BIODIVERSITY IN OUR LIVES

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Almost every aspect of human well-being is dependent on biodiversity. The food we eat, the air we breathe and the water we drink are all either directly produced by other species, or their quality is dependent on the activities of other species. Our food comprises largely of organisms such as animals, plants and mushrooms but the rate at which such food can be produced is dependent on the availability of nutrients that are influenced by species such as the bacteria which occur in soil, or on those which aid digestion. Without plants our atmosphere would not contain enough oxygen to sustain animal life and in the absence of the actions of multiple species of microorganism we would not have clean waters or nutrients for plant growth. Of course, the presence of other species also brightens our lives because of the beauty and diversity that they present to us each day.

These contributions from biodiversity are now referred to as ecosystem services and have been categorised as *provisioning* (e.g. food production) *regulating* (e.g. control of water availability), *cultural* (e.g. the aesthetic and spiritual value of biodiversity) and *supporting* (e.g. the contributions to the maintenance of 'healthy soil').[1] These services are priceless but global economic values of US$33 trillion per year have been placed on them. In this context, the presence of earthworms in Ireland has been estimated to contribute up to €723 million per year to livestock production.[2]

Against this background, it is estimated that as much as 50% of the biodiversity which exists today will be lost by the end of the century through our direct actions. This has raised the issue of biodiversity loss as an unsustainable consequence of development. Sustainable development has been defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' and 'unlike essentially all other scientific disciplines, conservation biology is a science with a time limit, with the clock ticking faster as the human population continues to increase'.[3]

WHAT IS BIODIVERSITY?

Biodiversity is not simply the number of species in an area. It includes the genetic diversity within species, the differences between species and the diversity of habitats within a landscape. All of these make significant contributions in terms of the continued provision of the ecosystem services referred to above. We know relatively little about this diversity. For example, we cannot even guess to within an order of magnitude how many species exist on Earth. Fewer than 2 million are currently classified, and estimates range from under 5 million to more than 50 million. Approximately 31,000 species and 117 habitat types have been recorded in Ireland; however, because of the small number of biologists currently trained to identify and classify living organisms, and, because of poor funding in this area, further advances are likely to be severely limited and species may be lost without us ever knowing of their existence or importance to the ecosystem.[4]

CAUSES OF LOSS

This loss in biodiversity is driven primarily by land use change, climate change, nitrogen deposition (e.g. acid rain), introduction of non-native species and elevated concentrations of atmospheric carbon dioxide. The relative importance of these factors varies from one part of the world to another and from one habitat to

another. For example, land use change is the primary driver of loss of biodiversity on land in most parts of the world, e.g. deforestation in the tropics, while the introduction of non-native species is particularly important in lakes.

In all areas there is a natural turnover of species. For example in bird species, the now common collared dove was first seen in Galway in 1959. More recently, we have lost the corn bunting and gained the greater spotted woodpecker, presumably due to the decline in cereal cultivation and the increased area of older forests. However, the intensive management of much of our land has caused the loss of many species locally.[5] In addition, habitat destruction means that a majority of the Irish habitats considered a priority by the EU are now considered to have 'unfavourable overall conservation status'[6] and their integrity is being lost.

The introduction of non-native species (such as the grey squirrel) is known to affect local species (such as the red squirrel).In Ireland, introductions have been particularly damaging in freshwaters where they change the character of the habitat through overgrowth that smothers native species. The number of these invasive aquatic species which have been introduced by humans is quite startling. For example, in the Grand Canal and the River Barrow, introduced species such as the African curly-leaved waterweed, the dace, the bloody red shrimp, Nuttall's pondweed and the zebra mussel are all affecting other species and biodiversity.

CONSERVATION AND SUSTAINABILITY

Biodiversity is fundamentally important to our continued well-being but it is being lost as a result of human activities. Various approaches have been used to attempt to stem this loss. These include the establishment of protected areas and single-species conservation programmes, which are often enshrined in legislation. However, in recognising that humans are an integral component of ecosystems, an additional approach, *the ecosystem approach*, was developed in the Convention on Biological Diversity, an international treaty aimed at sustaining the rich diversity of life on Earth. It recommends that maintenance of ecosystem stuctures is essential while accepting that they are used by humans and require 'adaptive management to deal with the complex and dynamic nature of ecosystems and the absence of complete knowledge or understanding of their functioning'.[7]

The international framework provides for the conservation of species within sustainably functioning systems and, if operated effectively, removes the potential for total collapse through the inadvertent loss of species that were keystone but which had not been recognised as such. As Aldo Leopold put it '…if the biota, in the course of aeons, has built something that we like but we do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering'.

NOTES

[1] Millennium Ecosystem Assessment 2005 *Ecosystems and Human Well-being: Biodiversity Synthesis*. World Resources Institute, Washington, DC.
[2] Bullock, C. *et al.* 2008 *The Economic and Social Aspects of Biodiversity — Benefits and Costs of Biodiversity in Ireland*. Government Publications.
[3] May, R. M. 1988 How many species are there on earth? *Science* 247: 1441–1449.
[4] Moriarty, C. *et al.* 2005 *The Natural History Museum — Present status and future needs*. Royal Irish Academy, Dublin; FitzPatrick et al.; 2010 *Ireland's Biodiversity in 2010: State of Knowledge*. National Biodiversity Data Centre, Waterford.
[5] Purvis *et al.* 2009 Biodiversity – *Monitoring, Functional Significance and Management for the Maintenance and Economic Utilisation of Biodiversity in the Intensively Farmed Landscape* Environmental Protection Agency, Wexford.
[6] http://www.npws.ie/legislationandconventions/nationalbiodiversityplan/(accessed 19 July).
[7] http://www.cbd.int/(accessed 19 July).

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