

A HOUSE ON FIRE: LINKING THE BIOLOGICAL AND LINGUISTIC DIVERSITY CRISES

BY
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*"When you lose a language, it's like dropping a bomb on a museum."*¹

*"We are accelerating toward a calamity unparalleled in planetary history . . . These are crucial years for us to act, as the Library of Life burns furiously around us, throughout the world."*²

I. INTRODUCTION

Although it is a truism among conservation biologists that humanity is in the midst of the Earth's sixth great extinction spasm, overt public awareness of the crisis is dim, and understanding of its implications even dimmer. The house is burning down around us, and even as the beams begin to cave in, we have but the vaguest intuition of the enormity of the danger. How is it possible to ignore the biosphere careening toward an extinction catastrophe unparalleled not only in the brief span of human history, but in the last sixty-five million years of life on Earth? The question is not entirely rhetorical. It places us before the most profound and difficult task facing the environmental movement: how to reach through the maze of denial, information overload, biological disassociation, cynical politics, and economic struggle to turn our fellow humans toward the fire consuming plants, animals, and the ecosystems without which life, including our own, cannot exist.

The biodiversity knowledge gap is one part of the problem. A recent poll revealed a steady decline in the understanding of the extinction crisis from researchers to teachers to the public.³ Scientists rated overpopulation and biodiversity loss to be greater problems than ozone depletion, global warming, or pollution.⁴ Seventy percent of scientists

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¹ Robert L. Hotz, *The Struggle to Save Dying Languages*, L.A. TIMES, Jan. 25, 2000, at A1 (quoting Kenneth Hale, Massachusetts Institute of Technology).

² Gregory Benford, *Saving the "Library of Life,"* 89 PROC. NATL. ACAD. SCI., 11,098-101 (1992).

³ LOUIS HARRIS & ASSOCS., *BIODIVERSITY IN THE NEXT MILLENNIUM* (1998). This is a poll produced for the American Museum of Natural History, New York.

⁴ *Id.*

believe that during the next thirty years, twenty percent of all species on Earth will become extinct.⁵ Thirty-three percent believe the global extinction toll could reach fifty percent over the next thirty years.⁶ In contrast, fifty percent of science teachers do not believe we are in the midst of mass extinction event.⁷ Only thirty-eight percent described themselves as being "very familiar" with the concept of biological diversity.⁸ Over half of the general public is unaware of the extinction crisis.⁹ Most of the public rated pollution as the most important environmental problem.¹⁰ Only a few described themselves as understanding the concept of biological diversity.¹¹ The great majority of scientists believed that the global implications of biodiversity loss are underestimated by the general public (95%), government (87%), media (80%), and educators (58%).¹² Yet, lack of information is not the central problem, rather it is the inability to grasp the scale, synergistic effects, and ultimately, the meaning of mass extinction in our time plays the largest part.

In the increasingly humanized, homogenized, and expansive "first world," the loss of linguistic and cultural diversity is intimately linked with a difficulty in coming to grips with the loss of biological diversity. Human languages are as much *of* as *about* nature. Their functioning, therefore, is not immune to the far reaching effects of species extinction and ecosystem disruption. The converse is also true: biological diversity is being profoundly impacted by the rapid extinction of human languages.

II. BIOLOGICAL MELTDOWN

We cannot determine the exact number of species driven to extinction by humans in recent history. Even in our era of lightning fast communication and global science, the majority of extinctions go undocumented because most species still remain undiscovered.¹³ Based on documented modern extinction rates, estimates indicate that the Pacific islands alone have lost 2000 species of birds in the past 1000 to 2000 years, meaning that about twenty percent of all bird spe-

⁵ *Id.*

⁶ *Id.*

⁷ *Id.*

⁸ *Id.*

⁹ *Id.*

¹⁰ *Id.*

¹¹ *Id.*

¹² *Id.*

¹³ Benford, *supra* note 2. Benford has proposed a world-wide effort to rapidly collect and freeze as many species as possible from imperiled ecosystems. *Id.* at 11,098. Since the current extinction rate far surpasses the rate of scientific study, he argues it is more important to preserve specimens now for future research, than to allow species to be lost to science forever. *Id.* Regardless of its merits, Benford's proposal provides a sobering glimpse of the desperation felt by many biologists.

