BIODIVERSITY: THREATENED AND ENDANGERED SPECIES

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Adoption of the Biodiversity Convention by more than 150 nations at the 1992 UNCED Earth Summit in Rio de Janeiro has fueled increased attention to the loss of species that is associated with economic development. Forestry and deforestation have been identified as among the most important threats to biodiversity worldwide. As a result, market pressures inspired by environmental concerns are propelling forestry into a new mode of operation. In this "new forestry," issues related to species conservation, ecosystem integrity, and sustainability of the resource will share center stage with the more traditional approach of giving highest priority to productivity goals. We are presently in the midst of a social process to sort out the balance desired among these goals.

With the shift in public attitudes, foresters suddenly must explain how their management practices affect the fauna and flora of forested lands. Insects and other arthropods play an important role in the developing debate because they represent an overwhelming majority of species on earth, fulfill many important functions in forest ecosystems, and because data about their communities can be used to assess the extent to which a managed forest resembles its pristine precursor.

Though particular arthropod species are less fretted over than those of the charismatic, furred, or feathered megafauna, some conspicuous but uncommon taxa such as the Karner blue butterfly have attracted widespread attention. Public concern flows from worry that forestry will affect populations of such species negatively and thus increase the probability of their extinction. Study of the biota of forested lands of northern Europe, which have been subjected to several harvest rotations, suggest that such worries are justified, and it has dawned on us that our actions could contribute to the demise of forest species. From a broader viewpoint, we have come to realize how little is actually understood about the biota of North American forests. The realization that we are woefully ignorant of forest biodiversity and its relation to forest function has sent forest entomologists scurrying in new research directions, often in the company of biologists of other taxonomic persuasions.

As in any area that has suddenly sprung to the forefront of public attention, the general literature about insect "biodiversity" in forests is awash with motherhood statements. There is little agreement about the best approaches to helpful research. Rather than simply reiterate the importance of biodiversity and bemoan the inadequate state of knowledge, we asked the panelists to focus their comments on the following matters and to be prepared to discuss them:

1. How should we build concerns about threatened species and biodiversity into our thinking about forestry?

2. What sorts of general policy would be constructive?

3. What sorts or challenges are presently most important for researchers? Under this topic, we indicated that it would be most appropriate to illustrate remarks with a précis of any special work in which panelists were participating.

Abstracts of the presentations by the five panelists are provided below. The presentations ranged from practical examples, through emerging general principles, to more philosophical discussion about why we should be concerned at all.

Two philosophical issues raised from the floor were dealt with during a short general discussion. W. J. Mattson (Michigan State University) suggested that we need to address the value of biodiversity in relation to its causal relationship to our quality of life, whether this be physical or spiritual. As flows from E. O. Wilson's "biophilia" hypothesis, a primary reason for being concerned about endangered species might be simply that we like them, i.e., that we feel more comfortable being connected to a world that includes particular wild creatures. If humans depend psychologically on

components of "natural" ecosystems, loss of a species amounts to much more than simply rearranging atoms in the universe, even if particular species cannot be directly connected to ecosystem integrity or tangible economic return. Some may experience discomfort as our biological surroundings shift in response to perturbations associated with human-centered development. In essence, this seems to come down to the contrast between an eco-centric viewpoint, which holds humans responsible for their collective effects on other species, and a homo-centric viewpoint, which sees human action as a part of the natural course of events on earth, and thus a legitimate factor in the extinction of other forms of life. C. B. Williams (University of California, Berkeley) pointed out that western culture represents only one of a number of viewpoints about the value of particular species, and cautioned against generalizing our culture-based values. As an example he stated that the aboriginal people of North America may have had a much different view of the reduction of wild species like the bison than did our western European ancestors. Overall, the general opinion seemed to be that forest arthropod communities should be sustained and that our efforts might better focus on habitat management than efforts to ensure the survival of particular species.

A NORTH EUROPEAN PERSPECTIVE

Jari Niemelä[a]

I discussed the issue of boreal insects and forestry in Fennoscandia in the framework of the three topics that were provided by the panel moderators.

1. Concerns about threatened species and biodiversity. Concern about threatened species on the one hand and about biodiversity on the other hand form two ends of a continuum of approaches to nature conservation. Protection of threatened species or environments focuses on species/environment specific protection measures, whereas the maintenance of biodiversity involves a holistic approach to conservation. As diversity is a fundamental property of natural systems, this approach emphasizes the overall structure and functioning of the entire ecosystem, e.g., boreal forest. Thus, in addition to understanding of the biology of the forest, a wide variety of human activities related to forest use need to be considered. In this context, insects can be the targets for conservation measures or they can function as surrogates (indicators) of biodiversity (or ecosystem function).

