CONVENTION ON
BIOLOGICAL DIVERSITY

Distr.
GENERAL

UNEP/CBD/SBSTTA/1/4
24 July 1995

ORIGINAL: *ENGLISH*

SUBSIDIARY BODY ON SCIENTIFIC, TECHNICAL
AND TECHNOLOGICAL ADVICE
First meeting
Paris, 4-8 September 1995
Item 5.1.1 of the provisional agenda

ALTERNATIVE WAYS AND MEANS IN WHICH THE CONFERENCE OF THE PARTIES COULD START THE PROCESS OF CONSIDERING THE COMPONENTS OF BIOLOGICAL DIVERSITY PARTICULARLY THOSE UNDER THREAT AND THE IDENTIFICATION OF ACTION WHICH COULD BE TAKEN UNDER THE CONVENTION

Note by the Secretariat

1. INTRODUCTION

1. At its first meeting held in Nassau, the Bahamas, from 28 November to 9 December 1994, the Conference of the Parties (COP) decided to adopt in its medium-term programme of work (UNEP/CBD/COP/1/17) under "Conservation of biological diversity" (item 5.2), the following item 5.2.1: "Preliminary consideration of components of biological diversity particularly under threat and action which could be taken under the Convention".

2. Considering the importance of the item and the urgency of actions needed to be taken, the COP requested the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) to provide advice on the item as a matter of priority, for consideration at the second meeting of the COP in November 1995. Accordingly, the COP included in the draft agenda of the first meeting of the SBSTTA (UNEP/CBD/COP/1/17), under item 5.1: "Provision of scientific and technical assessments of the status of biological diversity", item 5.1.1: "Alternative ways and means in which the Conference of the Parties could start the process of considering the components of biological diversity, particularly those under threat, and the identification of action which could be taken under the Convention".

3. This agenda item must first be seen in the context set by its placement in the medium-term work programme of the Conference of the Parties (UNEP/CBD/COP/1/17, page 62) and in the

/...

United Nations
Environment
Programme
UNEP

provisional agenda for the first meeting of the SBSTTA (UNEP/CBD/SBSTTA/1/1). In the medium-term programme of work the item is under item 5.2 "*Conservation* of biological diversity" and in the SBSTTA draft agenda it is placed under agenda item 5.1: "Provision of scientific and technical *assessments* of the status of biological diversity". It would therefore follow that the SBSTTA needs to consider agenda item 5.1.1 from the perspective of both *conservation* and *assessing* the status of biological diversity. The COP, however, is to consider action which might be taken under the Convention, and the Convention recognizes the need to take a holistic and not merely a conservation-oriented approach to action to address the threatened components of biological diversity. Accordingly, this note and its annexes look at the conservation approaches while highlighting the need to integrate these across a broader spectrum of action.

4. Methods for considering and addressing the components of biological diversity under threat have traditionally been conservation-oriented. The Convention on Biological Diversity was born at least partially because traditional conservation methods were found lacking in stemming the loss of biological diversity. The Convention sets a new context for considering biological diversity which recognizes the causes of biodiversity loss are complex and multi-facetted and that action to address the loss must therefore reach beyond traditional approaches. Identifying effective action requires some understanding of what is causing the threat to the component under consideration. In this context, it is critical that socio-economic and other issues share the center stage with the more purely biological considerations. Still, it is not clear how to incorporate in an explicit way socio-economic processes as a source of possible threat to the components of biological diversity nor is it clear what specific actions will be effective at addressing the threats posed by these processes.

5. The purpose of this note is to provide a framework which facilitates the SBSTTA's consideration of this agenda item by reviewing what has been done and noting where further action may be desirable. Understanding the enormity of the task, the COP asked the SBSTTA to advise it on how to "start" the process of considering and taking action for the components of biological diversity under threat. Recognizing that this is just the beginning of a longer term and perhaps ongoing exercise, this note examines existing ways in which this issue is being considered. The paper first addresses three basic questions:

(a) What methods currently exist for considering the components of biological diversity?

(b) What methods are currently used for identifying which components of biological diversity are under threat?

(c) Having identified those threatened components, what methods are currently used for determining the conservation actions which need to be taken?

6. Recognizing that the ultimate goal is effective action to address the causes which threaten the components of biological diversity, the note highlights the limitations of current approaches and suggests what further work might be helpful in considering possible action under the Convention. As noted above, socio-economic issues may be at the heart of the loss of biological diversity. These socio-economic considerations must therefore be central to the ways and means the COP considers to address the components of biological diversity under threat. These considerations do not figure prominently in the most prevalent mechanisms in use today for identifying and taking action. The SBSTTA may therefore wish to advise the COP of the need to assess and implement new approaches and to avoid limiting itself to existing methods. Following through on this advice will require work to fill in the gaps in knowledge and understanding. The SBSTTA may wish to consider creating a panel of experts

to continue the process it will begin at its first meeting (*see Modus Operandi* of the Subsidiary Body on Scientific, Technical and Technological Advice, UNEP/CBD/SBSTTA/1/2). To facilitate the SBSTTA's potential consideration of a panel, this note concludes with possible terms of reference for the panel.

