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Book Reviews

Sustaining Life: How Human Health Depends on Biodiversity

Eric Chivian & Aaron Bernstein

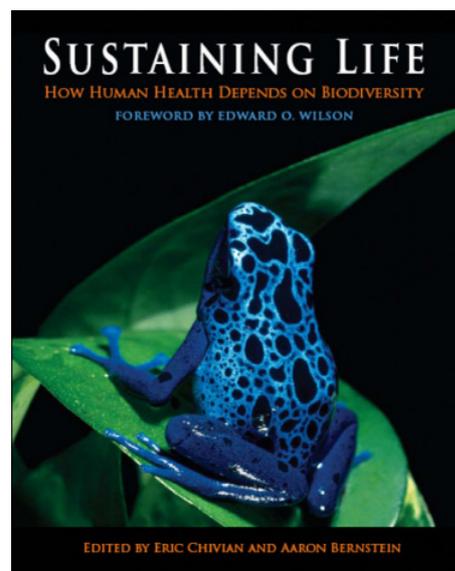
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Daniel F. Buss

Environmental Health Assessment and Promotion Laboratory, IOC-Fiocruz, Rio de Janeiro, Brazil
dbuss@ioc.fiocruz.br

What is the value of biodiversity? This book, *Sustaining Life: How Human Health Depends on Biodiversity*, is part of an effort to demonstrate how strongly human societies are interconnected with nature. More and more, people are being warned of the damaging effect of toxic pollutants on their health and that global warming, the destruction of forests and the irresponsible use of natural resources are global threats. However, the interrelations between biodiversity and human well-being have not yet been sufficiently disseminated to the general public.

The idea for the book came from a concrete example: a type of frog discovered in the 1980s in Australia displays the unusual behavior of gestating its young in its stomach. Preliminary studies indicated that the young produced enzymes that could inhibit the production of digestive enzymes and acids in the mother's stomach during the gestation of the offspring. The authors state that research with these animals would have allowed new approaches for the prevention and treatment of human ulcers, but "these studies could not continue because this species became extinct and its secrets for medicine were lost", according to the book's editors, Eric Chivian and Aaron Bernstein. Both are researchers at Harvard Medical School's Center for Health and Global Environment – a center created and directed by Chivian, who played an important role in the movement International Physicians for the Prevention of Nuclear War, which won the Nobel Peace Prize in 1985. The book was published with the support of the United Nations Environment Program (UNEP) and the Convention on Biological Diversity (CBD), and counts with the participation of



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more than 100 specialists who collaborated with writing and/or reviewing the 10 chapters into which the work is divided.

The editors' main achievement was organizing into one single document information about the potential of human actions to impact biodiversity and how its loss would affect human health. The book offers a broad range of material, with abundant information collected from around the globe, beautiful illustrations and language accessible to managers, undergraduates and the general public. A Portuguese edition would be important not just to provide access to global data, but because the book gives special attention to mega-diverse countries, including Brazil, bringing relevant information that is as yet little disseminated.

More specifically, the book's 10 chapters tackle the subject's basic concepts, seeking to didactically present to the reader information and examples about the services provided by ecosystems, focusing mainly on the production of natural medications and the use of biodiversity in biomedical research.

In the book's central chapter the authors state that, as the current rate of extinction of species is around 10,000 times greater than in pre-human times, we are entering the "sixth great phase of extinction of life on Earth". To demonstrate what the loss of species means for human life, astonishing details are given about the impacts and prospects of developing new treatments, pharmaceutical products and diagnosis tests from seven groups of endangered organisms that have the potential to be used in medicine.

The editors refer particularly to amphibians – toads, frogs, salamanders, among others – as this group is especially susceptible to climactic alterations, loss of habitat and infections, which means it contains about one third of the approximately 6,000 endangered species and more than 120 of those already extinct in the last few decades. The emphasis is on the substances produced by some of these animals, which may contribute to the production of medications with various purposes: alkaloids that can be used as analgesics and in the treatment of heart diseases, composites found in the skin of frogs that can be used as germicides, a natural "glue" to repair cartilage and other tissues in humans, among others.

