

X01219

Acknowledgements

Most of all, we must acknowledge the enormous contribution made by Mrs Wendy Davies in providing administrative support throughout the organization of the event, by Dr Ruth Ibbotson in organizing the exhibition which accompanied the Workshop, and finally Ms Marilyn Rainbow for preparing the camera-ready copy for publication.

Colin P. Ogbourne
Chair, Organizing Committee
Deputy Director General (Information), CABI

September 1996

The Importance of Biodiversity Information

1

SIR CRISPIN TICKELL

Green College, The Radcliffe Observatory, University of Oxford, Woodstock Road, Oxford OX2 6HG, UK

Why Are We Concerned About Biodiversity?

It may be worth standing back, and remembering why biodiversity is so important. Many points will be familiar but they are still worth drawing attention to:

Ethical

Should we regard ourselves as free to exterminate so many of our companions on the living planet, whether they are of use to us or not?

Most Christian thinkers saw humans as separate from the rest of nature, which they believed was for their plunder or pleasure. Many still do. But respect for life as such has always been a central tenet of Buddhism and Taoism, among other systems of belief.

There is an increasing awareness that humans have some kind of ethical responsibility for the welfare, or at least the continued existence, of our only known living companions in the universe.

Aesthetic

These points usually go without saying, but they are difficult to define.

There is, I believe, a profound human instinct which causes people to feel linked to the natural world. Even the most hardened city dwellers need space and greenery in their work and play.

The culture of every people is closely allied to its landscapes and their living inhabitants, and cannot be dissociated from them.

AZ < 6916

Direct Economic

We need to maintain our own good health as well as that of the plants and animals, big and small, on which we depend for food. They represent a surprisingly small sample of the possibilities.

We pride ourselves on our medicine as if it were somehow detached from the natural world. Yet more than three-quarters of people in poor countries depend on plant-based drugs, while in industrial countries about a quarter of prescription drugs contain at least one compound that comes from flowering plants.

Substances derived from the rosy periwinkle of Madagascar have recently proved effective against childhood leukaemia and Hodgkin's disease, and the bark of the Pacific yew has yielded drugs for use against ovarian cancer.

As well as conserving diversity at the level of species and ecosystems, we also need to cherish the genetic diversity that occurs within them. Modern agricultural techniques have led to an excessive dependence on a few miracle strains of even fewer plants and animals.

Meanwhile the wild relatives of these strains are often lost when natural habitat is converted for other land uses.

Without a large natural genetic reservoir, we make our food supplies vulnerable to disease as the Irish potato growers in the last century learned to their cost.

Microbes are showing enormous promise in cleaning up pollution and providing novel enzymes to speed up chemical reactions in many industrial processes.

An American team has extracted a pair of enzymes from two microorganisms that can join forces to yield hydrogen gas from glucose and thus bring the dream of using hydrogen as an economical, pollution-free fuel a step closer to reality.

Ecological

At present we take as cost free a broadly regular climatic system with ecosystems, terrestrial and marine, to match. We rely on forests and vegetation to produce soil, to hold it together and to regulate water supplies by preserving catchment basins, recharging groundwater and buffering extreme conditions. We rely upon soils to be fertile and to absorb and break down pollutants. We rely on coral reefs and mangrove forests as spawning grounds for fish, and wetlands and deltas as shock absorbers for floods.

There is no conceivable substitute for these natural services. Often we hardly notice them. Yet we cannot continue to assume that they will continue or come for free for ever.

In many cases we do not know the threshold which, once passed, leads to their collapse. One example is that of keystone species, or more commonly, groups of species, which make an unusually strong contribution to community structure or processes. If these keystones are lost the vulnerability of their many dependants is high and a cascade of extinction is likely.

As can be seen in many parts of the world, damage to them carries enormous costs. Synergistic interactions are particularly worrying and unpredictable. An example is the way pollution has killed the microbial populations which support the Mediterranean's distinctive sea meadows of marine plants where hundreds of species of fish spawn and feed. This has allowed an alien weed species introduced from the tropics to blanket 1500 hectares of sea bed along the Riviera. This weed has mutated to twice its normal size, contains a toxin that kills algae, and is doing other damage to the sea meadows.

The Effects of Human Actions

Meanwhile the adverse effects of human impacts on biodiversity are increasing dramatically.

Estimates of the number of species doomed to extinction due to projected loss of tropical forests over the next 25 years range from 2–25% in the various groups examined (mainly plants and birds). This would be equivalent to 1000–10,000 times the expected background rate (Heywood, 1995). Extinction is irreversible.

