Encyclopedia of Environmental Biology, vol. 1 (Academic Press, 1995), pp. 517-528

Duties to Endangered Species

Holmes Rolston III
Colorado State University

Whether humans have duties to endangered species is a significant theoretical and urgent practical question. Few persons doubt that we 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, currently under alarming threat of extinction. The U.S. Congress, deploring the lack of "adequate concern [for] and conservation [of]" species, has sought to protect species through the Endangered Species Act. Congress has also entered into a Convention on International Trade in Endangered Species. The United Nations has negotiated a Biodiversity Convention, signed by over 100 nations. Taking or jeopardizing endangered species (at least the listed ones) 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, in addition to obligations that humans have to other humans, fellow members of their own species? This would be part of an interspecific environmental ethics, and involves a challenging mix of science and conscience. An answer is vital to the more comprehensive question of the conservation of biodiversity, how humans can achieve a sustainable relationship to the natural world..

I. ETHICAL DUTIES AND BIOLOGICAL SPECIES

A rationale for saving species that centers on their worth to humans is anthropocentric, in which species have instrumental values; a rationale that includes their intrinsic and ecosystemic values, those values they may have in themselves or in their functions in ecosystems, in addition to or independently of persons, is naturalistic. Some say there are no duties to endangered species, only duties to persons. The preservation of species, by the usual utilitarian account, is commended only insofar as human beings have or might have interests at stake. This includes duties to future human beings, duties derived from our stewardship role as keepers of the planet for later people. Any duties concerning species will then be a matter of finding out whatever human values are at stake with the loss of species and of applying classical duties to persons to protect these values. [See MASS

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 entertainment.

Ethics has always been about partners with entwined destinies. But it has never been very convincing when pleaded as enlightened self-interest (that one should always do what is in one's intelligent self-interest), including class self-interest, even though in practice altruistic ethics often need to be reinforced by self-interest. To value all other species only for human interests is rather like a nation's 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, although individual tokens of the species type can be. Species, as such, don't care, although individual animals can care. Species require habitats, embedded in ecosystems that evolve and change. Ninety- eight percent of the species that have inhabited Earth are extinct, replaced by other species. Nature doesn't care, so why should we? All of the familiar moral landmarks are gone. We have moved beyond caring about humans, or culture, or moral agents, or individual animals that are close kin, or can suffer, or can 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, or moral standing, or need our sympathy, or that we should consider their point of view. None of these elements has figured within the coordinates of prevailing ethical systems.

In fact, ethics and biology have had uncertain relationships. An often-heard argument forbids moving from what *is* the case (a description of scientific facts) to what *ought to be* (a prescription of moral duty); 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 destroy values in nature, at least not without overriding justification producing greater value. 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?

II. THE THREAT OF EXTINCTION

Although projections vary, reliable estimates are that ~20% 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. 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 10. In Hawaii, of 68 species of birds unique to the islands, 41 are extinct or virtually so. Half of the 2200 native plants are endangered or threatened. Covering all states, a candidate list of plants contains over 2000 taxa considered to be endangered, threatened, or of concern, although relatively few of these have been formally listed. A candidate list of animals contains about 1800 entries. Humans approach, and in places have even exceeded, the catastrophic rates of natural extinction spasms of the geological past.

Throughout the Endangered Species Act, from the title onward, the mood is one of danger. The Act laments the irretrievable extinction of any species, climaxing in a "no-jeopardy" clause. That clause has proved the toughest part of the Act, where nearly all of the litigation has arisen. This instructs all federal agencies to take whatever action is necessary "to insure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of such endangered species or threatened species." Existence is at stake, both of species and of habitats that are critical for them.

