how the species makes its way through the world.

In this sense, species are objectively there as living processes in the evolutionary ecosystem – found, not made by taxonomists. Species are real historical entities, interbreeding populations. By contrast, families, orders, and genera are not levels where biological reproduction takes place. So far from being arbitrary, species are the real evolutionary units of biodiversity. This claim – that there are specific forms of life historically maintained in their environments over time – is not fictional,

but, rather, seems as certain as anything else we believe about the empirical world, even though at times scientists revise the theories and taxa with which they map these forms.

Species are more like mountains and rivers, phenomena that are objectively there to be mapped. The edges of such natural kinds will sometimes be fuzzy, to some extent discretionary. We can expect that one species will modify into another over evolutionary time, often gradually, sometimes more quickly. But it does not follow from the fact that speciation is sometimes in progress that species are merely made up, instead of found as evolutionary lines articulated into diverse forms, each with its more or less distinct integrity, breeding population, gene pool, and role in its ecosystem. It is quite objective to claim that evolutionary lines are articulated into diverse kinds of life. What taxonomists do, or should do, is "carve nature at the joints" (Plato).

G. G. Simpson concludes, "An evolutionary species is a lineage (an ancestral-descendant sequence of populations) evolving separately from others and with its own unitary evolutionary role and tendencies" (1961, p. 153). Niles Eldredge and Joel Cracraft insist, with emphasis, that species are "*discrete entities in time as well as space*" (1980, p. 92). The various criteria for defining species (recent descent, reproductive isolation, morphology, distinct gene pool) come together at least in providing evidence that species are really there. What survives for a few months, years, or decades is the individual animal or plant, what survives for millennia is the kind as a lineage. Life is something passing through the individual as much as something it possesses on its own. Even a species defends itself; that is one way to interpret reproduction. The individual organism resists death; the species resists extinction through reproduction with variation. At both levels, biological identity is conserved over time.

### Questions of duty: ought species be saved?

Why ought species to be protected? One reply is that nature is a kind of wonderland. Humans ought to preserve an environment adequate to match their capacity to wonder. But nature as a wonderland introduces the question whether preserving resources for wonder is not better seen as preserving a remarkable natural history that has objective worth. Valuing speciation directly, however, seems to attach value to the evolutionary process (the wonderland), not merely to subjective experiences that arise when humans reflect over it (the wonder).

One might say that humans of decent character will refrain from needless destruction of all kinds. Vandals destroying art objects do not so much hurt statues as do they cheapen their own character. By this account, the duty to save endangered species is really a matter of cultivating human excellences. It is philistine to destroy species carelessly. It is uncalled for. But such a prohibition seems to depend on some value in the species as such, for there need be no prohibition against destroying a valueless thing. Why are such insensitive actions "uncalled for" unless there is something in the species itself that "calls for" a more appropriate attitude? If the excellence of character really comes from appreciating something wonderful, then why not attach value to this other? It seems unexcellent – cheap and philistine – to say that excellence of human character is what we are after. One ought to want virtue in the human

beholder that recognizes value in the endangered species. Excellence of human character does indeed result, but let the human virtue come tributary to value found in nature. An enriched humanity results, with values in the species and values in persons compounded – but only if the loci of value are not confounded (see **NORMATIVE ETHICS**).

A naturalistic account values species, speciation, and the cumulative biodiversity intrinsically. Humans ought to respect these dynamic life forms preserved in historical lines. It is not *form* (species) as mere morphology, but the *formative* (speciating) process that humans ought to preserve, although the process cannot be preserved without some of its products, and the products (species) are valuable as results of the creative process. An ethic about species sees that the species is a bigger event than the individual organism. Biological conservation goes on at this level too; and in a sense this level is more appropriate for moral concern, since the species with its populations is a comprehensive evolutionary unit.

A consideration of species is both revealing and challenging because it offers a biologically based counterexample to the focus on individuals – typically sentient animals and usually individual persons – that has been so characteristic in western ethics. As evolution takes place in ecosystems, it is not mere individuality that counts. The individual represents (re-presents) a species in each new generation. It is a token of a type, and the type is more important than the token. A biological identity – a kind of value – is here defended. The achievement resides in the dynamic form; the individual inherits this, exemplifies it, and passes it on. The evolutionary history that the particular individual has is something passing through it during its life, passed to it and passed on during reproduction, as much as something it intrinsically possesses. Having a biological identity reasserted genetically over time is as true of the species as of the individual. That identity includes its evolutionary achievements, the know-how to perpetuate that kind in the midst of its perpetual perishing, its location as an adapted fit in its ecosystem, filling its niche in the biotic community; respecting this identity generates duties to species.

