

## **BIODIVERSITY: ITS IMPORTANCE TO HUMAN HEALTH**

A Project of the Center for Health and the Global Environment,  
Harvard Medical School  
Under the Auspices of the World Health Organization (WHO) and the  
United Nations Environment Programme (UNEP)

### **History**

Although there has been a great deal of attention paid to the subject of foreclosing the discovery of new medicines from higher plants secondary to the destruction of tropical rainforests, there has been little attempt to cover the full, complex range of consequences for human health from species loss and ecosystem disruption. To address this need, the Center for Health and the Global Environment at Harvard Medical School organized a conference at the American Museum of Natural History in 1998, “The Value of Plants, Animals, and Microbes to Human Health,” in collaboration with the Museum, UNEP, and the Fogarty International Center at the NIH. At the conclusion of the conference, the Center proposed to the WHO and UNEP that it undertake the project “ Biodiversity: Its Importance to Human Health,” in which leading scientists and health professionals from around the world would compile “state of the art” knowledge about the importance of other species to human health, and produce a report for the United Nations. Both WHO and UNEP agreed to be partners in this project, and WHO established a cross-cluster working group on “Biodiversity and Human Health,” designating Robert Bos a scientist in the Department of Protection of the Human Environment, as the convenor.

In August, 1999, an initial meeting was held at Harvard Medical School to begin planning the project. The project was officially launched in December, 1999 at WHO headquarters in Geneva, attended by chairs and co-chairs of the various working groups, and representatives from the WHO, UNEP, the World Conservation Union, the World Conservation Monitoring Center, the World Bank, the Convention on Biological Diversity, and other interested parties.

Four important developments have taken place since the project was first proposed:

1. The Millennium Ecosystem Assessment, an international project designed to evaluate the condition of the Earth’s ecosystems, has requested that our report be summarized and incorporated into theirs as the Section on Human Health.
2. The Convention on Biological Diversity has requested our input into their deliberations so that human health can inform its policy decisions.
3. The International Biodiversity Observation Year has designated our project as one of their core projects to be promoted.
4. And the WHO and UNEP have signed an historic Memorandum of Understanding to cooperate on environmental health issues, including in their list of priority areas of collaboration “biodiversity and human health,” in part driven by our project.

### **Project Content and Working Group Composition**

The project is divided into seven working groups that will report on the best and most current scientific and public health information available in their respective areas. These are:

I. A Status Report on Global Biodiversity, and the Driving Forces of Species Loss

Chairs—Stuart Pimm PhD (USA), Professor of Conservation Biology, Columbia University

Maria Alice Alves PhD (Brazil), Lecturer on Ecology, State University of Rio de Janeiro

Members—Melanie Stiassny (USA)

Callum Roberts (U.K.)

Christer Nilsson (Sweden)

Terry Root (USA)

Stephen Schneider (USA)

This working group shall review the current state of biodiversity worldwide, and shall cover the driving forces of species loss and ecosystem disruption. The status of endangered plants, animals, and micro-organisms will be reviewed in terrestrial, aquatic, and marine environments. The roles of habitat degradation and fragmentation, invasive species, and of global climate change, will also be examined as driving forces of biodiversity loss, along with other aspects of global environmental change.

II. Ecosystem-based Life Support Systems

Chairs—Jerry Melillo PhD (USA), Co-Director, The Ecosystems Center, Marine Biological Laboratories, Woods Hole

Osueldo Sala PhD (Argentina), Professor of Ecology, University of Buenos Aires

Members—H. Baijnath (South Africa)

Donald Boesch (USA)

Jose Sarukhan (Mexico),

David Tilman (USA)

P. Vallinga (Netherlands)

Brian Walker (Australia)

R. Wang (China)

WGII will discuss the ways that ecosystems support human health and make all life possible on Earth. It will look at such services as purification of air and water, mitigation of floods and droughts, detoxification and decomposition of wastes, and maintaining concentrations of vital gases and water vapor in the atmosphere. Other ecosystem services, such as those that control infectious agents in the environment (both for humans and for crops), or those that support the production of food on land and in water, will be covered by other working groups.

III. Medicines from Natural Sources

Chairs—David Newman PhD (USA), Chemist, Natural Products Division,  
National Cancer Institute  
John Kilama PhD (Uganda), President, Global Biodiversity Institute  
Members—John Cardellina (USA)  
Elaine Elizabetsky (Brazil)  
William Fenical (USA)  
Charles Wambebe (Nigeria)  
Victor Amo (Ghana)  
Gordon Cragg (USA)

This group shall catalogue medicines that are derived from, or are patterned after products derived from, terrestrial, aquatic, and marine plants, animals, and micro-organisms, looking at some of the most promising new examples. The role of ethnobotanical knowledge in natural medicines will be examined, and the history of current efforts of drug discovery in developing countries will be discussed. The group will also look at natural products that are used in food production, such as natural pesticides for crops.