It may be thought that, although the terms are

maleficent, humans are not in jeopardy; only the plants and animals are. Humans have important, but not life-jeopardizing, benefits to be gained from saving species. Congress did want to protect values at stake to the nation and its people. Yet, in the snail darter case (Tennessee Valley Authority versus Hill), the U.S. Supreme Court found in the Act "repeated expressions of congressional concern over what it saw as the enormous danger presented by the eradication of any endangered species." Although Congress has not said that humans have duties to species (such an ethical judgment might not be the prerogative of Congress), the Court insisted "that Congress intended endangered species to be afforded the highest of priorities." All of this suggests considerable peril, and responsibility proportionate to the peril.

Nor is this simply an Act for the utilitarian con servation of important economic resources. Congress declared that species have "esthetic, ecological, educational, historical, recreational and scientific value" but refused to put on the list that value that has since become the one most often given: economic value. Rather, revealing what Congress thought was at stake, economic value is sharply set opposite to these others. Congress laments "economic growth and development untempered by adequate concern and conservation," and it has consistently refused to allow the economic benefits or costs of the preservation of a species to be one of the criteria that determine whether it is listed. Since economic concerns must sometimes be con- sidered, Congress in the 1978 amendments authorized a high-level interagency committee to evaluate difficult cases, and, should this committee deem fit, to permit economic development at the cost of extinction of species that impede such development. But it clearly places a high burden of proof on those who wish to put species at peril for development reasons.

III. 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). It is difficult enough to argue from an *is* (that a species exists) to an *ought* (that a species ought to exist). Matters grow worse if the concept of species is troublesome to begin with, and there are several differing concepts of species within biology. Perhaps any 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." Is there enough factual reality in species to base duty there? [See SPECIATION.]

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 a convenient grouping of its members, an artifact of the classifier's thoughts and aims. Some natural properties are used-reproductive structures, bones, teeth, or perhaps ancestry, genes, 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, and phyla; biologists concede that these do not exist in nature, even though we may think that two species in different orders represent more biodiversity 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 en-

Persons have a strong duty not to harm others (called a duty of nonmaleficence) and a weaker, though important, duty to help others (called a duty of beneficence). Many endangered species-which ones we may not now know-are expected to have agricultural, industrial, and medical benefits. Relatively few plants have been tested for their usefulness. Loss of the wild stocks of cultivars leaves humans genetically vulnerable, so it is prudent to save native materials. According to this reasoning, the protection of nature is ultimately for the purpose of the enlightened exploitation of nature. Norman Myers urges "conserving our global stock."

Where they are not directly useful, wild species may be indirectly important for the roles they play in ecosystems-as part of the human life support system. They are "rivets" in the airplane, the Earthship in which we humans are flying, and one ought not to pop rivets in people's planes. 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. [See ECOLOGICAL ENERGETICS OF ECOSYSTEMS.]

On the benefit side, there are less tangible benefits. Species that are too rare to play roles in ecosystems can have recreational and aesthetic value-even, for many persons, religious value. 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 provide entertainment and new knowledge, regardless of their stabilizing or economic benefits. 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 called the Rosetta stone argument (named after the famous obelisk found at the town of 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. It is safe to say that, in the decades ahead, the quality of life will decline in proportion to the loss of biotic diversity, although it is sometimes thought that one must sacrifice biotic diversity to improve human life.

Following this logic, humans do not have duties to the book, the stone, or the species, but to ourselves-duties both of prudence and education. Such anthropogenic reasons are pragmatic and impressive. They are also moral, since persons are benefited or harmed. But are there also naturalistic reasons? 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 (*Bidens* spp.), 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 to humans. So far as humans are concerned, its extinction might be good riddance.

Are there completely worthless species-not good for anything at all? If so, is there any reason or duty to save them? Are the humanistic reasons exhaustive? A primary environmental ethics answers 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. 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

dangered species designations have altered when systematists decided to lump or split previous groupings. To whatever degree species are artifacts of those doing the taxonomy, duties to save them seem 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 mor- phology and function; they will be able to interbreed, and they can do so because they have similar genomes.

