



The  
Association  
for Tropical  
Biology



Smithsonian Tropical Research Institute

## ASSOCIATION FOR TROPICAL BIOLOGY

### RESEARCH PRIORITIES IN TROPICAL BIOLOGY REPORT ON THE PANAMA WORKSHOP 4 AUGUST 2002

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#### EXECUTIVE SUMMARY

In light of the social, economic, and political changes taking place in the tropics, the Council of the Association for Tropical Biology (ATB) decided to review ATB's mission and to assess research priorities in tropical biology. For this, a series of retreats and workshops were planned to identify research priorities in tropical biology. The first Research Priority Workshop was held in Bangalore, India, in July 2001, followed by a retreat in Washington in 2002 attended by ATB's Council. In August 2002, the second Research Priority Workshop took place in Panama City, Panama. This report summarizes the events and outlines the major recommendations from the second Research Priority Workshop.

After the introductory remarks and discussion, Workshop participants were divided into four sub-groups to discuss issues in four priority areas: 1) basic biological research, 2) conservation and management, 3) education, training, and outreach, and 4) public policy.

The origin and maintenance of tropical diversity and the impact of humans on this diversity dominated discussions in the Basic Biological Research sub-group. Soils and nutrient dynamics was the second most important theme identified by this group. Other questions related to systematics, biotic inventories, and population biology, particularly of endangered, endemic, and keystone species.

For the Conservation and Management sub-group, the impact of climate change, land-use change, human impact, and invasive species on tropical ecosystems and species dominated the discussion. Because the impacts are negative and mostly have led to degradation of habitats, restoration also emerged as an important theme. One way to counter continuous degradation is to highlight the values of tropical ecosystems. Issues concerning the valuation of ecosystem goods and services surfaced several times during the deliberations of this group. Effective management must integrate science and policy issues, so participants emphasized the need for communication and continuous interaction between scientists and managers.

The Education, Training, and Outreach sub-group highlighted the importance of education, training, and outreach in meeting the broader goals of understanding tropical nature as well as conserving and managing threatened tropical biota. It is important to convey the results of research to students, educators and managers, and to the general public. A main concern of this group was the growing inequity between developed and developing countries in educational and training resources, including human resources.

The Public Policy sub-group was primarily concerned with the type of inputs that tropical biologists should provide in conservation and management of tropical forests. Of primary concern were the anthropogenic impacts on tropical ecosystems. The group considered the significant issues that deserve special attention, and discussed the most effective ways to translate growing knowledge into action. The measures for enhanced policy inputs included frequent interactions among researchers, managers, decision-makers and local communities, greater emphasis on applied and policy-oriented research, and training of biologists for better communication of their findings and concerns.

The Panama Priority Workshop represented the continuation of efforts formally initiated in Bangalore, India. Results from this second workshop further helped identify research priorities in tropical biology under several major topics and subtopics, and present a rationale for questions posed and the mechanisms to address those questions. The final discussions among the community of tropical biologists will take place in Washington (ATB Retreat II) in February 2003, and in Aberdeen, Scotland, (final Workshop) in July 2003. The White Paper that emerges from these efforts will provide a roadmap to lead future efforts in helping better understand and conserve tropical habitats and biota.

## **BACKGROUND**

Tropical ecosystems contain the majority of the Earth's biodiversity. Natural ecosystems in the tropics and elsewhere also produce goods and ecosystem services that in turn sustain local and regional economies. Escalating threats to tropical ecosystems call for research that allows us to understand, conserve, and responsibly manage tropical ecosystems.

In 2000, the Council of the Association for Tropical Biology (ATB) decided to review the mission of ATB in light of the social, economic, and political changes taking place in the tropics. Our goal was to develop a white paper on research priorities in tropical biology through a series of retreats and workshops. The first Priority Workshop was held in Bangalore, India, in July 2001 during the annual meeting of ATB in association with the Ashoka Trust for Research in Ecology and the Environment. This workshop was attended by 85 scientists, many from India and Asia (report available at <http://www.atbbio.org>). This workshop was followed by a retreat in Washington in 2002 attended by the Council of ATB. In addition to the Council sessions one invited discussion included representatives from funding agencies, foundations, and non-government organizations (for the retreat report, see <http://www.atbbio.org>). The second Priority Workshop was held in Panama in August 2002 during the annual meeting of ATB cosponsored by the Smithsonian Tropical Research Institute. The workshop was attended by 67 participants from 19 countries (Appendix 1). Appendix 2 provides the agenda for the workshop.