cies on Earth have already gone extinct.¹⁴ The global extinction rate over the last five hundred years has been estimated at 1000 species per year,¹⁵ while the current extinction rate is believed to be between fifteen thousand and fifty thousand species per year.¹⁶

The International Union for the Conservation of Nature (IUCN), a collaborative effort of over 7000 scientists, reviewed the status of forty-eight percent of all terrestrial vertebrate species (including one hundred percent of birds and mammals), 1.7% of all marine vertebrates, and a small percentage of terrestrial and marine invertebrates.¹⁷ By their count, forty-one percent of all mammal species are in serious decline and twenty-five percent are currently threatened with extinction (see Table 1). Twenty percent of all bird species are in serious decline and eleven percent are currently threatened with extinction (see Table 1). Twenty-six percent of the reptiles, thirty-percent of amphibians, and thirty-nine percent of fish reviewed are also in serious decline (see Table 1).¹⁸

TABLE 1. NUMBER OF THREATENED, SERIOUSLY DECLINING, AND IMPERILED VERTEBRATE SPECIES BY CLASS.¹⁹

Class	Reviewed	Threatened	Near-threatened	Serious Decline
Mammals	100%	25%	16%	41%
Birds	100%	11%	9%	20%
Reptiles	20%	20%	6%	26%
Amphibians	12%	25%	5%	30%
Fish	10%	34%	5%	39%

Most alarming from a biodiversity standpoint is the serious decline of 50% or more of all the species in thirteen orders, including Primates (50%), Chiroptera (bats, 50%), Cetacea (whales and porpoises, 69%), Perissodactyla (horses, tapirs, and rhinos, 77%),

¹⁴ David Steadman, *Human-Caused Extinction of Birds*, in *BIODIVERSITY II*, 139-160 (M. Reaka-Kudla et al. eds., 1997).

¹⁵ Stuart L. Pimm et al., *The Future of Biodiversity*, 269 *SCIENCE* 347, 349 (1995).

¹⁶ W.V.Reid & K.R. Miller, *Keeping Options Alive: The Scientific Basis for Conserving Diversity*, *WORLD RESOURCES INST.* (1989).

¹⁷ INTERNATIONAL UNION FOR THE CONSERVATION OF NATURE (IUCN), 1996 RED LIST OF THREATENED ANIMALS, (Jonathan Baillie & Brian Groombridge, eds., 1996) [hereinafter IUCN Report]. IUCN, *1996 IUCN of Threatened Animals* (visited Apr. 8, 2000) <<http://www.iucn.org/themes/ssc/96anrl/contents.htm>>.

¹⁸ Invertebrate classes represented in the study will not be discussed because their relatively small number does not permit a meaningful trend assessment for a grouping that includes 95% of all species on earth. P.M. Hammond, *The Current Magnitude of Biodiversity*, in *GLOBAL BIODIVERSITY ASSESSMENT* (V.H. Heywood, ed., 1995).

¹⁹ IUCN Report, *supra* note 17. Threatened = IUCN categories: critically endangered, endangered, and vulnerable; Near-Threatened = IUCN categories: conservation dependent or near-threatened; Serious Decline = Threatened + Near-Threatened.

Sirenia (manatees and other sea cows, 100%), Apterygiformes (kiwis, 100%), and Procellariiformes (albatrosses and petrels, 75%) (see Table 2). While it may take ten million years to "replace" an extinct species, the loss of entire orders of vertebrate evolution may not be replaceable in any geological timeline. The ecological role of some species may be partially exercised by evolutionarily "redundant" species; however, redundancy does not occur at the level of orders. Bats, sea cows, elephants, marsupials, primates, and cetaceans are critical and irreplaceable players in a vast ecological web. Their disappearance, indeed even a significant reduction in their numbers, will have far reaching implications.

