WHY CARE ABOUT BIODIVERSITY?

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Summary

Biodiversity is the property of living systems of being diverse; that is, no two individual organisms are alike, excepting clones. More commonly we associate biodiversity with the enormous number of biological species, estimated at ten million (or more). Another very important aspect of biodiversity is the diversity of habitats, landscapes, and ecosystems. The growth of the human population and its economic development threaten this diversity. One of the factors that threaten species and habitat diversity is the growth and intensification of agriculture. Yet it also illustrates the dilemma faced by humanity: in order to feed a growing population estimated to reach more than eight billion persons by mid-century, agricultural production needs to expand. Likewise the growth of industry in the next fifty years will demand more natural resources. The great challenge is to develop ways to fulfill human aspirations for a richer and more equitable and just world, without jeopardizing the functional ability of natural systems, which includes maintaining biodiversity. This has been referred to as achieving sustainability.

Sustainability is a process that includes technical, economic, and social considerations. It must, however, be guided by ethical considerations and the realization that by acquiring mastery over the environment, humans have also acquired responsibilities towards nature. By respecting and asserting the right of other species to their existence,

we affirm the right to our own free existence and human values. And it is part of a broader agenda that involves issues of justice and equity.

1. Introduction

In this highly developed, automated, urban environment in which most of us live it is easy to forget that we are an integral part of nature, which provides the basic necessities of life. Our food comes from plants and animals, as well as the natural fibers for our clothing, such as cotton, flax, wool, and silk. Nature is also the source of the raw materials with which we fabricate synthetic fibers. The materials of our shelters, such as wood, stone, clay for bricks, limestone for cement, even the coal and petroleum for the roof tiles and the covering of the driveways are from natural products. Lastly, the oil and coal that drives our cars and machines, and heats our homes and factories in winter are the fossilized bodies of plants and animals. But this is not all.

Natural ecosystems recycle the water and the nutrients needed by plants and animals. Not only does the Earth decompose and turn literally into dust all organic refuse, the Earth also turns into harmless elements all kind of toxic substances and pollutants. Otherwise after more than 200 years of spewing industrial and domestic wastes through our chimneys, car exhausts, or dumping them in landfills, rivers, and lakes, this planet would be knee deep or worse, in waste. Each year enough trash is produced in the United States alone to cover the world with several feet of detritus. Fortunately most of it is quickly decomposed and recycled by natural processes, performed by organisms.

So there is a practical, utilitarian reason to care about Biodiversity and the functioning of ecosystems.

There may also be a second, deeper, more elusive and complex philosophical justification to care about biodiversity. It has to do with our own values and our relations to nature as the source of our own spirituality. For some people, living creatures have value in themselves and as such they may deserve reverence and respect. There is of course no way of knowing whether this is so, this being a matter of belief rather than scientific evidence. But it is a fact that many people derive a particular sense of well-being when in contact with nature. As natural landscapes get transformed, the remaining more or less natural environments acquire a greater value, which is reflected in their economic importance and the willingness of human societies to invest in their preservation.

The greater brainpower that we have acquired in the process of evolution has made us more god-like than any other creature on Earth. It has made us more sentient, more perceptive, and more powerful, but with it we have acquired the responsibility to be the shepherds of other living creatures and the stewards of nature. It has not necessarily given us the right to destroy life, or to determine the fate of other species, except perhaps in the rare cases of our biological enemies such as the smallpox virus. Although more controversial, this is another reason that we must care about biodiversity.

The reasons to care about Biodiversity are many, from the possible disappearance of many species, especially emblematic species and large mammals, to the threat to soils

and water posed by modern agricultural techniques, to the impacts of industrial development, and the growth of the human population. In this article I will concentrate on the ethical issues involved and the problems in attaining sustainability as exemplified by modern agriculture. All these issues will be addressed in greater depth in coming volumes. Here we wish to present a general overview and stress the moral dilemmas that humankind faces as it tries to reduce biodiversity loss.

