SPECIAL REPORT

J. Sci Soc. Thailand, 15 (1989) 231-235

PRIORITIES FOR BIODIVERSITY RESEARCH

WARREN Y. BROCKELMAN

Department of Biology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand.

(Received 14 February 1990)

The word "biodiversity" has become a major focus of international conservation efforts during the last few years. The most visible event which initiated the current world-wide concern was the "National Forum on Biodiversity", a large meeting held in Washington D.C. in 1986 under the auspices of the Smithsonian Institution and the U.S. National Academy of Sciences. The major outcome of the meeting was the book **Biodiversity,** edited by E.O. Wilson (1988), which contains a wide selection of brief but informative articles by many eminent scientists. These events are stimulating increased support from the U.S. Government for international conservation efforts and renewed efforts by many other agencies and governments including, we hope, Thailand.

The Biology Section of the Science Society, chaired by Prof. Aksorn Sripleng of Kasetsart University, devoted its October meeting last year in Chiang Mai to the topic of "Biodiversity: Inventory and Values". Support was provided by the U.S. Agency for International Development and Wildlife Conservation International in New York. This seminar attracted more than 400 participants and featured talks by at least 20 Thai experts on various groups of organisms. The opening address was given by Prof. Dr. Sanga Sabhasri, Permanent Secretary of the Ministry of Science, Technology and Energy, who has provided enthusiastic support for the SST's efforts to promote education and research on this topic. The proceedings of the meeting will be published in their entirety in a special publication of the SST. The contributions of three eminent foreign participants are expected to be published in this journal. These were Prof. Peter S. Ashton of Harvard University, Prof. Stephen P. Hubbell of Princeton University and Prof. David S. Woodruff of the University of California at San Diego. All of these biologists are active in research on biodiversity in Southeast Asia.

What is so special or urgent about conservation of "biodiversity"? Why do we even need this special term ?

The word "biodiversity" provides a distinct genetic focus to conservation efforts. Biodiversity deals with three levels of biological organization: (1) genetic variability within species populations; (2) species, or taxonomic diversity; and (3) diversity of ecosystems, or the environments in which species live. All levels of diversity are essential for the persistence of life on earth.

Most environmentalists have come to the realization that the most serious problem facing the world today is the irreplaceable loss of genetic information through the steady extinction of species of organisms. What factors have, rather suddenly, brought most biologists to this realization during the late 1980s? Conservation of species and environments has long been the imperative of ecologists, but a number of developments, some of them scientific, have helped to bring biodiversity to center stage.

Deforestation is one. Demand for cropland and for tropical forest products, both by poor farmers in developing countries and the wealthier industries of all nations, has led to unprecedented rates of forest loss or conversion to other uses. Biologists now estimate that more than half of the world's species of plants and animals occur in tropical forests, which occupy no more than about 7 percent of the earth's land area.

Paleontologists now have a relatively comprehensive record of the history of biodiversity on the earth and have estimated the rates at which species have gone extinct during previous eras. The history of the earth has been marked by infrequent major extinction episodes followed by long periods of slow recovery characterized by low rates extinction. The present rate of species loss due to human disturbance is at least 1000 times greater than the "natural" background rate. It is clear that in the present instant of geological time, the biodiversity on earth is headed for its greatest crisis since the great Cretaceous-Tertiary extinction event 65 million years ago, which brought the age of large reptiles to a close and paved the way for the gradual increase in dominance by mammals and flowering plants. The biosphere will in all likelihood not begin to recover from the current crisis during the relatively brief expected span of human presence on earth. We are losing several species of vertebrates per year, and perhaps 10 percent of our birds and mammals are on the brink of extinction and will not make it through the next century. Ecologists have evidence that permits them to infer that the percentage lost over the next 1,000 years will be much greater, perhaps more than 50 percent.

Biologists and conservationists in Thailand and elsewhere are faced with the problem of trying to reverse or slow the rate of extinction of species. Preventing extinction does not mean merely saving a few individuals of each species—it requires protecting large areas of natural habitat, and managing rare or declining species to keep them above what population biologists consider to be the "minimum viable population" for long term persistence.

Conserving the earth's biodiversity is not simply the sentimental wish of environmentalists. It is becoming the imperative of all people and governments. In Thailand, for example, future options for economic development will depend greatly on biotechnological research. Presently, much research is being carried out on natural chemical products from

native plants. More than 10,000 species of vascular plants occur in Thailand, of which only about 15 percent have yet been catalogued systematically in the **Flora of Thailand.** Very few plants have been assayed for potentially useful chemicals, and many have not even been properly described and named or remain to be discovered. Much consideration needs to be given to the questions of how all these species are to be conserved for future study and use, and whether or not we will even have sufficient qualified taxonomic botanists to find and properly identify our native plants.

Genetic engineers cannot create new genetic material or manufacture new species de novo and duplicate the achievements of millions of years of natural selection. Their primary achievement has been to discover ways of transferring genetic material from one species to another, a kind of artificial recombination. Plant breeders have already discovered that the most extensive source of "new" genetic material is the wild strains of useful plants, and in the thousands of wild species that have never been carefully examined for their useful characteristics. Without our native flora and fauna, the future of biotechnological research will be limited. Biodiversity conservation and research are vital to the long term economic well being of Thailand.