The IUCN compilers believe that mammal declines (with twenty-five percent of the species threatened and forty-one percent in serious decline) represent the status of vertebrates as a whole, rather than bird declines (where eleven percent are threatened and twenty percent are in serious decline).²⁰ At least twenty-five percent of the species within the five orders of reptiles and amphibians which were fully reviewed were threatened.²¹ In addition, thirty-four percent of all fish species reviewed were threatened (see Table 2). Given the IUCN definition of endangered,²² over twenty-five percent all species on earth could become extinct within the next one hundred years.²³ While it is unlikely that every one of them will become extinct, the extinction of species not currently listed as threatened will probably make-up the difference.²⁴ More alarmingly, twenty percent of all primates could become extinct in just twenty years.²⁵

TABLE 2. TABLE 2. NUMBER OF THREATENED, SERIOUSLY DECLINING, AND IMPERILED SPECIES BY SELECTED CLASS AND ORDER.²⁶

Mammals		Threatened	Near Threatened	Serious Decline
Microbiotheria	opossum-like species	100%	0%	100%
Sirenia	sea cows	100%	0%	100%
Notoryctemorphia	mole-like marsupials	100%	0%	100%
Proboscidea	elephants	100%	0%	100%
Perissodactyla	horses, tapirs and rhinos	65%	12%	77%

²⁰ IUCN report, *supra* note 17.

²¹ *Id.*

²² *Id.*

²³ *Id.*

²⁴ Pimm, *supra* note 15, at 349.

²⁵ IUCN Report, *supra* note 17.

²⁶ *Id.* Extinct = IUCN categories: extinct or extinct in the wild; Threatened = IUCN categories: critically endangered, endangered, and vulnerable; Near-Threatened = IUCN categories: conservation dependent or near-threatened; Serious Decline = Threatened + Near-Threatened.

Artiodactyla	even-toed ungulates	33%	37%	70%
Cetacea	whales and porpoises	33%	36%	69%
Primates	lemurs, monkeys and apes	46%	19%	65%
Dermoptera	flying lemurs	50%	0%	50%
Chiroptera	bats	26%	24%	50%
Hyracoidea	hyraxes	50%	0%	50%
Insectivora	shrews, hedgehogs and moles	36%	1%	37%
Monotremata	egg-laying mammals	33%	0%	33%
Carnivora	dogs, cats, bears, raccoons, etc.	26%	6%	32%
Rodentia	rodents	17%	13%	30%
Birds		Threatened	Near Threatened	Serious Decline
Apterygiformes	kiwis	100%	0%	100%
Casuariiformes	cassowaries	50%	25%	75%
Procellariiformes	albatrosses and petrels	29%	10%	39%
Galliformes	pheasants, partridges, etc	25%	12%	37%
Psittaciformes	parrots	25%	11%	36%
Gruiformes	rails and cranes	26%	7%	33%
Columbiformes	pigeons and doves	17%	14%	31%
Coraciiformes	kingfishers, bee-eaters, etc.	12%	11%	23%
Podicipediformes	grebes	18%	5%	23%
Passeriformes	song birds	10%	8%	18%
Reptiles		Threatened	Near Threatened	Serious Decline
Testudines	tortoises, turtles, terrapins	38%	19%	57%
Rhynchocephalia	tuatara	50%	0%	50%
Crocodylia	crocodiles and alligators	43%	0%	43%
Amphibians		Threatened	Near Threatened	Serious Decline
Caudata	salamanders and newts	25%	6%	31%
Anura	frogs and toads	25%	5%	30%

In assessing the status of the 270,000 known species of vascular plants worldwide, the IUCN determined that fourteen percent are currently threatened with extinction.²⁷ As with vertebrates, the threat is not only to individual species, but to large evolutionary groupings as well. Of the 511 families of vascular plants, 372 contain threatened

²⁷ INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES (IUCN), 1997 RED LIST OF THREATENED PLANTS (K.S. Walter & H.J. Gillett eds., 1998). [hereinafter IUCN Plant Report] Walters and Gillett report that 12.5% of vascular plants are threatened. *Id.* This figure was updated to 13.8% by the IUCN on 6-98. See also IUCN, 1997 IUCN Red List of Threatened Plants (visited May 22, 2000) <<http://iucn.org/themes/ssc/97plrl/table8.htm>>.

