ECOLOGY

The Barometer of Life

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A broader taxonomic base to threatened species assessments will enable better conservation and policy decisions.

On 11 January 2010, the United Nations inaugurated the International Year of Biodiversity in Berlin. This initiative is timely, because the environmental movement suffers from an imbalance between its sense of urgency and its intensity of activity. Center stage is now occupied by concerns for the physical environment—in particular, climate change, pollution, and depletion of nonrenewable resources. However, if the living world is to be kept in anything approaching a sustainable condition that can adapt to changes, then politicians, government officials, scientists, and the public will need to give biodiversity the urgent attention that they are starting to give to the physical environment.

About 1.9 million species (*1*) have been discovered and given scientific names (*2*), though the actual number may exceed 10 million (*3*). Bacteria and archeans could comprise tens of millions species—once taxonomic units are precisely defined. Knowledge about species and extinction rates remains very poor, and species disappear before we know they existed. We propose that, as scientists are better able to assess the conservation status of the species that compose an ecosystem, the more they will understand the health of that ecosystem. It is time to accelerate taxonomy and scientific natural history, two of the most vital but neglected disciplines of biology (*4*, *5*).

The Encyclopedia of Life (EOL), a powerful initiative (*5*), is now fully operational and working toward its goal of documenting every known species. Essential though the EOL is, it needs to be complemented by another project, the "Barometer of Life." This initiative would need to unite taxonomists, biogeographers, ecologists, conservationists, and amateur naturalists in a coordinated exploration of global biodiversity, with an emphasis on identifying which species are threatened. While

Species and Projected Costs for a Barometer of Life

Major taxonomic grouping	Described species*	Species assessed on IUCN Red List by 2009†	FOR THE BAROMETER	
			Provisional target number of species	Estimated cost to complete (US$)
Chordates	64,788	27,882	61,635	16,000,000
Invertebrates	1,359,365	7,615	45,344	20,000,000
Plants	310,129	12,151	38,521	17,000,000
Fungi and others	165,305	18	14,500	7,000,000
	1,899,587	47,666	160,000	60,000,000

*Data on the number of described species taken from (*1*). †Data on the number of assessed species from www.iucnredlist.org.

the EOL will provide a Web page on every species, the barometer would compile conservation-related data on distributions, threats, and assessments of extinction risk on a subset of species broadly representative of biodiversity as a whole. The logical platform for this barometer is *The Red List of Threatened Species* (*6*) of the International Union for Conservation of Nature (IUCN), which, for over 45 years, has published information on the status and trends of species. The IUCN Red List began by focusing on selected species, but it now covers entire taxonomic classes. It provided the first global picture of vertebrate diversity—a measure of the magnitude, geography and type of threats among several taxonomic groups, and a baseline from which to measure changes in status of species (*7*, *8*). The IUCN Red List includes assessments of all species of mammals, birds, amphibians, freshwater crabs, reef-building corals, cycads, and conifers (*8*). More than 250 national red lists for various taxonomic groups have been developed in >100 countries (*9*).

However, the Red List is biased toward higher vertebrates. The vast majority of species—including most plants, invertebrates, and lower vertebrates, and almost all fungi—are still grossly underrepresented. A more finely tuned barometer is within reach by expanding the taxonomic base of the Red List to make it much more representative of the diversity of life. We anticipate that a representative barometer will need to monitor the status of 160,000 species (see table, above), roughly three times the almost 48,000 species currently on the Red List. The target number of species to be assessed is still provisional. Some groups (e.g., nematodes and sponges) are so poorly known that it would be hard to include them in the barometer at this time.

A representative barometer would provide

a solid basis for informing decisions globally, for example, on conservation planning, resource allocation, environmental impact assessments, monitoring biodiversity trends (through the IUCN Red List Index) (*7*, *8*), and enabling countries to develop national-level biodiversity indicators (*10*).

For the Red List to reach its full potential as the Barometer of Life, a substantial increase in the magnitude of the current effort will be required. About U.S.$4 million is spent annually to maintain and enhance the IUCN Red List (*11*), in addition to voluntary contributions of thousands of biologists worldwide. The total cost of achieving the broader taxonomic base is on the order of U.S.$60 million. The barometer would, from an economic perspective, be one of the best investments for the good of humanity.

References and Notes
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