Nine species of bears are on the list of endangered species, including the Giant Panda, the Asian Black Bear and the main poster child of global warming, the Polar Bear. Apart from climate change, these animals suffer from hunting or capture. In China, there are more than 7,000 black bears kept in cages for the periodic removal of bile, which contains ursodeoxycholic acid (UDCA), used for the treatment of several liver and heart diseases and against hypertension, among many other things. To illustrate just how much these animals can be exposed to hunting, in the Asian market the gall bladder of a bear is worth more than its weight in gold. These values remain high even though there has been wide production of synthetic UDCA from cattle bile since 1955. Another fantastic characteristic these

animals possess is their ability to hibernate for several months without suffering loss of bone mass. These animals, rather, manage to produce bone mass during this period, creating enormous potential for the treatment of osteoporosis.

The gymnosperms – a group that includes pine trees, araucarias, sequoias and cypresses, among others – are some of the oldest plants ever found and include almost 1000 described species, found from the tropics to the poles. Various pharmaceutical products are produced from composts extracted or synthesized from these plants and they have been used as decongestants and anti-cancer treatments. The greatest current emphasis on this group lies in one plant in particular, the ginkgo biloba. These trees, which can live more than 2000 years and have already resisted to several great periods of extinction, including the Cretaceous period 65 million years ago, are now on the list of endangered species. Recorded in medical use since the Ming dynasty in 1436 B.C., ginkgolides can affect the inhibition of neurotransmitters linked to memory loss in humans, with great potential for containing Alzheimer's disease, as well as epilepsy and depression.

The gastropodic molluscs of the *Conus* genus are marine and inhabit coral reefs and mangrove swamps – habitats that suffer from climate change, rising sea levels and coastal exploration. They are predators that hunt fish and other mollusks, injecting them with a cocktail of toxic paralyzing peptides, using a proboscis shaped like a harpoon. Estimates show that the approximately 700 species produce between 70,000 and 140,000 conopeptides – which makes them one of the most poisonous groups on Earth – many having potential for medical use. Out of these, ziconotide has been shown to be a powerful analgesic, about 1000 times stronger than morphine, which has been used successfully in patients in advanced states of cancer and AIDS. Other conopeptides are capable of preventing the death of nerve cells caused by neurodegenerative diseases such as Lou Gehrig's, Alzheimer's and Parkinson's diseases. The potential of this group of animals for medical purposes is enormous, as out of the great number of composts they produce, only 100 have been isolated and studied, showing encouraging results.

Horseshoe crabs, which are not crustaceans but rather related to arachnids, are marine organisms that seem to have come straight out of sci-fi movies. They have ten eyes, several other organs that sense light, six legs and blood that turns cobalt blue when in contact with air. These species, which inhabit the Atlantic coast of North America to the beaches of southeast Asia, suffer from overfishing, just to be used as bait for eels or to have their external skeletons ground for fertilizer. However, they have immense value for biomedical research. Another peptide was developed in a compost known as T140, which blocks the human receptors that allow the HIV virus to connect to the body's immunological cells, being as effective as AZT in inhibiting this virus. Other cells found in the blood of horseshoe crabs can

detect the presence of bacteria in the spinal fluid of people suffering from cerebral meningitis. The test is so sensitive that it can detect 1 picogram per milliliter of solution – the “equivalent of finding a grain of sugar in an Olympic pool”.

About 450 million years ago, the animals that evolved into modern sharks already inhabited the oceans. Now, many species are threatened, with population reductions of up to 75% in the last 15 years. Their importance for medical use consists, among other possibilities, in the use of the aminosterol Squalamine to treat problems in the retina which cause sight damage or loss in humans. The main cause of this reduction in the shark populations has been overfishing, due to higher consumption of their meat and the use of their cartilage in various medications – which ends up being a tragic irony, in the light of what the book’s authors propose. For this reason, as a general conclusion, the authors state that these medical benefits must not be used as a license to exploit wildlife in such a way as to increase pressure on species that are endangered or vulnerable. On the contrary, they should be used as an incentive to conserve and adequately manage these species and their ecosystems.