When a rhododendron plant dies, another one replaces it. But when *Rhododendron chapmanii* – an endangered species in the US Southeast – goes extinct, the species terminates forever. Death of a token is radically different from death of a type; death of an individual different from death of an entire lineage. The deaths of individual rhododendrons in perennial turnover are even necessary if the species is to persist. Seeds are dispersed and replacement rhododendrons grow elsewhere in the pinewood forests, as landscapes change or succession shifts. Latercoming replacements, mutants as well as replacements, are selected for or against in a stable or changing environment. Individuals improve in fitness and the species adapts to an altering climate or competitive pressures. Tracking its environment over time, the species is conserved, modified, and continues on.

With extinction, this stops. Extinction shuts down the generative processes, a kind of superkilling. This kills forms (*species*) – not just individuals. This kills "essences" beyond "existences," collectively, not just distributively. To kill a particular plant is to stop a life of a few years, while other lives of such kind continue unabated, and the possibilities for the future are unaffected; to superkill a particular species is to shut down a story of many millennia, and leave no future possibilities.

A species lacks moral agency, reflective self-awareness, sentience, or organic individuality. Some are tempted to say that specific-level processes cannot count morally. But each ongoing species defends a form of life, and these forms are, on the whole, good kinds. Such speciation has achieved all the planetary richness of life. Virtually all ethicists say that in *Homo sapiens* one species has appeared that not only exists but ought to continue to exist. Everyone concerned for children, grandchildren, and FUTURE GENERATIONS believes that. A naturalistic ethic refuses to say this exclusively of a late-coming, highly developed form and asks whether this duty ought not to extend more broadly to the other species – though not with equal intensity over them all, in view of varied levels of development.

The wrong that humans are doing, or are allowing to happen through carelessness, is stopping the historical gene flow in which the vitality of life is laid, which, viewed at another level, is the same as the flow of natural kinds, which is the drama of biodiversity. A shutdown of the life stream is the most destructive event possible. The duty to species can be overridden, for example with pests or disease organisms. But a *prima facie* duty stands nevertheless.

The question is not: What is this rare plant or animal good for? But: What good is here? Not: Is this species good for my kind, *Homo sapiens*. But: Is *Rhododendron chapmanii* a good of its kind, a good kind? To care directly about a plant or animal species is to be quite non-anthropocentric and objective about botanical and zoological processes that take place independently of human preferences.

Never before has this level of question been faced, which is why philosophical ethicists have been stuttering about it. Previously, humans did not have much power to cause extinctions, or knowledge about what they were inadvertently doing. But today humans have more understanding than ever of the natural world they inhabit, of the speciating processes, more predictive power to foresee the intended and unintended results of their actions, and more power to reverse the undesirable consequences. The duties that such power and vision generate no longer attach simply to individuals or persons but are emerging duties to specific forms of life.

A consideration of species strains any ethic fixed on individual organisms, much less on sentience or persons. But the resulting ethic can be biologically sounder, though it revises what was formerly thought logically permissible or ethically binding. When ethics is informed by this kind of biology, it is appropriate to attach duty dynamically to the specific form of life. The species line is the more fundamental living system, the whole, of which individual organisms are the essential parts. The appropriate survival unit is the appropriate level of moral concern. Concern for biodiversity will always, by this account, be concern centrally for species. Saving endangered species can even, at times, take priority over the preferences of persons – or even the lives of persons, as with the shoot-to-kill policies for poachers of elephants and rhinoceros (Rolston 1996).

### **Species in ecosystems**

A species is what it is inseparably from the environmental niche into which it fits. Habitats are essential to species, and an endangered species often means an endangered habitat. The species and the community are complementary goods in synthesis,

parallel to, but a level above, the way the species and individual organisms have distinguishable but entwined goods. From this viewpoint, it is not preservation of *species* that we wish, but the preservation of *species in the system*. It is not merely *what* they are, but *where* they are that humans must value correctly. Appropriate concern for species is impossible without concern for the diverse ecosystems that they inhabit.

