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A COROLLARY FROM THE IUCN/IAB WORKSHOP: ENDANGERED BRYOPHYTES WORLD-WIDE

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INTRODUCTION

The workshop held in Mexico City August 8, 1995 was a step forward in the process of creating a global Action Plan (AP) for the conservation of bryophytes. Several experienced bryologists presented selected topics within the scope of the workshop and treated a wide variety of subjects starting with an introduction to the concept of endangered species, followed by two sessions of papers focusing on taxa and geographical regions respectively, and a concluding plenary discussion.

CONCEPT OF CONSERVATION

The concept of conserving bryophyte species and habitats is similar to that of conserving flowering plants but there is a much more marked lack of trained and active bryologists compared to phanerogamists. Several of the participants at the workshop stressed the lack of knowledge about bryophytes in general and stated at the same time the need to educate and train more bryologists in order to supply more effectively the relevant data needed for bryophyte conservation, threatened species and habitats.

TAXONOMY

From the presented papers and the subsequent discussion it was in general concluded that taxonomists can help the conservationists to assess rare and threatened species. Modern concepts of conservation priorities, such as phylogenetic

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uniqueness with studies of cladograms and evolutionary rates, are useful, especially when used as additional data for achieving the conservation of maximal genetic, morphological, chemical and ecological diversity.

The taxonomists also pointed out the extreme lack of taxonomic knowledge which is evident, for example, in the suborder Jungermanniineae which is one of the largest suborders of hepatics with only about 50% well known or recently monographed. There are tropical regions where species are being destroyed before they can be described.

ECOLOGY

One paper about habitats and ecology provided the important information that the diversity of epiphyllous bryophyte communities can be used as an important tool to detect any depletion of forest ecosystems at an early stage.

GEOGRAPHY

From a geographical point of view we were told that endemism is higher on islands than on mainlands. Island countries would therefore be expected to have more species of global importance than countries on the mainland.

Also of high importance are the mountainous areas of the tropical and northern Pacific Rim and the Himalayas which share many species that have very restricted distributions. Centres of morphological diversity include the Andes and the Himalayas; the southern extremities of Africa, South America and Australasia; Pacific tropical lowlands and the Caribbean region.

THE IMPORTANCE OF BRYOPHYTES

Most of the attending bryologists agreed that the AP should give information on the use and importance of bryophytes because this has often been inadequate in the past. Better information about bryophytes will increase the chances of receiving more resources for conservation as well as promoting bryophytes with the public.

A number of good examples of ecological importance were forwarded during the day. For example, the ecological value of bryophytes as an important stage for the establishment of vascular plants such as epiphytes, orchids, etc. In the tropics, bryophytes are extensively used as nesting material by birds. They are also important as a habitat for invertebrates.

Other points of importance included are their significance as a carbon sink, *e.g., Sphagnum* in peat is estimated to contain about half of all the carbon that has been naturally emitted.

We should not neglect to say that bryophytes are beautiful. This is recognised in moss gardens. There is even the possibility of developing 'bryo-tourism'!

The AP must convince politicians that biodiversity is important: when funding is short, biodiversity is always the first thing to be cut!

THREATS

The workshop also mentioned threats and conservation measures specific to bryophytes. Habitat destruction is in many countries the major threat to mosses, especially to species with narrow ranges and endemics. Habitat conservation is therefore the only way to prevent a decline in many tropical taxa. Deforestation is unquestionably a major factor in destroying vast areas of bryophyte habitat. Tropical forest is continually being invaded and encroached upon by an expanding human population, for habitation and for use in agriculture.

Wetlands are also vulnerable to human destruction or alteration through agricultural use, draining and mining of peat resources. Changing the drainage patterns into and from such wetlands leads to the restriction or destruction of bryophyte habitats. Flooding, especially for hydroelectric development, has already destroyed extensive areas in many countries. The proposal by the Chinese government to flood the valley of the Yangtze River is likely to be disturbance for bryophytes, as well as for other wildlife.

Air pollution, particularly acid rain, certainly continues to influence bryofloras all over the world.

IMPLEMENTATION

Regional 'hotspots' of bryological biodiversity should be identified. Regional committees of the IAB should be established to do this job. The conservation of bryophytes, like that of other groups, can only succeed with the co-operation of local people. this means that, as is already happening in some areas, conservation of tropical forest must be integrated into the local economy, with local people receiving profits from 'eco-tourism'. Bryologists must strive to influence this type of conservation programme, so that it includes at least a mention of bryophytes and their ecological importance as an integral part of the education programme. Also it is the responsibility of bryologists to ensure that any forest management takes bryophytes into account as much as is necessary to conserve them. This means influencing conservation authorities and thereby raising the level of awareness about bryophytes among conservation managers and ordinary people.

The AP should also encourage the initiation of courses involving conservation and recommend the appointment of more people who know about bryophytes in the conservation agencies, at least people who can appreciate bryophytes and the necessity for their conservation.

Priority should be given in the AP to the conservation of montane forests. It was also stressed that implementation of bryophyte conservation practices as applied in the north temperate regions is inappropriate for many tropical areas. This is largely because of our relatively poor state of knowledge in tropical regions. Vast regions in the tropics have not been explored thoroughly, and only when a significant increase occurs in the number of tropical bryologists will we be in a better position to address issues of species conservation. There are several constructive steps that must be taken to insure that we have the information necessary to implement conservation practices in tropical countries with regard to bryophytes. In particular; bryologists in temperate countries can help with training and education in bryology, including workshops and courses and donation of equipment such as basic literature and microscopes. If the international community has a desire to promote conservation in the tropics, then it should first provide the foundations to develop a basis for such knowledge by directly providing training and workshops for residents in developing countries.

Meanwhile, the rate of deforestation simply does not allow the luxury of waiting for more discussions and committee meetings to refine our knowledge of tropical bryophytes. Rather, the community should deliver the human and material goods today; tomorrow will be too late.

IMMEDIATE NEEDS

We should try to help countries to maintain and establish research posts for bryologists, and support and train graduates in the field of bryology. A suggestion from the audience to ask IAB members for donations to support specific projects was forwarded to the IAB board and was later granted. Areas of work could include surveys of potential hotspots, research into reproductive biology and dispersal (to investigate whether bryophytes can be re-introduced), and restoration ecology.

SUMMING UP

To sum up the results; bryophyte conservation is quite a recent concept, but conserving action is progressing. Europe is ahead of other parts of the world in bryophyte conservation, and bryophytes now appear in the conservation legislation of many European countries as well as in Europe-wide legislation. North American countries are now beginning to take bryophyte conservation seriously, but tropical countries are far behind. We need an Action Plan very soon in order to start acting and implementing. Thanks to the essential contributions considered at the workshop, although our knowledge still is incomplete, it will be sufficient to provide a first AP for bryophytes.