and/or extinct species.²⁸ Over fifty percent of the species in thirty-nine families are threatened, including eight families of gymnosperms (among them cycads and conifers).²⁹ Gymnosperms experience wide exploitation from logging and horticulture.³⁰ One hundred percent of the species in nineteen families are threatened.³¹ Fourteen percent of rose species, thirty-two percent of lilies, fourteen percent of cherries, and twenty-nine percent of palm species are also threatened.³²

Unfortunately, the situation is much worse than these numbers indicate because the IUCN only assesses full species. Subspecies, more numerous and more prone to extinction, typically have smaller ranges, population sizes, and population numbers than species.³³ In many instances, a wide-ranging species can remain biologically secure, though one or more of its subspecies is endangered.³⁴ The Willow Flycatcher (*Empidonax traillii*) for example, is wide-spread and common in large areas of North America, while the southwestern subspecies (*E. t. extimus*) is gravely endangered.³⁵ Two other subspecies (*E. t. brewsterii* and *E. t. adastus*) are suffering dramatic declines.³⁶ In recognition of the importance of preserving subspecies, the Endangered Species Act (ESA) defines "species" broadly to include species, subspecies, and distinct population segments.³⁷ Twenty-three percent of all "species" listed under the ESA are subspecies.³⁸ Although a global assessment of subspecies is not available, the picture is grim on local levels: of Arizona's thirty-two native fish (species and subspecies), twenty-eight (88%) are listed as threatened, endangered, or are candidates for listing by either the state or federal government.³⁹

The global extinction of species and subspecies is a cumulative effect of extinction of all their local populations. For example, the typical salmonid (salmon, trout, and char) extinction dynamic involves the gradual loss of genetically distinct populations, each of which is associated with a single stream, river, or watershed.⁴⁰ Of the fifty-three genetically distinct trout populations in the western United States, forty-one (77%) are listed as extinct, threatened, or endangered by the United States Fish and Wildlife Service or the American Fisheries So-

²⁸ *Id.*

²⁹ *Id.*

³⁰ *Id.*

³¹ *Id.*

³² *Id.*

³³ IUCN Plant Report, *supra* note 27.

³⁴ STEIN, PRECIOUS HERITAGE: THE STATUS OF BIODIVERSITY IN THE UNITED STATES 97 (Oxford University Press 2000).

³⁵ 59 Fed. Reg. 10,693 (1995).

³⁶ Schlorff, *Report to the Fish & Game Commission: Status Review of the Willow Flycatcher (Empidonax traillii) in California* (1990).

³⁷ Endangered Species Act of 1973, 16 U.S.C. § 1532(16) (1994).

³⁸ Endangered and Threatened Wildlife, 50 C.F.R. §17.11 (1999).

³⁹ See *Endangered Species in Arizona* (last modified Apr. 12, 2000) <<http://endangeredspecie.com/states/az.htm>>.

⁴⁰ See Kieran Suckling, unpubl. data (2000) (on file with author).

ciety (or are under petition for listing).⁴¹ On a global scale, sixteen million populations are being driven to extinction each year.⁴² That is three to eight times greater than the species extinction rate.

III. LINGUISTIC MELTDOWN

The diversity of co-existing languages and cultures prior to the ongoing colonization of the globe by a small number of dominant nations was astounding. In what is now California, indigenous peoples once spoke over one hundred distinct languages.⁴³ This small area supported more linguistic diversity than all of Europe. Over three hundred native languages were spoken in what is now the United States.⁴⁴ Meso-America had eighty distinct languages and South America had over five hundred.⁴⁵ At least two hundred-fifty distinct languages were spoken in aboriginal Australia.⁴⁶

The rate of extinction of these languages, and often the people who speak them, is equally astounding. Eighty percent of all indigenous languages spoken in the United States have become moribund since European colonization.⁴⁷ Sixty-five percent of California's indigenous languages are extinct, many of the remaining are spoken by fewer than ten people (all elders).⁴⁸ The only remaining fluent speaker of Chumash, a family of six languages once spoken in southern California, is a professional linguist.⁴⁹ Only two or three of California's indigenous languages are spoken by more than one hundred-fifty people.⁵⁰ None are spoken by children at home.⁵¹ Approximately forty-two percent of the three hundred indigenous languages of the United States are extinct.⁵² Only twenty (7%) are still being passed onto children.⁵³

