



Editorial

Forest ecosystems: threats, sustainable use and biodiversity conservation

The seventh meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the Convention on Biological Diversity was held in Montreal on 12–16 November 2001 to produce recommendations for the next Conference of the Parties (COP) in April 2002. Besides secondary issues (biological diversity of dry, sub-humid and agricultural lands, plant conservation strategy and incentive measures), the main theme focused on forest biological diversity and was based on a comprehensive report of an Ad Hoc Technical Expert Group. From research to practical actions, the theme included reviews of the status and trends of, and major threats to, forest biological diversity and forest ecosystem functioning and services, as well as options for the conservation and sustainable use of forest biodiversity. A special emphasis was placed on the impacts of climate changes, forest fires and harvests of non-timber resources, including bush meat. Here, I shall stress and extend some major points of the draft report and recommendations. Beyond their necessarily formal and consensual wording, they reflect the evolving attitude of scientists and conservationists on the value, management and future of the world's forests.

Status, trends, values and threats

According to the FAO's broad definition, 3869 million ha of forests remained in the world in 2000 (including 5% of tree plantations), of which about 49% were boreal, 47% tropical and 4% temperate. On average, 9.4 million ha of them disappeared every year since 1990 and only 7.8% are included in protected areas. The highest levels of local species richness and endemism, but also of deforestation, unsustainable logging and species extinction (1–10% predicted in the next 25 years) occur in tropical forests. As a result, the tropical forest biome holds 37% of forest carbon but is currently a net source of carbon dioxide to the atmosphere, contrary to temperate forests. Large-scale logging, often clear-cutting, of boreal forests is a relatively new threat.

The biodiversity includes much more than the current number of species in a given forest, let alone the phylogenetic diversity measured as the number of higher taxa. It ranges from intraspecific genetic diversity to the mosaic of habitats at the landscape scale, and involves the multiple and complex networks of biotic interactions between species. This diversity at smaller or larger scales with its evolutionary adaptations, selection pressures and resulting ecological processes may be easily disrupted and

highly degraded well before the species themselves have disappeared. Biodiversity has an intrinsic value but is also the critical basis of all direct (goods), indirect (services) and optional values. Whereas traditional values are still significant (e.g. timber, firewood, bush meat, soil protection, medicines, cultural values, . . .), new additional values are gaining importance (e.g. carbon sequestration, regulation of hydrological cycles, water quality, biodiversity conservation, recreational use, . . .). However, there is still a pressing need to balance more equitably marketable values with increasingly prominent non-consumptive values, up to and including existence value (willingness to pay to preserve) manifested in the general public.

The main cause of the continuing biodiversity loss is of course deforestation (most of it for low yield agriculture), but close to it is the impoverishment of the remaining forest tracts. The ranking of the direct causes of this degradation of forest structure and plant or animal communities varies between forest types and countries, but the following are widely considered to be severe threats at least in some forest areas: logging, especially unsustainable and high impact exploitations; shifting cultivation; large infrastructures like roads, residential areas or power lines; intensive silviculture (homogenisation of forest stands); unsustainable use of non-timber forest resources (sometimes leading to local species extinctions); human-induced fires (20 million ha of forest worldwide were affected in 1997–1998); spread of invasive exotic species; atmospheric pollution; climate changes; fragmentation and associated edge effects. Broad socio-economic driving forces such as population growth, poverty, institutional weaknesses, policy failures, or misdirected financial incentives are major underlying causes which should be addressed in the first place. Among these various negative factors, the so-called bushmeat crisis, or more generally the widespread commercial hunting, often facilitated and aggravated by logging or mining operations, is of special concern since it usually results in critically low densities of large key vertebrate species, in otherwise undisturbed tropical forests.

Policy developments and prerequisites

As a response to past forest-related policies which have failed to significantly reduce the general decline of forest cover and forest biological diversity, new strategies are currently developed, mixing various forms of wise adaptive management and economic incentives with conservation of protected areas and local people participation using an ecosystem approach. However, many basic tools, necessary to ensure efficient forest management, are still lacking or little developed. Among them, the following may be emphasized:

- useful criteria of sustainable forest use;
- operational indicators to predict forest biological quality;
- surrogates for biodiversity and trends other than the status of rare or threatened species alone;

- a better knowledge of key resources, taxa or structural attributes whose loss may trigger other extinctions;
- a standard forest classification;
- consistent monitoring programmes to provide information on changes in forest quality;
- a deeper understanding of the role of biological diversity in the functioning of ecosystems and the linkages between the loss of this diversity and the ability of forests to sustain their range of goods and services;
- practical principles and guidelines for the sustainable use of biodiversity;
- integration of non-timber uses into forest inventories and management;
- a better coordination between the many international and national initiatives on forest conservation and management.

Several valuable large-scale actions or operative guidelines are now building up worldwide, e.g. forest certification, low impact logging, preparation of national forest programmes, implementation of an International Model Forest Network, or creation of corridors between forest patches. Some of them, however, should include a greater awareness of biological diversity at all levels and should add relevant specific criteria to their management plans to give a higher priority to, and allow maintenance of appropriate levels of biodiversity. Yet, if some of them may actually slow the decline of forest biodiversity, at least locally, most have still to prove that they are really able to stop, if not to reverse it in the long term and at large regional scales.

The conservation dilemma: use for/or conservation?

Until recently, the conservation value of forests was assessed mostly by their area, notably because of an emphasis on the effects of fragmentation, and even more generally by their sustainable management for timber production. An increasing importance is now given to the ecological quality of forest habitats, although clear definitions, measures and criteria of this quality are still lacking. The qualitative and quantitative uses of forest ecosystems are critical determinants of the level and attributes of forest biodiversity.

Two opposed views are expressed among conservationists. In a simplistic way, these two extremes may be expressed as follows: (1) at least indigenous people are an integral part of forest ecosystems, have evolved a sustainable use of them and have a negligible, if not beneficial impact on their biodiversity; (2) any human exploitation of natural forests is a disturbance. At moderate levels, some disturbances may be beneficial, as are natural disturbances. However, they quickly become detrimental with human population growth, higher efficiency of tools and commercial exploitation. Even a sustainable harvest may result in a lower (albeit stable) level of the harvested resource, which may have consequences for other taxa or ecological processes. Therefore, only a strict preservation, without any significant use, may allow the

maintenance of the highest possible biodiversity (more a qualitative notion, yet to be defined). The first vision mainly comes from anthropologists and is often falsified by ecological and historical evidence. The second concept has not yet determined up to which threshold man's activity may be considered to be within the range of ecological impacts produced by other animal species in balanced natural communities.

Because of the strong and increasing human pressure on natural habitats, human use of most, if not all forest ecosystems is almost unavoidable. A compromise or makeshift is therefore necessary to allow an acceptable level of protection to many of these forests. Nevertheless, the scientific community in the SBSTTA has reaffirmed unanimously in its recommendations, and strongly emphasized the critical value of primary forests and strictly protected areas for the conservation of biodiversity and the necessity to maintain a substantial network of them as an essential complement to any conservation strategy based on sustainable use and other preservation measures in the much larger matrix of managed and unprotected areas. The usefulness of tree plantation or agroforests in the restoration of degraded or deforested land was duly acknowledged, but not their equivalence to natural forests in terms of biological richness. So, the necessity to achieve a balance between strict conservation and sustainable use is more than ever a priority, even if in some cases, the two must be spatially dissociated.

Jean-Marc Thiollay
Laboratoire d'Ecologie
ENS, 46, rue d'Ulm
75230 Paris Cedex 05
France