All of these concepts combine for a more realist account than the artifact-of-taxonomy subjectivist account. A species is not just a class that taxonomists decide on; it is a living historical form (Latin: *species*), propagated in individual organisms, that 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 this sense species are objectively there as living processes in the evolutionary ecosystem-found, not made by taxonomists. Species are real historical entites, interbreeding populations. By contrast, families, orders, and genera are not levels at which biological reproduction takes place. So far from being arbitrary, species are the real evolutionary units. 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, as Plato said, to "carve nature at the joints."

G. G. Simpson concluded, "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." Niles Eldredge and Joel Cracraft insist, with emphasis, that species are "*discrete entities in time as well as space*." As convincing an account as any finds that species, though not individual organisms, are another natural kind of historical individual, each a unique event in natural history, and that species names are proper names. The various criteria for defining species (recent descent, reproductive isolation, morphology, and 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.

IV. QUESTIONS OF DUTY: OUGHT SPECIES BE SAVED?

Why ought species be protected? Beyond a humanistic set of answers, when we confront the objective history of speciation and

evolution of species, is there some nonhumanistic reason to save endangered species? One reply here is that nature is a kind of wonderland. As curiosities and relics of the past, even species that are presently not good for anything in particular can be given an umbrella protection by saying that humans ought to preserve an environment adequate to match their capacity to wonder.

But nature as a wonderland introduces the question of whether preserving resources for wonder is not better seen as preserving a remarkable natural history that has objective worth-an evolutionary process that has spontaneously assembled as its products millions of species. 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). It will be better, beyond our pragmatic self-enlightened strategies for conservation, beyond our obligations to other humans, beyond even our wonder, to know the full truth of the human obligation, to have the best reasons for saving species, as well as the good ones.

We might say that humans of decent character will refrain from needless destruction of all kinds, including destruction of species. Vandals destroy ing 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; persons of character will not do it. 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. Is there not here some insensitivity to a form of life that (unlike a statue) has an intrinsic value that places some claim on humans?

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, so full of wonder? It seems unexcellent-cheap and philistine-to say that excellence of human character is what we are after when we preserve these endangered species. We 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.

A naturalistic account values species and speciation intrinsically, not as resources or as a means to human excellence. Humans ought to respect these dynamic life forms preserved in historical lines, vital informational processes that persist genetically over millions of years, overleaping short-lived individuals. 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, although species are always exemplified in individual organisms. Biological conservation goes on at this level too, and in a sense this level is more appropriate for moral concern, since the species is a comprehensive evolutionary unit but the single organism is not. [See SPECIES DIVERSITY.]

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. Though species are not moral agents, a biological identity-a kind of value-is here defended. The dignity 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. Respecting that identity generates duties to species.

When a rhododendron plant dies, another one replaces it. But when *Rhododendron chapmanii*-an endangered species in the U.S. 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 forest, as landscapes change or succession shifts. Later-coming 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.

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," the "soul" as well as the "body. " This kills 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. All ethicists say that in *Homo sapiens* one species has appeared that not only exists but ought to exist. A naturalistic ethic refuses to say this exclusively of a late-coming highly developed form and extends this duty more broadly to the other species-although 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 historical gene flow in which the vitality of life is laid, and which, viewed at another level, is the same as the flow of natural kinds. A shutdown of the life stream is the most destructive event possible. Although all specific stories must eventually end, we seldom want unnatural ends. The difference between natural extinction and human-caused extinction is something like that between death by natural causes and murder. Humans ought not to play the role of murderers. The duty to species can be overridden, for example, with pests or disease organisms. But a prima facia duty stands nevertheless. [See EVOLUTION AND EXTINCTION.]

What is wrong with human-caused extinction is not just the loss of human resources, but the loss of biological sources. 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? True, we are censuring insensitivity in persons, but we are appreciating an objective vitality in the world, one that precedes and overleaps our personal or cultural presence. To care directly about a plant or animal species is to be quite nonanthropocentric and objective about botanical and zoological processes that take place independently of human preferences.