As has become commonplace in documents tending toward catastrophic predictions (as exemplified by the IPCC¹ and the documentary “An Inconvenient Truth²”), the high levels of consumption in industrialized societies, particularly the United States, is marked as a target for immediate action. The “ecological footprint” (quantity of productive earth needed to maintain an individual with the average standard of living of that country/region) of the United States – 9 hectares per person – is two and a half times larger than that of Latin America and the Caribbean (3.7 hectares per person) and almost five times larger than the average footprint that a person needs to have in order for the activities of the entire global population to be sustainable (1.9 hectares per person).

Not only is consumption per capita high and rising, it also seems impossible to reverse a situation that will reach unprecedented levels: not only do “developing nations” (80% of the global population) have ever more access to goods and products, the UN predicts the planet will have 9 billion inhabitants by the middle of the 21st century.

At this time, we must reflect on the best ways of dealing with a problem that is already in place. The dilemma: “to rethink/change attitudes and behaviors vs. to find ways of dealing with the impacts” already seems misplaced, once it is undeniable that the two must go together.

One criticism that can be leveled at the work is that there is plenty of evidence about the impacts, but few alternatives for their solution. The book dedicates only 22 of the 429 pages of text to “What individuals can do to conserve biodiversity”. Apart from an approach that is out of synch with a problem of this magnitude, it only focuses on the actions of individuals, as the title suggests.

We know that each situation is unique and there is no recipe for salvation, but it is time to extend the actions of the humming-bird (to use sociologist Betinho’s beautiful metaphor about the little bird who tries, in vain, to put out the fire in the forest all by himself – doing “his bit”) to a joint action from all the “animals” in the forest (that is, civil organizations, governments, companies etc). In order to do this, it is logical to count on individuals – as long as they are organized – to fight for a fairer, more equal, healthier and happier planet.

The classic definition of sustainable development is “that which meets the needs of the present without compromising the possibility of future generations meeting their own needs”³. Of course people have “needs”, but they also have values and they appreciate the freedom to decide what value to give to things and how to preserve these values. For this reason, seeing human beings only in terms of their needs may give us a somewhat insufficient vision of humanity.

For example, someone might believe we need to do whatever is possible to preserve an endangered species, let’s say, the rusty-barred owl. There would be no contradiction if the same person declared that our standard of living is generally – or completely – independent of the presence or absence of the rusty-barred owl, but they believe we should not allow its extinction, for reasons that have little to do with the standard of living of human beings⁴.

Thus, the idea of “sustainable freedoms” can be not only conceptually important (as part of a general approach that deals with *development as freedom*), it can also generate important political changes. And this depends on individual participation in forming this new collective conception.

The book’s approach, excessively focused on the medical point of view, with biodiversity being portrayed almost exclusively as a “service” or “resource”, clashes with a different point of view, and I include myself in this group, which believes it should be considered independently of its “utility” for human actions. In this conception, the answer to the question “how much is biodiversity worth” does not have – or should not have – practical importance. Protection of the environment and the species that live in it should be an ethical principle held by the only species capable of it: the human being.

Notes

1. 4th Assessment Report - Intergovernmental Panel on Climate Change (IPCC) – <http://www.ipcc.ch/>
2. An Inconvenient Truth – <http://www.climatecrisis.net/>
3. *Nosso futuro comum*. Comissão Mundial sobre Meio Ambiente e Desenvolvimento, 1988, p. 46. Rio de Janeiro: Editora da Fundação Getúlio Vargas.
4. *Por que é necessário preservar a coruja-pintada*. Amartya Sen. Caderno Mais! Folha de São Paulo, 24 de março de 2004.

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