2. What is Biodiversity?

Diversity is the property of a set of objects of not being identical, of varying one from another in one or more characteristics. When applied to organisms, it refers to the universal property of all living things that each individual being is unique, that is, no two organisms are identical. The origin of this variability is to be found in the basic and fundamental property of the DNA molecule that the order of the bases does not affect the free energy of the molecule, in other words all combinations of the four bases that form the genetic code are chemically equally viable. This characteristic combined with natural selection allows the acquisition and accumulation of favorable mutations, and in the approximately 3 thousand million years that life has existed on Earth these processes have produced the enormous biological variation that we see today, which is at best only a very small percentage of all the variation that has existed in the past.

Spaceship Earth like any good spaceship has a lot of redundancy built into it. Just like the space shuttle has three computers on board, and two or three copies of most systems, to keep the shuttle going if one of its systems fails, so too in nature there are many species that do very similar things. There are about one half-million species of plants, some two million species of fungi, close to eight million species of insects, and over one hundred thousand species of vertebrates. Not all of them do the same thing: most of them are specialists adapted to function in a limited range of environments. But it is also clear that many species are very similar and are replaceable to a limited extent. But we do not know to what extent, nor do we know which the essential species are.

But spaceship Earth can malfunction if it is not kept clean and tidy, and in good working order. Then its capacity to supply our needs may be affected. Also, as is true for any vehicle, as more and more people climb on board, the place gets full, and it gets harder and more complicated to keep things in order.

3. Signs of Environmental Deterioration

Planet Earth is a blend of living and non-living elements interacting in innumerable ways that result in a variety of landscapes and ecosystems. This amalgam is very dynamic, both in time and in space, and is constantly changing, unfolding, and producing new combinations of landscapes and ecosystems. The living elements—living by nature of their capacity to self-reproduce—come in a great variety of forms, shapes, and complexities that are continuously changing and evolving, comprising the diversity of life.

Cosmic factors and local geological forces have sustained the process of ecosystem evolution. Organisms have in turn molded the process by modifying the characteristics

of their surroundings. The most significant of these changes is probably the transformation by photosynthetic bacteria of the atmosphere of the Earth from a reducing to an oxidizing one, a process completed about a thousand million years ago. Humans, late arrivals to this series of events, have of late become important transformers of natural landscapes, although nothing they have done or are likely to do, other than an atomic holocaust, can match the transformation of the atmosphere by the early photosynthetic bacteria. Yet there are some parallels.

Although transformation of the atmosphere from a reducing to an oxidizing one did not eliminate all anaerobic organisms, it reduced them significantly, both in numbers, biomass, and relative importance, and opened the way for an entire new biological world dominated by oxygen breeding, multicellular plants and animals.

Today people are transforming the surface of the globe at such an accelerated pace that they have launched a new phase in the evolution of the planet. This new condition is characterized by the dominance of one species, our own, over all others, to an extent never before experienced on Earth. Because of our ability to transform landscapes, we, humans, are in a situation where we can choose to jeopardize our own existence as well as that of innumerable other species, or we can select to achieve a more harmonious coexistence with our biological and abiological surroundings. This presents us with an ethical and moral choice. We can decide to go ahead with development not paying attention to the possible environmental impacts of development, or we can choose to develop in a way that we do not jeopardize the integrity of ecosystems.

Wherever we look these days we see worrisome signs of a possible decline of the Earth's capacity to deliver the ecological services that we always have taken for granted. The climate is warming and there is strong evidence that it is in great measure due to the pollution of the atmosphere by carbon dioxide and other gases most of them coming from increased human activities. The stratospheric ozone layer that protects us from damaging ultraviolet light has been reduced by 50 percent creating a serious health hazard due principally to the action of human made gases. It has been calculated that each year there are 250 thousand more cases of skin cancer in the United States alone as a result of this factor. Yet fulfilling our needs without transforming the environment is impossible. A good example is furnished by agriculture.

Agriculture (including animal husbandry) is the human activity that most transforms the environment. Yet agriculture is also the most basic economic activity of humans since it provides us with our daily bread. Most impacting is modern high input agriculture, the so-called "Green Revolution" technologies. Yet without it the six billion people on this planet could not survive. This is only one of the many dilemmas faced by humankind as it tries to find a way to meet its goals of ending hunger, malnutrition and poverty, maintain a productive agriculture, and preserve natural ecosystems, especially tropical forests and savannas. Industrial development and the use of oceans are others.

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