The workshop in Panama City, Panama, represented the continuation of efforts formally initiated in Bangalore, India. After an introduction on the goals of the workshop by John Kress, Kamal Bawa summarized the results of the Bangalore workshop. Nalini Nadkarni then set the agenda of the Panama Workshop, emphasizing that participants would identify priorities. She also pointed out that the organizers plan to consult other tropical biologists not present at the workshop. Such consultations may occur directly or indirectly through comments on the workshop report posted on the ATB website.

The introductory session was followed by brief comments from Tom Lovejoy (The H. John Heinz III Center for Science, Economics, and the Environment), David Kaimowitz (Center for International Forestry Research), Gary Hartshorn (Organization for Tropical Studies), Heraldo Vasconcelos (Biological Dynamics of Forest Fragments Project), and Peter Frumhoff (Union of Concerned Scientists).

Lovejoy noted that the world has changed much since 1976, when a formal panel last discussed priorities for tropical biology (National Research Council, 1976). At that time there were 2 billion fewer people on the earth, no trans-Amazonian highway had been built, and the Biological Tree of Life was much simpler. He outlined two reasons for setting priorities: 1) Humanity's great quest for sustainability, and 2) biologists' curiosity about the natural world. Lovejoy stressed the need for simplistic, but large over-arching questions that focused on exploration of tropical diversity and the manner in which tropical ecosystems function. The science of tropical biology, Lovejoy pointed out, must continuously provide inputs to policy-making to sustain tropical biotas.

Vasconcelos pointed out that the Forest Fragments Project, which started out as an experiment to ask a simple question (How big must a biological reserve be?), has subsequently become a center for basic research and training in tropical biology, a center for habitat conservation and management, and a center for the development and maintenance of large data sets for research and biodiversity monitoring. His list of priorities included a better understanding of species distributions, long-term monitoring, studies of vulnerable and threatened species (especially endemic taxa), and applied projects in conservation and management.

Kaimowitz raised the question of whether research priorities should incorporate the use of tropical diversity by local communities. He further asked what role local communities could play in conservation and management of tropical biodiversity, following the presumed failure of integrated conservation and development projects. An examination of reasons for this perceived failure of the integrated conservation and development projects itself should be an important research priority.

Integration of science with management and policy-making was the subject of Frumhoff's remarks. He pointed out that priorities in policy decisions are determined by what we know, whereas priorities in science are determined by what we do not know. Thus, it is important for scientists to provide the established facts to policy makers while at the same time recognize the precautionary principle of the inherent uncertainty of science.

Hartshorn noted that education and outreach are fundamental to any assessment of prioritization in research. Education provides the platform to launch research priorities and to implement the agenda. Because of the inequity in human resources between the north and the south (i.e., tropical and non-tropical countries), collaboration between the two halves of the world is critical for development of human resources needed to implement the new research agenda.

## **SUB-GROUPS**

After the introductory remarks and discussion, the Workshop participants were divided into four subgroups to discuss issues in four priority areas: 1) basic biological research, 2) conservation and management, 3) education, training, and outreach, and 4) public policy.

### **Sub-Group 1: Basic Biological Research**

The origin and maintenance of tropical diversity and the impact of humans on this diversity dominated discussions in the sub-group. The fundamental questions about tropical diversity identified in the discussion are listed below. Issues of human impact are similar to those discussed by the conservation and management sub-group, and are thus outlined under the priorities identified by that sub-group. Soils and nutrient dynamics was the second most important theme identified by the basic research sub-group. Other questions related to systematics, biotic inventories, and population biology, particularly of endangered, endemic, and keystone species.

### ***Origin, Maintenance and Patterns of Tropical Diversity***

- How did diversity originate and how is it maintained in natural and human impacted landscape?
- What are the patterns of diversity, particularly with respect to the distribution of endemic and epiphytic species (and what forces generate these patterns)?
- What is the role of biotic interactions in the structure and function of tropical ecosystems?
- What are the spatial and temporal scales over which speciation occurs?

### ***Systematics and Inventories***

- What is the number and type of species in the poorly known regions of the world?
- What is the level of species richness in poorly known groups such as epiphytes, fungi, and microorganisms?
- What factors and processes explain the current patterns and distribution of tropical diversity?

### ***Population Biology***

- How does spatial heterogeneity influence genetic diversity in species, and how does this diversity determine evolutionary potential or the vulnerability of species?
- What are the critical life history parameters of timber and non-timber forest product species for sustainable management?
- What are the most sensitive life history stages of endangered species?