Never before has this level of question been faced. 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. Increasingly, we know the natural histories of flora and fauna;

we find that, willy-nilly, we have a vital role in whether these stories continue. 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 result can be biologically sounder, although it revises what was formerly thought logically permissible or ethically binding. When ethics are 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 species too has its integrity, its individuality; and it is more important to protect this than to protect individual integrity. The appropriate survival unit is the appropriate level of moral concern.

V. SPECIES IN ECOSYSTEMS

A species is what it is inseparably from the environmental niche into which it fits. A species is what it is where it is. Particular species may not be essential in the sense that the ecosystem can survive the loss of individual species without adverse effect. But habitats are essential to species, and an endangered species often means an endangered habitat. Species play lesser or greater roles in their habitats. Integrity in the species fits into integrity in the ecosystem. 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. 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 we must value correctly.

This limits the otherwise important role that zoos and botanical gardens can play in the conservation of species. They can provide research, a refuge for species, breeding programs, aid on 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. Plants, which are autotrophs, have a certain independence that animals and other heterotrophs do not have. Plants need only water, sunshine, soil, nutrients, and local conditions of growth; animals, often mobile and higher up the trophic pyramid, may range more widely, but in this alternate form of independence depend on the primary production of plants. Every natural form of life came to be what it is where it is, shaped as an adaptive fit, even when species acquire a fitness that enables them to track into differing environments. (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 selected by natural forces in the environment for a niche it can occupy.

In an ethic of endangered species, we want to admire the evolutionary or creative process as much as the product. 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 time scales species too are ephemeral. But the speciating process is not. Persisting through vicissitudes for 2.5 billion years, speciation is about as long-continuing as anything on earth can be.

VI. NATURAL AND HUMAN CAUSED EXTINCTIONS

It might seem that for humans to terminate species now and again is quite natural. Species become extinct all the time in natural history. But although extinction is a quite natural event,

there are important theoretical and practical differences between natural and anthropogenic (human-caused) extinctions. Artificial extinction, caused by human disturbance or encroachments, is radically different from natural extinction. In natural extinction a species dies out when it has become unfit in habitat, and other existing or future species appear in its place. There are replacements. Such extinction is normal turnover in ongoing speciation. Although harmful to a species, extinction in nature is seldom an evil in 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 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 rare species from natural extinctions, although they might have a duty to other humans to save such species as resources or museum pieces. No species has a "right to life" apart from the continued existence of the eco- system with which it cofits. But humans do have a duty to avoid artificial extinction.

Over evolutionary time nature, though extinguishing species, has provided new species at a higher rate than the extinction rate, hence the accumulated global diversity. There have been infrequent catastrophic extinction events, anomalies in the record, each succeeded by a recovery of previous diversity. Although natural events, these extinctions so deviate from the normal trends that many paleontologists look for causes external to the evolutionary ecosystem-supernovae or collisions with asteroids. Typically, however, the biological processes that characterize Earth are both prolific and with considerable powers of recovery after catastrophe. Uninterrupted by accident, or even interrupted so, they steadily increase the numbers of species.

An ethicist must be circumspect. An argument might commit what logicians call the genetic fallacy to suppose that present value depended on 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 nonliving 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 5-10 million species in several billion years, setbacks notwithstanding. Were the sole 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 has been, is, or ought to be going on in biological conservation.

VII. RESPECT FOR RARE LIFE

Duties to endangered species will be especially concerned with a respect for a rare life. Such respect must ask about the role of rarity in generating respect, if this differs from a more general respect for common life. 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 we 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 initally 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; each species presents an actual unique expression of the prolific potential driving the evolutionary epic. A rare species may be barely hanging on, surviving by mere luck, and we have already noticed that there is no duty to save species going extinct naturally. 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 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.