#### IV. The Role of Species in Medical Research

Chairs—Eric Chivian M.D., Director, Center for Health and the  
Global Environment, Harvard Medical School  
Joshua Rosenthal PhD (USA), Director of Biodiversity Programs,  
Fogarty International Center, National Institutes of Health  
Members—Toshio Narahasi (USA)  
Gary Ruvkun (USA)  
Baldomero Olivera (Philippines) ,  
Ralph Nelson (USA)  
John Daly (USA)  
Ken Paigen (USA)  
Other members to be selected

WGIV shall cover the history of species in human medical research, from Mendel's sweet peas to present day subjects such as the microscopic roundworm *C. elegans*, dart-poison frogs, and chimpanzees, and shall highlight some of the latest work with species that are increasingly threatened. The group will focus on some species that provide important insights for understanding and treating diabetes, renal disease, osteoporosis, cancer, various neurologic and immunologic diseases, and other maladies.

#### V. Ecosystem Disruption, Biodiversity, and Human Infectious Diseases

Chairs—David Molyneux PhD (UK), Professor of Tropical Health  
Sciences, University of Liverpool  
Stephen Morse PhD (USA), Professor of Virology, Columbia School

of Public Health

Members—Thomas Kristensen (Denmark)  
Yasmin Rubio (Venezuela)  
Felix Amerasinghe (Sri Lanka)  
Paul E. Epstein (USA)  
Robert Bos (WHO)  
Peter Daszak (USA)  
Rick Ostfeld (USA)

One of the most rapidly advancing and important areas of ecology is that looking at how land-use patterns, and alterations in the balances of predators and prey, and hosts and parasites, (and the factors that alter these balances, directly from human over-exploitation, indirectly from such forces as human-caused climate change) can lead to the emergence and spread of human infectious diseases. Examples include hantavirus pulmonary syndrome, Argentine hemorrhagic fever, malaria, cholera, and Lyme disease. WGV will look at the dynamics of these changes.

VI. The Role of Biodiversity in World Food Production Food

Chairs—Daniel Hillel PhD (Israel), Professor Emeritus of Plant, Soil, and Environmental Sciences, University of Massachusetts  
Cynthia Rosenzweig PhD (USA), Senior Scientist, Center for Climate Systems Research, Columbia University

Members—Amos Tandler (Israel)  
Francisco Garcia-Olmedo (Spain)  
Tony McMichael (U.K.)  
Zhao Shidong (China)  
Hans Herren (Kenya)  
Diana Wall (USA)  
Jacquie McGlade (UK)

This working group will cover how biodiversity is important to soil formation and fertility, pollination, the dispersal of seeds and translocation of nutrients, and to holding various plant diseases and pests in check. It will also look at the vulnerabilities of crop monoculture, and will examine the potential health and environmental risks of growing genetically-modified crops. Finally, it will review the degradation of finfish and shellfish spawning grounds and fisheries, aquaculture, mariculture, and the use of genetically modified organisms in these practices.

VII. Policy Options

Chair—Jeffrey McNeely PhD (Switzerland), Chief Scientist, World Conservation Union (IUCN)  
Co-chair—Madhav Gadgil PhD (India), Professor, Centre for Ecological Sciences, Indian Institute of Science; Chair, Science and Technology Advisory Panel, Global Environment Facility

Members—Vernon Heywood (U.K.)  
Setijati Sastrapradja (Indonesia)  
Martha Chouchena-Rojas (Colombia)  
Walter Reid (USA)

This working group will review the conclusions of the other six working groups, discuss those international agreements that have been established to protect biodiversity (CITES, CBD, Convention on Wetlands, etc.), review issues related to intellectual property rights, “biopiracy,” and patents, and recommend a list of policy options, designed to address the crises of species loss and ecosystem disruption, that are national, regional, and international in scope.

## **Report**

The final report “Biodiversity: Its Importance to Human Health” will be approximately 250-300 pages in length and will make extensive use of visual illustrations and regional case studies, as well as include a complete list of current references. When published (Cambridge University Press is interested), it will be presented to the United Nations on the occasion of the 10<sup>th</sup> anniversary of the Rio Earth Summit in Johannesburg, South Africa in September, 2002. It will be incorporated in summary form as the Section on Human Health into the Millennium Ecosystem Assessment, and will help frame policy discussions at the Convention on Biological Diversity. It will be publicized by the International Biodiversity Observation Year, of which it is a Core Project.