### ***Soil and Nutrient Dynamics***

- What nutrients limit net primary productivity?
- How do nutrients affect regeneration potential after land use change?
- How do nutrient dynamics influence economic returns from tropical lands?

The participants also emphasized the need for long-term research on under represented ecosystems and taxonomic groups. Interdisciplinary research that integrates sub-disciplines of biology as well as the social sciences was also stressed.

### **Sub-Group 2: Conservation and Management**

The impact of climate change, land-use change, human impact, and invasive species on tropical ecosystems and species dominated the questions raised by this sub-group. Because the impacts are negative and mostly have led to degradation of habitats, restoration also emerged as an important theme. One way to counter continuous degradation is to highlight the values of tropical ecosystems. Issues concerning the valuation of ecosystem goods and services surfaced several times during the deliberations of the group. Effective management must integrate science and policy issues, so participants emphasized the need for communication and continuous interaction between scientists and managers.

### ***Human Impacts on Tropical Ecosystems***

- What are the effects of climate change, land use and land cover change, habitat fragmentation, and nitrogen deposition on diversity structure and function of tropical forest ecosystems? What is the magnitude of these effects? What ecosystems processes and species are most resilient or vulnerable?
- What are the major drivers of land use and land cover change? What are the deleterious effects of anthropogenic changes in landscapes?
- What is the impact of climate change on long-term processes in tropical ecosystems? Can tropical ecosystems be used as indicators of climate change?
- What is the role of tropical forests in stabilizing the global carbon budget?

### ***Fragmentation***

- How does the fragmentation of natural landscapes influence the diversity and functioning of tropical communities?
- What are the effects of fragmentation on dispersal, invasive species and spread of diseases?
- What are the major constraints to habitat connectivity in fragmented environments?

### ***Restoration***

- What are the biological, social, economic, and political limitations to restoration of tropical ecosystems? How might one overcome these limitations?

### ***Ecosystem services***

- What is the economic value of biological diversity? What are the best measures of ecosystem services? How can we communicate these values to policy makers and civil society?
- What is the relationship between ecosystem services and biological diversity?
- How is human welfare related to the maintenance of biodiversity and ecosystem services?

Participants pointed out the need for the development of a conceptual model that would incorporate biological and local livelihood concerns at multiple scales. They also stressed the importance of the involvement of local communities and traditional knowledge in conservation and management. The need for long term monitoring of tropical ecosystems to understand the drivers and consequences of contemporary changes and policy responses to such changes was articulated numerous times. It is critical to standardize methods and approaches for parallel projects so that data are comparable across organisms, ecosystems, habitats, and sites. The development of those methods and protocols must be accorded a high research priority.

### **Sub-Group 3: Education, Training, and Outreach**

This sub-group highlighted the importance of education, training, and outreach in meeting the broader goals of understanding tropical nature as well as conserving and managing threatened tropical biota. It is important to convey the results of research to students, educators and managers, and to the general public. A main concern of this group was the growing inequity between developed and developing countries in educational and training resources, including human resources. Four key points emerged from the discussions of this sub-group were:

- The need to promote professional and technical training that significantly strengthens human and biological resources of developing countries.
- The need to produce educational materials focused on tropical biology and conservation in Spanish and other languages.
- The need to train scientists in public dissemination of research.
- The need to integrate conservation and sustainability ideas into institutions that train primary and secondary school teachers.

The sub-group urged that the efforts to convey the past and current findings in tropical research to educators, policy makers, and the general public must be accelerated.

#### **Sub-group 4: Public Policy**

The policy sub-group was primarily concerned with the type of inputs that tropical biologists should provide in conservation and management of tropical forests. Of primary concern were the anthropogenic impacts on tropical ecosystems. The group considered the significant issues that deserve special attention, and discussed the most effective ways to translate growing knowledge into action. The measures for enhanced policy inputs included frequent interactions among researchers, managers, decision-makers and local communities, greater emphasis on applied and policy-oriented research, and training of biologists for better communication of their findings and concerns. Five areas were identified for policy inputs:

- Impact of land use change and land cover change, climate change, extraction of forest products, hunting on structure and function of tropical forests.
- Effects of globalization and international trade on tropical ecosystems.
- Management of tropical forest ecosystems.
- Introduction of genetically modified organisms and tropical biodiversity.
- Education and training of tropical biologists.

