

The Importance of Biodiversity to Human Health



August 2005 was, to put it mildly, a busy time for me even by the standards of a well-travelled crusty academic. I had been in China for three weeks, travelling from south to north, and experiencing most unusual weather conditions, 38 to 44°C each day with almost complete humidity - not the ideal environment for an Ulsterman with an undoubted large complement of Viking genes!

I returned home with a turnaround time of just 36 hours, before heading off to speak at the first Conference On Health And Biodiversity (COHAB 2005), held in the Radisson Hotel in Galway City between August 23rd and 25th. This conference was the brainchild of Conor Kretsch, a consultant scientist with the Moore Group in Galway and what a job he brought to an amazing and fruitful conclusion.

The delegates and invited speakers were representative of a broad spectrum of disciplines and international interest groups and many are most distinguished in their fields. However, the atmosphere of the conference was homely (as one would expect from being well-laced with Irish West Coast hospitality) and relaxed, and I think that I can speak for all delegates who attended that it proved to be most rewarding.

What brought so many people from all quarters of the globe together for this meeting? The answer to this is probably the most important current issue for planet Earth that is the mass extinction event that is unfolding around us as a result of climatic and environmental meltdown. In terms of impact upon humanity as a whole and on all other species that co-inhabit our biosphere, this issue makes the oil crisis pale into insignificance.

Symbiosis is a term that literally means “living with”, but implicit in this term is the concept that all parties involved acquire some benefit from the alliance. What has become increasingly more apparent in recent years, to even the most sceptical of scientists, is that all life on Earth lives in a symbiosis – it is just that we did not recognise (and some still don’t) the complexity of interactions between all life forms. COHAB set out to address the issues underpinning this tenet and to bring these concepts to as wide an audience as possible. Discussions and presentations focused around three main areas: ‘Biodiversity and Agriculture’, ‘Biodiversity and Emerging Infectious Diseases’ and ‘Biodiversity and Drug Discovery’. It was demonstrated quite unequivocally, that in each of these areas there was a profound interaction between the requirements for the well-being of humans and interaction with a plethora of cohabiting species.

With respect to agriculture, all of our food crops, fruit and vegetables are derived from species that we have domesticated at different times in the past and in our desire to improve such products for biologically-irrelevant reasons (such as how they look on supermarket shelves) we run the risk of losing important natural attributes and wild-type genes that confer advantages and properties that we have not yet discovered.

With respect to emerging infectious diseases, we need only refer to the recent problems of SARS and bird flu, without forgetting the “plagues” of the recent past such as Ebola, that emerge from the forest from time to time certainly as a result of humans crossing biological “lines in the sand”. Many if not all such diseases

Orange-tip butterfly, *Antocharis cardamines*. © Robert Thompson



are the result of ignorance or dismissal of fundamental biology but we proceed along these paths of behaviour at our peril as a species. One can now travel around the Earth in little over 24 hours and the number of international travellers is now greater by orders of magnitude than at any time in our relatively short species history. This provides the microbial stowaways, in the form of new and indeed existing infectious agents, with an unlimited potential for rapid global spread, with all of the consequences to our human society. Most of the drugs that have contributed so much to the extension of human life expectancy in the 20th century (remember that this is when the pharmaceutical industry came into existence) have been discovered from natural sources in plants, trees, microbes and animals. While microbes will always fare well (they can evolve rapid resistance to our antibiotics and rapidly changing environments as we all now know) plants, trees and animals are more sensitive to habitat destruction, climate change and pollution. Combine all three of these factors, as we are apparently doing on a global scale, and the effects are incalculable for our well-being.

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When animals and plants go extinct they take their genes, proteins and metabolites with them - the very sources of the majority of our drugs. Thus with every extinction event, our probabilities of drug discovery are reduced in parallel. You may be forgiven for wondering how these events affect you on the island of Ireland. Well the biodiversity of this island is relatively low due to several factors including past geological history such as the breaking of land bridges, the last Ice Age and the massive deforestation that has taken place over the past thousand years. However, this is no reason for not taking every possible step to conserve what remains, especially on an island that has a very low population in relative terms and an equitable climate with good provision of water resources.

The golden toad, a species from Cost Rica, went extinct in the late 1980s. (Courtesy of the Consortium for Conservation Medicine, New York.) Prof. Shaw's research involves extracting toxins produced by poisonous frogs and investigating their potential uses in human medicine, particularly in treating cancer and cardiovascular disease. Speaking about the worldwide extinction of frog species, Prof Shaw explains: "It's like burning the library before we have read the books".

What has become very clear over recent years is that the situation we as a species find ourselves in today has no effective precedent in human history. For most of our time on this planet, we have lived with relative independence of the majority of others but now we are influenced to a large degree by their combined actions. Global warming, for which we are all responsible to a greater or lesser extent, can produce the hurricane damage in the Southern US, the typhoon damage in China/Korea/Japan, the cyclone damage in Bangladesh, the droughts in sub-Saharan Africa and the recent flooding in Central Europe. Thus the actions of people in one part of the world can have dramatic effects on the lives of others at different locations. A very good example brought to our attention at the COHAB conference was of the changes to both environment and flora/fauna noted by the Native American nations of the Yukon - a very remote and unspoilt region of the world. These changes included the northern retreat of coniferous forest, the reduction in winter snowfall and the distribution of caribou and white-tailed deer - all of which have led to alterations in the lifestyles of these native peoples and all of which are unique events in their history.

We have all become citizens of a global village and can no longer behave in ways that are perceived as being of no consequence to our brothers and sisters. We must all face up to the responsibilities of global citizenship including developing an awareness of the needs and welfare of other cultures and perhaps even more importantly, placing the needs and welfare of those other life forms with whom we share this world on a par with our own. We all need each other ultimately to survive in a sustainable manner on this planet and let's hope that there is still time for humankind to realise and fully embrace our stewardship of the biosphere and all of its denizens. Let's hope and pray that COHAB - a unique and creative endeavour initiated in the beautiful west of Ireland - will contribute in some way towards this ideal and may pave the way for further dialogue.

Prof. Chris Shaw is Professor in Drug Discovery within the School of Pharmacy, Queen's University Belfast. Prof. Shaw's exciting work involves the discovery and characterisation of biologically active agents within nature, most notably from amphibian venoms that are harvested worldwide.