Rhododendron chapmanii is a particular evolutionary achievement. Though rare, it is a satisfactory fit, well placed in its niche in the transition zone between the dry longleaf pine forests and the moist Cyrilla thickets. Millions of years of struggle lie behind it; the results of that history are now genetically coded within it. Rare species-if one insists on a restricted evolutionary theory-are random accidents (as are the naturally common ones), resulting from a cumulation of mutations. But this mutational fertility generates creativity, and, equally by the theory, surviving species must be 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.

This respect for life is sometimes expressed in terms of rights. Aldo Leopold, advocating respect for the fauna and flora on the landscape, says "A land ethic of course cannot prevent the alteration, management, and use of these `resources,' but it does affirm their right to continued existence, and, at least in spots, their continued existence in a natural state." They "should continue as a matter of biotic right." Charles S. Elton, an ecologist, reports a belief that he himself shares: "There are millions of people in the world who think that animals have a right to exist and be left alone." This appeal to a biotic right must be taken as evidence of the strength of conviction that there are duties to species. Nevertheless, many philosophers have concluded that the vocabulary of rights, though useful rhetorically, is not the most appropriate category of analysis for values at the species level. "Rights" is best developed as a category for protecting personal values; rights are not objectively present in the natural world. But endangered species are objectively valuable kinds, good in themselves; they do have their own welfare. Respect for life ought to be directly based on this value.

The seriousness of respect for rare life is further illustrated when the idea approaches a "reverence" for life. As noticed earlier, when the U.S. Congress declared that species have multiple values, it left economic value off the list. Another notable omission is religious value. Congress would have overstepped its authority to declare that species carry religious value. Nevertheless, for many, Americans and others around the globe, this is the most important value at stake. 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." Noah's ark was the aboriginal endangered species project; God commanded, "Keep them alive with you."

God's name does not appear directly in the Endangered Species Act but nevertheless occurs in connection with the Act. The high-level interagency committee may permit human development at the cost of extinction of species. In the legislation this committee is given the rather nondescript name "The En-

dangered Species Committee," but almost at once it was nicknamed "the God Committee." The name mixes jest with theological insight and reveals that religious value is implicitly lurking in the Act. Humans are trustees of creation and ought to "play God" with extreme care. 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.

This genesis is, in biological perspective, spontaneous and autonomous; and biologists find nature to be prolific, whether or not the God question is raised. Whether the conviction rises to a reverence for life or not, the respect for life in jeopardy becomes intense. Life is the peculiar value on our planet, among the rare phenomena in the universe, indeed, not yet elsewhere known. Natural history is a vast scene of birth and death, sprouting, budding, flowering, fruiting, passing away, passing life on. Biologists know, better than others, that Earth has brought forth the natural kinds exuberantly over the millennia. Ultimately, there is a kind of creativity in nature demanding at least that one spell nature with a capital N, if one does not pass beyond nature to detect some deeper sacred presence.

Biologists today are not inclined, nor should they be as biologists, to look for explanations in supernature, but biologists meanwhile find a nature that is superb! This commands a deep respect. Science, many think, eliminates from nature any suggestions of teleology, but it is not so easy for science to dismiss genesis. What has managed to happen on Earth is startling by any criteria. Ernst Mayr concludes, "Virtually all biologists are religious, in the deeper sense of the word, even though it may be a religion without revelation. ... The unknown and maybe unknowable instills in us a sense of humility and awe." "And if one is a truly thinking biologist, one has a feeling of responsibility for nature, as reflected by much of the conservation movement." If anything at all on Earth is sacred, it must be this enthralling creativity that characterizes our home planet.

Species are a characteristic expression of the creative process. The swarms of species are both presence and symbol of forces in natural systems that transcend human powers and utility. Generated from earth, air, fire, and water, these fauna and flora are an archetype of the foundations of the world. Earth is a fertile planet, and in that sense the genesis on Earth is the deepest valuational category of all, one classically reached by the concept of creation. Many find it impossible to be a conservation biologist without a respect for life. Whatever biologists may make of the mystery of life's origins, they almost unanimously conclude that the catastrophic loss of species that is at hand and by our hand is tragic, irreversible, and unforgivable. That generates duties to endangered species.