#### **NEXT STEPS IN THE PRIORITIZATION PROCESS**

This report will be posted on the ATB web site to solicit comments from tropical biologists. We will draw attention to the report by posting an announcement on list serves that are read by ecologists, educators, policy-makers, and conservationists. The draft will also be directly communicated to the participants in our third workshop, which will be held at the ATB meeting in partnership with the British Ecological Society in Aberdeen, UK, July 2003. Comments will be collated and incorporated into the second draft.

The first draft of a white paper on research priorities in tropical biology will be prepared on the basis of the reports from the Bangalore Workshop (2001), Washington Retreat I (2002), and the Panama Workshop (2002). This document will highlight priorities under several major topics and subtopics while presenting the rationale for the questions posed and the mechanisms to address those questions. This draft will be discussed at the Washington retreat II in February 2003. We will invite leading tropical biologists to this retreat. Managers, policy makers, and representatives from the major funding foundations will also be represented at this retreat. The final document emerging from the retreat will be further discussed at the annual ATB meeting in Aberdeen to get inputs and endorsement from the general tropical scientific community. A plenary symposium at the Aberdeen Meeting to articulate the major issues contained in the draft white paper will kick off the discussion and debate about the priorities. The symposium will be followed by the workshop that will feature detailed discussions. The white paper will be revised on the basis of inputs from the

participants. This document will be sent for further review to tropical biologists, resource managers and policy makers. It will also be posted on the web sites of the organizations that have participated in the effort. The final version will be prepared in October 2003, after receiving additional comments.

## **CONCLUDING STATEMENT**

The time is at hand to define and implement major goals in tropical biology and conservation. The Association for Tropical Biology in conjunction with the Ashoka Trust for Research in Ecology and the Environment (Bangalore), the Smithsonian Tropical Research Institute (Panama), the Organization for Tropical Studies (North Carolina), and the British Ecological Society (Aberdeen) is mobilizing the community of tropical biologists and environmental managers in a major effort to identify and prioritize these objectives. This Report of the Panama Workshop follows on the successful Bangalore Workshop and ATB Retreat I in Washington. The final discussions among the community of tropical biologists will take place in Washington (ATB Retreat II) in February 2003, and in Aberdeen, Scotland, (final Workshop) in July 2003. We expect that the White Paper that emerges from these efforts will provide a strong justification and roadmap for the acceleration of efforts to understand and conserve tropical habitats and biota.

## Appendix 1: List of Workshop Participants

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## Appendix 2

### **AGENDA FOR 2<sup>ND</sup> WORKSHOP PRIORTIES INTROPICAL BIOLOGY RESEARCH AND CONSERVATION**

August 3, 2002; 9 am to 4 pm

WJK = John Kress; KB = Kamal Bawa; NN = Nalini Nadkarni

#### **I. INTRODUCTION (900-930)**

- A. Welcome, introductions, & acknowledgments (WJK) [10 min]
- B. Summary of past workshop (KB) [10 min]
- C. Outline of Workshop goals and activities (NN) [10 min]

#### **II. PRESENTATIONS ON CONSERVATION APPROACHES FROM INVITED REPRESENTATIVES [NN] (930-1030)**

- A. Tom Lovejoy – Tropical biology and conservation research issues, USA [15 min]
- B. Heraldo Vasconcelos, Brazil [15min]
- C. David Kaimowitz, Indonesia [15 min]
- D. Gary Hartshorn, USA [15 min]
- E. Peter Frumhoff, UCS, USA [15 min]

#### **COFFEE BREAK [15 MIN] (1045-1100)**

#### **III. FOLLOW UP TO PRESENTATIONS AND PANEL DISCUSSION [WJK, KB, NN] [30 MIN] (1100-1215)**

#### **IV. INVITATION TO SUBMIT THREE PRIORITIES (ALL PARTICIPANTS) (1215-1230)**

#### **LUNCH [60 min] (1230-1:30)**

#### **IV. SMALL GROUP DISCUSSIONS [60 min] (1135-1230)**

- A. Formulate appropriate small groups (3-5 groups, depending on size and content)
- B. Introductions and setting of agenda within small groups
- C. Discussions within small groups

#### **V. SMALL GROUPS REPORT OUT TO WHOLE WORKSHOP (130-230)**

- A. Discussion and plan for report within small groups (15)
- B. Reports from each group [30]
- C. Reaction/discussion of whole group [15min]

BREAK [15 min] (230-300)

#### **VI SUMMARIES AND CONCLUSIONS (300-330)**

- A. Comments from invited representatives [10 min]
- B. Comments from large group [15 min]
- C. Comments from organizers [5 min]

#### **VII. NEXT STEPS, TIMETABLE, AND TASK ASSIGNMENTS [30 min] (330-400)**