Even if species do not become extinct, many of them will lose distinct populations or suffer severe loss of genetic variability through habitat loss or fragmentation. Human actions have directly and indirectly undercut the self-sustaining, and natural regenerative capacity of many ecological systems but many of the effects of these most recent human-induced changes will not emerge for some time yet (Heywood, 1995).

We are interfering with natural processes on a giant scale but are blundering blindfold. We ought to know more about the results of our actions. The urgency of the crisis and the inadequacy of resources mean that we will have to identify priorities. Everyone has his own, although most would include hotspots of extinction: areas that feature exceptional concentrations of diversity (however measured) and exceptional threats of destruction. But in setting priorities, there are some obvious points that affect us directly, for example:

Human Health

Changes in the environment, whether natural or human-made, produce new variants in viruses, bacteria, protozoa and insects. For them, changes in temperature, moisture and land use are crucial. The vast microbial world in and around us changes far faster than we can. Already we are finding increasing resistance to modern drugs, a resurgence of old diseases, and a birth of new ones.

At the same time we are producing a rich variety of changes in the air we breathe, the food we eat and the water we drink. New pollutants, especially those arising from cars in urban conditions, contribute to respiratory disease. Furthermore, the use of certain chemicals in fertilizers and pesticides can affect the human endocrine system with results ranging from breast cancer to lower sperm counts.

Changes of Habitat

We have already witnessed the unforeseen consequences of moving microorganisms, plants and animals out of their natural environment. There are many examples: for example, the water hyacinth which is fairly inconspicuous in its natural Amazonian habitats, but exhibits explosive growth in the slow moving, highly eutrophic waters of artificial canals and reservoirs in Florida. The numbers of such case studies are increasing. We have little idea how to cope.

Exotic species generally do better in ecosystems that have been disturbed by human activity, especially those which can be described as immature.

The effects of biotechnology and concerns over the release of genetically modified organisms could be even more unpredictable. Their development may eventually do wonders for medicine and agriculture, but once released such organisms cannot be recalled.

Conclusions

The value of research and accumulation of knowledge to support it, together with the development of new and rapid assessment techniques, needs no emphasis from me. Already the use of computer modelling has led to startling advances in understanding. If I have one message, it is that problems of biodiversity cannot be seen in isolation. Each leads into concatenations of others; and these in turn lead into questions of values, and on into economics, politics and the management of human society. Obviously we should direct our lives and economies consistently with nature rather than try to subjugate and control it. This requires deeper understanding and acceptance of natural processes, and an ability to cope with their inherent uncertainties, in short a greater respect for nature. The human species is subject to natural laws and processes in the same way as every other. One thing is for sure, we are in for surprises, good and bad, as thresholds are passed and new stabilities and instabilities are reached.

Reference

Heywood, V.H. (ed.) (1995) *Global Biodiversity Assessment*. Cambridge University Press, Cambridge.

Information Needs in Biodiversity Assessments – From Genes to Ecosystems 2

VERNON H. HEYWOOD

Department of Botany, School of Plant Sciences, University of Reading, P.O. Box 221, Whiteknights, Reading RG6 2AS, UK

“The number is contentious, the diversity is beyond dispute” R.H. Richens

Introduction

We live in an age of assessments, reflecting to a large degree the pace and intensity of change and transformation which affect most aspects of life today. This is especially true of the environment and the major alterations to which it has been and continues to be subjected as a result of human activities, e.g. agriculture, urbanization, industrialization and pollution, all of which have contributed to a massive fragmentation of our landscapes and a loss of biodiversity. To this anthropogenically induced change has to be added climatic change, itself partly induced by human factors. The realization that we are losing biodiversity on a substantial, some would say catastrophic, scale has led to a need for appraisal of just what it is we are losing so that a response can be planned.

Many biodiversity assessments have been commissioned in the context of the Convention on Biological Diversity (CBD), the preamble to which states that the Contracting Parties are ‘aware of the general lack of information and knowledge regarding biological diversity and of the urgent need to develop scientific, technical and institutional capacities to provide the basic understanding on which to plan and implement appropriate measures’. It should be pointed out, however, that unlike other environmental treaties no formal assessment of knowledge was carried out prior to the negotiation of the CBD. The UNEP *Global Biodiversity Assessment* (GBA) was commissioned and published after the CBD was signed as