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 24-hour day. Even more lately and suddenly, they increase the extinction rate dramatically, in this one century in several thousand years of recorded history. What is offensive in such conduct is not merely senseless destabilizing, 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 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 late-coming species in which mind has flowered and morals have emerged. On the humanistic account, such species ought to be saved for their benefits to humans. On the naturalistic account, the sole moral species has a duty to do something less self-interested than count all the products of an

evolutionary ecosystem as human resources; rather, 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 in which one species takes itself as absolute and values everything else relative to its utility.

Glossary

Anthropogenic extinction Extinction caused by human-introduced causes, as distinguished from natural extinction.
Catastrophic extinction Extinction at extremely high rates, differing from normal rates, at unusual periods in natural history.
Instrumental value Value as a means to an end. Species have instrumental value for humans if they have medical, industrial, agricultural, recreational, or other uses.
Intrinsic value Value that is inherent in something, without necessary reference to its instrumental value. Intrinsic value in species claims that natural kinds are good in themselves, whether or not they are useful to humans.
Natural extinction Extinction that takes place due to natural causes, without human causes, as has occurred throughout evolutionary history.
Naturalistic fallacy An alleged fallacy when one argues from statements of fact in premises to statements of duty in conclusions, from descriptions to prescriptions.

Bibliography

Council on Environmental Quality and Department of State (1980). "The Global 2000 Report to the President." U. S. Government Printing Office, Washington D.C. [Includes projections of impending losses of species.]

Darwin, C. (1872/1968). "The Origin of Species." Penguin, Baltimore, Maryland.

Ehrlich, P., Ehrlich, A. (1981). "Extinction." Random House, New York. [A comprehensive study of extinctions, with the rationale for saving species.]

Eldredge, N., Cracraft, J (1980). "Phylogenetic Patterns and the Evolutionary Process." Columbia University Press, New York.

Elton, C. S. (1958). "The Ecology of Invasions by Animals and Plants." Wiley, New York.

Ghiselin, M. (1987). Species concepts, individuality, and objectivity. *Biol. Philos.* 2, 127-144.

Hull, D. L. (1978). A matter of individuality. *Philos. Sci.* **45**, 335-360.

Leopold, A. (1968). "A Sand County Almanac." Oxford University Press, New York.

Mayr, E. (1982). "The Growth of Biological Thought." Harvard University Press, Camridge, Massachusetts.

Mayr E. (1985). How biology differs from the physical sciences. In "Evolution at a Crossroads" (J. Depew and B. H. Weber, eds.). MIT Press, Cambridge, Massachusetts.

Myers, N. (1979a). "The Sinking Ark." Pergamon, Oxford, England. [A comprehensive study of species losses worldwide.]

Myers, N. (1979b). Conserving our global stock. *Environment* **21**(9), 25-33.

Norton, B. G., ed. (1986). "The Preservation of Species." Princeton University Press, Princeton, NewJersey. [Oriented to policy and philosophical issues.]

Opler, P. A. (1977). The parade of passing species: A survey of extinctions in the U.S. *Sci. Teach.* **44**, 30-34.

Rolston, H., III(1985). Duties to endangered species. *Bioscience* **35**, 718-726.

Rolston, H., III (1988). Life in jeopardy: Duties to endangered species. In "Environmental Ethics," Temple University Press, Philadelphia.

Simpson, G. G. (1961). "Principles of Animal Taxonomy." Columbia University Press, New York.

U.S. Congress (1973). Endangered Species Act of 1973, 87 Stat. 884, Public Law 93-205.

U.S. Fish and Wildlife Service (1990). Review of plant taxa for listing as endangered or threatened species. *Fed. Regist.* **55**,(35), 6184-6229.

U.S. Fish and Wildlife Service (1991). Animal candidate review for listing as endangered or threatened species. *Fed. Regist.* **56**,(225), 58804-58836.