As many as fifty percent of all existing world languages are already moribund.⁵⁴ Between twenty and fifty percent will likely become extinct within one hundred years.⁵⁵ If the status quo continues, ninety

⁴¹ *Id.*

⁴² Jennifer B. Hughes et al., *Population Diversity: Its Extent and Extinction*, 278 *SCIENCE* 689 (1997).

⁴³ David Harmon, *Sameness and Silence: Language Extinctions and the Dawning of a Biocultural Approach to Diversity*, 8 *GLOBAL BIODIVERSITY* 2, 10 (1998).

⁴⁴ Encyclopedia Britannica Online, *American Indian Languages* (visited Apr. 7, 2000) <<http://www.britannica.com/bcom/eb/article/3/0,5716,6203+1+6119,00.html>>.

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ Harmon, *supra* note 43, at 4. Endangered languages are classified as extinct (no longer spoken or remembered), near extinct (spoken or remembered by six or fewer older adults), moribund (spoken only by mid-to-old age adults), or incipiently moribund (no longer spoken by children, but still spoken by adults of all ages). *Id.* at 5.

⁴⁸ Hotz, *supra* note 1.

⁴⁹ *Id.*

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² Harmon, *supra* note 43, at 5.

⁵³ Hotz, *supra* note 1.

⁵⁴ Harmon, *supra* note 43, at 5.

⁵⁵ *Id.*

percent of all existing languages could become moribund or extinct within one hundred years.⁵⁶ Some linguists classify ninety-five percent of all existing languages as endangered.⁵⁷

Is the decline in biological and linguistic diversity a coincidence; tragic, but independent, casualties of global imperialism? Or, perhaps, there is a simple causal link: indigenous people were subdued and exterminated to exploit the natural resources they controlled, the exploitation of resources in turn led to the decline of biological diversity. Both of these arguments contain elements of truth, but there is also a deeper link hinted at by the close correspondence between centers of biological and linguistic diversity. There is a sixty-four percent overlap between the twenty-five countries with the greatest number of endemic vertebrate species and the twenty-five countries with the greatest number of endemic languages.⁵⁸ Twelve of the nineteen high bird diversity countries are also high language diversity countries.⁵⁹ Seventeen of the high language diversity countries are among the twenty-five most diverse in flowering plants.⁶⁰ Ten of the twelve overall highest biodiversity countries are among the twenty-five most language diverse countries.⁶¹ Linguistic and biological diversity, therefore, are not only linked by the external threats to their survival; they appear to be internally related in their distribution.

IV. THE NATURE OF DIVERSITY

Anthropologist Claude Levi-Strauss was among the first European intellectuals to see a deep connection between ecology and linguistics, and between the extinction of species and cultures. In keeping with the tenets of structuralism, Levi-Strauss posited that words, signs, symbols, and myths are not autonomous entities.⁶² Their meanings can only be ascertained by looking at their relationship with other words and myths.⁶³ Despite the impression one might get from a dictionary, it is the structure, or total inter-relationship of words within a language that determines meaning, not individual words. Strictly speaking, meaning is the manner in which a system of words differs from and relates to each other. Whereas most structuralists of the mid-twentieth century (and many post-structuralists today) tended to see the differential nature of language as a sign of its self-referentiality, Levi-Strauss realized that the developing science of ecology was discovering that nature itself is fundamentally differential.⁶⁴ Like words, no species exists autonomously. Each has evolved to be what it "is" in rela-

⁵⁶ *Id.*

⁵⁷ *Id.*

⁵⁸ *Id.* at 7

⁵⁹ *Id.*

⁶⁰ *Id.*

⁶¹ *Id.*

⁶² See generally CLAUDE LEVI-STRAUSS, *THE SAVAGE MIND* (1966).