This limits the otherwise important role that zoos and botanical gardens can play in conservation. They can provide research, a refuge for species, breeding programs, aid in public education, and so forth; but they cannot simulate the ongoing dynamism of gene flow over time under the selection pressures in a wild biome. They only lock up a collection of individuals; they amputate the species from its habitat. The species can only be preserved *in situ*: the species ought to be preserved *in situ*. That does move from scientific facts to ethical duties, but what ought to be has to be based on what can be.

Neither individual nor species stands alone; both are embedded in an ecosystem. Every species came to be what it is where it is, shaped as an adaptive fit. (A problem with exotic species, introduced by humans, is often that they are not good fits in their alien ecosystems.) The product, a species, is the outcome of entwined genetic and ecological processes; the generative impulse springs from the gene pool, defended by information coded there. But the whole population or species survives when selection by natural forces tests the member individuals for their adapted fitness in the environmental niche the species occupies.

In an ethic of endangered species, one ought to admire the evolutionary or creative process as much as the product, since these two are intertwined. A species is an ongoing historical event, not just a collection of individuals produced. This involves regular species turnover when a species becomes unfit in its habitat, goes extinct, or tracks a changing environment until transformed into something else. On evolutionary timescales, species too are ephemeral. But the speciating process is not. Persisting through vicissitudes for two and a half billion years, speciation is about as long-continuing as anything on earth can be.

### Natural and human-caused extinctions

It might seem that for humans to terminate species now and again is quite natural. Species go extinct all the time in natural history. But there are important theoretical and practical differences between natural and anthropogenic (human-caused) extinctions. In natural extinction, a species dies out when it has become unfit in habitat, and other existing or novel species appear in its place. Such extinction is normal turnover in ongoing speciation. Though harmful to a species, extinction in nature seldom impoverishes the system. It is rather the key to tomorrow. The species is employed in, but abandoned to, the larger historical evolution of life.

By contrast, artificial extinction typically shuts down future evolution because it shuts down speciating processes dependent on those species. One opens doors, the other closes them. Humans generate and regenerate nothing; they only dead-end these lines. Relevant differences make the two as morally distinct as death by natural causes is from murder. Anthropogenic extinction differs from evolutionary extinction in that hundreds of thousands of species will perish because of culturally altered

environments that are radically different from the spontaneous environments in which such species evolved and in which they sometimes go extinct. In natural extinction, nature takes away life when it has become unfit in a habitat, or when the habitat alters, and typically supplies other life in its place. Natural extinction occurs with transformation, either of the extinct line or related or competing lines. Artificial extinction is without issue.

From this perspective, humans have no duty to preserve species from natural extinctions, although they might have a duty to other humans to save such species as resources or museum pieces. Some have claimed that the Uncompahgre fritillary (*Boloria acrocnema*), known from two alpine mountain peaks in Colorado, is going extinct naturally, and that therefore, no effort should be made to save it (Others claim that livestock are a decisive factor.) No species has a "right to life" apart from the continued existence of the ecosystem with which it is able to co-fit. But humans do have a duty to avoid artificial extinction.

Over evolutionary time, though extinguishing species, nature has provided new species at a higher rate than the extinction rate; hence the accumulated global biodiversity. There have been infrequent catastrophic extinction events, anomalies in the record, each succeeded by a recovery of previous diversity. Typically, however, the biological processes that characterize earth are prolific. Uninterrupted by accident or even interrupted so, they have rather steadily increased the numbers of species.

An ethicist has to be circumspect. An argument might commit what logicians call the genetic fallacy to suppose that present value depended upon origins. Species judged today to have intrinsic value might have arisen anciently and anomalously from a valueless context, akin to the way in which life arose mysteriously from non-living materials. But in an ecosystem, what a thing is differentiates poorly from the generating and sustaining matrix. The individual and the species have what value they have to some extent inevitably in the context of the forces that beget them. There is something awesome about an earth that begins with zero and runs up toward five to ten million species in several billion years, setbacks notwithstanding. Were the moral species, *Homo sapiens*, to conserve all Earth's species merely as resources for human preference satisfaction, we would not yet know the truth about what we ought to do in biological conservation.