The Science Society, Biology section, formulated a series of conclusions at the end of the October 1989 meeting which are printed below. The proceedings of the October meeting will serve primarily to educate members, students and other targeted groups about the great variety of native Thai plants and animals and their value. As is the case in all tropical countries, however, what we do not know about our biodiversity is more impressive than what we do know. The Biology Section is now working toward its final goal of establishing priorities for research on biodiversity in Thailand, both to help the Thai Government in formulating programs and proposals, and to offer guidance to development agencies in project development. Four workshops are planned for this year to formulate basic needs in biodiversity research in Thailand. The workshops will be kept relatively small and will feature brief reports and discussion of recommendations rather than talks or lectures.

The four areas which will receive attention are as follows:

1. Evolutionary biology and systematics
2. Ecology and distribution of populations and communities of organisms
3. Species management, propagation and uses
4. Storage and dissemination of information on biodiversity research, including printed publications and electronic data bases.

The workshops will deal with priority groups of plants and animals, priority research fields and problems, manpower needs, institutional needs and special policy issues. A final workshop will held at the Ministry of Science, Technology and Energy to synthesize and write the final recommendations.

The Biology Section has become convinced that "biodiversity" is everyone's concern, not just the concern of some biologists, It is hoped that the Science as a whole will share this concern and help convince everyone that conserving and understanding our native fauna and flora are urgent national priorities that need greatly increased support.

APPENDIX

BIODIVERSITY IN THAILAND: INVENTORY, VALUES AND RESEARCH PRIORITIES

Conclusions of the Annual Meeting of the Biology Section of the Science Society of Thailand Chiang Mai University, October 16-17, 1989

1. Thailand stretches from the wet tropics north into the dry subtropical regions. The most typical forest habitats are seasonal evergreen forests and deciduous forests with a long dry season. These forests are highly sensitive to increases in drought and fire, and hence very fragile. Thailand also has long coastlines and rivers, whose biologically rich habitats—mangroves, beaches, coral reefs, estuaries and swamps—are also becoming increasingly disturbed and modified by man.
2. Thailand's biodiversity is rich—an estimated 15,000-25,000 species of vascular plants and 600-800 species of freshwater fishes occur in the kingdom—but the flora and fauna are incompletely known. The Flora of Thailand Project has thus far enumerated only 15 percent of the species, and plants are still poorly known.
3. The wild animals and plants of Thailand are of tremendous importance to the rural economy, and provide the basis for the future social and economic development of the kingdom. Medicinal plants and natural chemical products are now receiving major research emphasis at several Thai universities. Native flora and fauna are the key to new developments in agriculture, forestry (especially community forestry), fisheries, biotechnology and tourism. They are the key to future economic sustainability and stability, and more equitable distribution of wealth, which the prime minister has declared as the socioeconomic priority for the year 1990.
4. The biodiversity of Thailand is rapidly eroding due to forest degradation, wetland alteration and drainage, pollution and coastal development. Future global climatic change may severely affect plant communities and soils and change aquatic ecosystems. Although the government has set aside a fine system of protected conservation areas soon to reach 15 percent of the kingdom, this system is highly fragmented and comprises over 100 separated units. It is also unbalanced ecologically, and not yet well managed.
5. Although efforts to conserve and manage the rich biodiversity of the kingdom must proceed with haste, neither conservation nor management can be effectively implemented and sustained without concurrent research efforts. Research is vital in order to:
   a. establish what and how many species of plants and animals occur in Thailand. Emphasis must be placed on important groups such as forest trees, freshwater fishes and key invertebrate groups such as economically and biomedically important crustacea and insects.
   b. inventory the ecosystems and important species groups in all regions, to determine their distribution, extent of fragmentation and effects of human disturbance.

c. understand processes that will inevitably contribute to extinction, such as genetic and demographic changes in small populations and communities, species dependencies and interactions, effects of drought, fire, soil erosion and human disturbance on survivability.
d. understand the ways in which rural people (85% of Thai people) now exploit wild plants and animals, and the socioeconomic and legal factors which lead to overexploitation of natural populations and environments.
e. investigate the cultural (particularly religious) and social factors which can be mobilized to promote sustained utilization of native fauna and flora.
f. Study the properties and distributions of plants and animals that can contribute to improved rural welfare, particularly through community forestry and improved local management efforts.

6. The most critical limiting factor for understanding the biodiversity of Thailand is shortage of trained manpower in systematic and environmental biology. Programs and funds must be obtained to increase the number of persons who can properly identify and research the flora and fauna of the kingdom, to include training from the technical level to scientists at the Ph.D. level. This problem has already reached the crisis stage in plant taxonomy, where a shortage of taxonomic expertise is hampering research on natural chemicals and other products. For many other important groups of organisms there are no local taxonomic experts at all, and no adequate museum collections.
7. Projects which foster better inter-institutional collaboration (including foreign institutions), inter-disciplinary work, and the development of long term field research sites for critical inventory of species and ecosystem studies are urgently needed.

(The Science Society of Thailand intends to follow up the biodiversity meeting with series of smaller workshops during 1990 to define the nation's needs for research on biodiversity and set priorities to help guide both the Thai Government and funding agencies.)