2. General policy. Use of three complementary approaches to the maintenance of forest biodiversity seems fruitful: (1) protected areas need to be established for sensitive species and environments; (2) by using biodiversity-friendly logging methods, it may be possible to maintain populations of the less sensitive species in the managed forest; and (3) restoration of habitats that have already been altered by forestry.

3. Challenges for researchers. In Fennoscandia, the most urgent question in this field is: Is it possible to maintain biodiversity in the managed forest while logging in an economically viable way? I am involved in an experimental study examining the ecological effects and technical-economical possibilities of alternative harvesting methods. The ecological emphasis is on invertebrates and plants. The team includes researchers from several universities, government research institutes, and forest industry's research unit.

A UNIVERSITY PERSPECTIVE

John D. Lattin[b]

In my opinion, there is no special "university perspective" on the biological diversity of insects and other arthropods found in forests but rather a common concern for the many species these ecosystems contain. Insects make ideal biological probes of many different environmental phenomena because they are abundant in numbers and species, they are often habitat specific and host specific, and usually they are quite sensitive to environmental perturbations. In order to maximize the utility of such organisms, we need adequate knowledge about their habits and relative abundance under different circumstances. The sheer numbers of different species make this a daunting task but it is still an essential activity if we are to understand and maintain maximum diversity of the most speciose group of organisms on earth.

In spite of our great need for more detailed information, we are asked daily to extrapolate our present information to address such questions as the impact of management plans for forest landscapes; to protect the

Northern Spotted Owl and associated species; the biological impact of raw log importations; the impact of different forest harvesting practices on the forest biota; a review of the entire fauna of a state for sensitive species; to characterize the riparian zone in forests using insect assemblages; and to compare elements of the insect fauna found in boreal forests at large spatial scales.

If we are to make contributions to such programs and activities we must continue to add to our general and specific information on the forest biota in order to use that knowledge to make the very best decisions on land use possible and develop sound management practices across the landscape. Our forests contain the greatest native arthropod diversity in many parts of the world. We all have a special responsibility to help maintain that rich biological heritage.

SPACE, TIME, AND THE HUMAN DIMENSIONS OF BIODIVERSITY

M.W. McFadden[c] and J. Kathy Parker[d]

In an earlier paper we examined biodiversity from the viewpoint of the evolutionary processes of extinction and speciation and discussed human values in light of some controversial biodiversity issues. In this presentation, we revisited the biodiversity issue and examined the human values associated with it in terms of time (geological) and space (biogeography). We also pondered questions of human feelings of loss and arrogance. The issue of arrogance is not directed at attempts to validate human values associated with the conservation of biodiversity but rather to examine the arrogance of *Homo sapiens* in light of this species' attempt to control natural selection and the course of evolution.

AN INDUSTRY PERSPECTIVE

William R. Gilbert[e]

An interesting dilemma is presented when trying to address issues related to incorporating listed species conservation, and biodiversity into commercial forestry. On one hand, industry has the responsibility to cooperate in the proactive conservation of listed species, and on the other hand it is imperative that conservation, planning not critically injure the economic goals for the lands that from an industry perspective represent a tremendous capital investment and are critical to the viability of the business itself.

The intent of Congress that the burden of listed species conservation would be borne by the federal government is clear in the wording of the act, and therefore the argument that management of federal lands may have to be integrated into conservation measures for listed species has substance. However, there is no wording in the Endangered Species Act (ESA) that suggests that Congress intended for listed species conservation to dramatically adversely affect normal, legal use of non-federal lands, particularly private lands.

It is very likely that an increasingly large number of listed species will occur primarily on non-federal lands, and many species would not occur on any public lands at all. If conservation of threatened species is to progress on a meaningful scale, it must involve the non-federal lands, including the working landscape, most of which is privately owned. If private lands, including both industrial and non-industrial private lands, are to be involved in this level of conservation, the mandate for economic realism and private property rights must be served. The conservation front may then be advanced.

So the concept can be fairly straightforward. If larger, non-federal landowners can adjust their management practices in an economically-viable manner to accommodate a conservation program that will insure the continuous availability of habitat on a dynamic landscape that would make habitat availability unlikely to jeopardize the existence of a species, then the potential burden that can be bestowed on small private landowners, who own the majority of our landscape, can be neutralized.

As an example, the Karner blue butterfly habitat conservation planning effort is a unique attempt at "grassroots" statewide conservation of an endangered species. Government agencies and private entities that will have land or financial assets committed to the plan jointly work as partners in the planning process. This process, because of its broad representation, is coordinated by a government agency, in this case the Wisconsin Department of Natural Resources. The DNR will be the applicant for the statewide incidental take permit on behalf of the partners, including itself as a partner, and the other citizens of Wisconsin.

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