### **Respect for life: biodiversity and rarity**

Duties to endangered species will be especially concerned with a respect for rare life. Such respect must ask about the role of rarity in generating respect. Rarity is not, as such, an intrinsically valuable property in fauna and flora, or in human experiences (even though people take an interest in things just because they are rare). Certain diseases are rare, and people are glad of it. Monsters and other sports of nature, such as albinos, are rare, and of no particular intrinsic value for their rarity, curiosities though they sometimes become. Indeed, if a species is naturally rare, that initially suggests its insignificance in an ecosystem. Rarity is no automatic cause for respect. Nevertheless, something about the rarity of endangered species heightens the element of respect, and accompanying duty.

Naturally rare species, as much as common or frequent species, signify exuberance in nature; they add to the biodiversity. A rare species may be barely hanging on, surviving by mere luck. But a rare species may be quite competent in its niche, not at all nearing extinction if left on its own; it is only facing extinction when made artificially more rare by human disruptions. The rare flower is a botanical achievement, a bit of brilliance, an ecological problem resolved, an evolutionary threshold crossed. The locally endemic species, perhaps one specialized for an unusual habitat, represents a rare discovery in nature, before it provides a rare human adventure in finding it.

Naturally rare species – if one insists on a restricted evolutionary theory – are random accidents (as in some sense also are the common ones), resulting from a cumulation of mutations. But this mutational fertility generates creativity, and, equally by the theory, surviving species must be more or less satisfactory fits in their environments. Sometimes they live on the cutting edge of exploratory probing; sometimes they are relics of the past. Either way they offer promise and memory of an inventive natural history. Life is a many-splendored thing; extinction of the rare dims this luster. From this arises the respect that generates a duty to save rare lives.

A six-year study sponsored by the National Science Foundation surveyed environmental attitudes in the general public. The survey tested support for the claim: "Our obligation to preserve nature isn't just a responsibility to other people but to the environment itself"; and, perhaps surprisingly, found agreeing not only 97 percent of Earth First! members but also 82 percent of sawmill workers from the Pacific Northwest. The public average was 87 percent. For the claim: "Justice is not just for human beings. We need to be as fair to plants and animals as we are towards people," the agreements are similar: 97 percent, 63 percent, and an average of 90 percent. The survey authors conclude: "An environmental view of the world is more universal than previous studies have suggested" (Kempton et al. 1995, pp. 113, ix).

The seriousness of respect for biodiversity is further illustrated when the idea approaches a "reverence" for life. Surveys also show that for many this is the most important value at stake, often taking a monotheistic form. Species are the creation itself, the "swarms of living creatures" (biodiversity) that "the earth brought forth" at the divine imperative; "God saw that it was good" and "blessed them" (Genesis 1). Noah's ark was the aboriginal endangered species project; God commanded, "Keep them alive with you" (Genesis 6). Any who decide to destroy species take, fearfully, the prerogative of God. When one is conserving life, ultimacy is always nearby. Extinction is forever; and, when danger is ultimate, absolutes become relevant. The motivation to save endangered species can and ought to be pragmatic, economic, political, and scientific; deeper down it is moral, philosophical, and religious. Species embody a fertility on earth that is sacred.

On the scale of evolutionary time, humans appear late and suddenly, a few hundred thousand years on a scale of billions of years, analogous to a few seconds in a twenty-four-hour day. Even more lately and suddenly they increase the extinction rate dramatically, as we have done in this one last century among several thousand years of recorded history. What is offensive in such conduct is not merely the loss of resources, but the maelstrom of killing and insensitivity to forms of life. What is required is not prudence but principled responsibility to the biospheric earth. Only the

human species contains moral agents, but conscience ought not to be used to exempt every other form of life from consideration, with the resulting paradox that the sole moral species acts only in its collective self-interest toward all the rest.

Several billion years worth of creative toil, several million species of teeming life, have been handed over to the care of the latecoming species in which the mind has flowered and morals have emerged. On the naturalistic account, the host of species has a claim to care in its own right. There is something Newtonian, not yet Einsteinian, besides something morally naive, about living in a reference frame where one species takes itself as absolute and values everything else relative to its utility.

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### **Further reading**

- Rolston III, Holmes (1988) "Life in jeopardy: duties to endangered species," in *Environmental Ethics* (Philadelphia: Temple University Press). [Expands the argument of this chapter.]