⁶³ *Id.*

⁶⁴ *Id.*

tion to a host of other species, processes, and environments. Each species fills a niche occupied by no other species, yet evolves in the presence of other species. Strictly speaking, diversity is not a characteristic of ecosystems and species, it is the condition of their possibility of existence.⁶⁵

If there is an ecology of language, it is because language and nature are of a single system of diversity. This unity becomes most apparent in the role of metaphor in human communication and understanding of the world. Metaphor is the principle means by which we communicate, and biological diversity is the foundation of an enormous portion of our metaphors. These metaphors are not simply poetic frills, they are indispensable to language and human thought. In his famous study of totemism, Levi-Strauss concluded that the diversity of totemic species found in indigenous cultures around the world are not simply cultural products, but essential modes of thought.⁶⁶ The language and thought of indigenous cultures is borne upon the living diversity with which they developed. Totemic animals (less often plants or other natural objects) are the dominant metaphors for self-understanding.⁶⁷ These metaphors are not "created" by cultures out of thin air, they arise out of a culture's evolving relationship with the species in its larger community.

High degrees of species richness and/or endemism may encourage high degrees of language endemism by providing a greater diversity of distinct metaphor clusters. The diversity of languages serves to situate indigenous cultures in relationship to other species and places, but also in relationship to other humans. All cultures have a tendency to totalize (i.e. to view their metaphors, concepts, beliefs, and languages as all inclusive of reality). Indigenous people; however, lived in a highly diverse network of other cultures and *their* languages, and other species and *their* cultures. They were constantly reminded of the limits of their cultural worlds. Natural metaphors (especially species metaphors) within language, and diversity between languages, are effective reminders that the domain we inhabit is limited. Our right to exploit does not extend endlessly. As individual languages become increasingly homogenized (i.e. dominant metaphors are human products and technologies, rather than other species), as the diversity between languages within a political or bioregion decrease (i.e. languages be-

⁶⁵ This has led some biologists to posit that the mass extinction of species is altering the process of evolution itself, including the cessation of evolution among large vertebrates. See N. Meyers, *Mass Extinction and Evolution*, 278 SCIENCE 597-98 (1997).

⁶⁶ LEVI-STRAUSS, *supra* note 62.

⁶⁷ Interestingly, the increasing prominence of technological metaphors, especially computer metaphors, in industrial societies confirms the totemic relationship. As critical societal functions are mediated by computers (education, shopping, work, recreation, even sex), we quite naturally treat them totemically and use them as metaphors for self-understanding (consider all the metaphors describing thought, language, and brains as computers). In societies where critical functions revolve around species (salmon, for example) the totemic relationship system is predominately natural.

come extinct), and as the diversity of living beings decrease, we lose the boundaries which preserve community stability.

V. CONCLUSION

Just as "first world" societies replace diverse plant communities with monoculture crops, we are replacing a tremendous and ancient linguistic diversity with vast mono-languages. There are approximately 6500 languages on Earth today;⁶⁸ however, about fifty percent of all humans speak and think in one of ten globally dominant languages.⁶⁹ That means 0.2% of all existing languages hold sway over fifty percent of all humans and likely upwards of eighty-five percent of the land surface of the globe. Not surprisingly, these are the languages of the cultures primarily responsible for the global extinction crisis and the eradication and marginalization of indigenous cultures. These cultures no longer recognize a limit to their beliefs or exploitation rights because they no longer genuinely encounter and become situated by a diversity of other languages, ideas, cultures, and species. The external world is simply a modulation of their own being.⁷⁰

Meanwhile, one percent of the human race speaks fifty to sixty percent of all human languages.⁷¹ This one percent and all its wealth of human knowledge, language, and diversity is extremely endangered. If we allow diversity to decline within human cultures and between cultures, we throw away the thought context to reverse the decline in biological diversity and save more species from extinction.

⁶⁸ Harmon, *supra* note 43.

⁶⁹ *Id.*

⁷⁰ For an intriguing discussion of the necessity of limits in establishing community identity see H.P. DUERR, *DREAMTIME: CONCERNING THE BOUNDARY BETWEEN WILDERNESS AND CIVILIZATION* (1985).

⁷¹ Harmon, *supra* note 43, at 5.