2. CONSIDERATION OF THE STATUS OF COMPONENTS OF BIOLOGICAL DIVERSITY

7. When considering the components of biological diversity, the Parties will have to set priorities. There are too many components of biological diversity for each to be considered separately. Priorities will need to be set in accordance with what are considered to be the most important criteria (which will in all likelihood vary from country to country). For instance, a country giving particular importance to maintaining species richness will give high priority to conserving highly diverse ecosystems. A country that prioritizes the need to prevent extinctions will give highest importance to conserving threatened species and sites for large numbers of threatened species. A country that attaches importance to maximizing the economic return on components of biological diversity will prioritize the sustainable management of economically valuable ecosystems, species and genes. A country with unique ecosystems and high levels of endemicity may give highest priority to maintaining endemics and near-endemics.

8. There are a number of options for determining whether or not a component is "important." Annex I of the Convention provides an indicative list for determining the importance of components of biological diversity at the ecosystem/habitat, species/community, and genome/gene levels. Given the relationship between determining the importance of a particular component of biological diversity and the identification of priority action, the SBSTTA may wish to consider: (1) the need for further elaboration of the criteria for determining the importance of a particular component, and (2) how these criteria can be translated into practical operational terms for use by Parties.

2.1 Ecosystem Level

9. Annex I of the Convention lists important ecosystems and habitats as having one or more of the following attributes:

(i) High diversity. This presumably means a high number of constituent species, or a wide variety of habitats within an ecosystem;

(ii) Large number of endemic or threatened species. The term "endemic" presumably refers to species that are restricted either to a particular habitat or ecosystem, or to a particular country;

(iii) Wilderness. This presumably refers to habitats and ecosystems that experience minimal human impacts;

(iv) Required by migratory species. This presumably refers to habitats and ecosystems that are of great importance, often essential, to migratory species during particular stages of their annual cycle;

(v) Social, economic, cultural or scientific importance. This reflects a recognition that importance cannot be determined solely by biological criteria;

(vi) Representative. This presumably refers to specific habitats and ecosystems that are

particularly characteristic of their type:

(vii) Unique. This presumably refers to habitats or ecosystems of which there is only one surviving example, and which are therefore unique;

(viii) Associated with key evolutionary or other biological processes. This perhaps includes the notion of habitats and ecosystems that are essential for fundamental evolutionary changes that could have a significant impact on biological diversity in the distant future.

2.2 Species and Communities Level

10. Annex I of the Convention lists important species and communities as having one or more of the following attributes:

(i) Threatened. This presumably refers to taxa and communities that face a high risk of extinction, either locally, nationally, or globally;

(ii) Wild relatives of domesticated or cultivated species. In other words, particular value is placed on these relatives, in particular in view of the value of their genes for further breeding, domestication, and cultivation;

(iii) Medicinal, agricultural or other economic value. In other words, importance should be attached to any taxon that is of high economic value, and therefore potentially available for sustainable use;

(iv) Social, scientific, or cultural importance. These are presumably taxa that are of high value, but not necessarily in traditional monetary terms;

(v) Importance for research into conservation and sustainable use. One example of such taxa given in Annex I is indicator species.

2.3 Genomes and Genes Level

11. Annex I of the Convention is much less specific about genes and genomes, stating that priority in identification and monitoring should go to genes and genomes of social, scientific and economic importance.

(i) Social. This may, for example, refer to genes controlling genes or genomes with characteristics of importance to communities and peoples in meeting their needs and fulfilling individual and social aspirations;

(ii) Economic. This may, for example, include the genes controlling characters of significance for present and future crop production or the production of other useful characteristics, such as medicinal qualities, which may be present in wild species;

(iii) Scientific. Key genes and genomes characteristics in this category may, for example, be those important to understanding species evolution and adaptation and the maintenance of biodiversity at higher levels (species and ecosystems). Genes used for breeding research and fundamental investigations of importance to conservation and sustainable use in general would also fall in this category.

3. IDENTIFICATION OF COMPONENTS OF BIOLOGICAL DIVERSITY UNDER THREAT

12. There are clearly a large numbers of ways in which Parties can consider the components of biological diversity. The way in which they do so will no doubt respond to particular national priorities and local conditions. However, one factor that is important in all countries is the issue of threat to components of biological diversity. If the components continue to be lost, then the potential benefits of sustainable use and equitable sharing will also be lost. It was no doubt in view of the serious nature of the threats to biological diversity, and the challenge that this poses to meeting the objectives of the Convention, that the first meeting of the Conference of the Parties decided to give particular attention to this issue in agenda item 5.1.1 at the first SBSTTA meeting.

13. It is widely known that biological diversity is under threat, some components particularly so. The question that each Party has to face, however, is: which particular components are under threat, either locally, nationally or globally in our country? A large amount of research and investigation has been carried out on developing methodologies for identifying components of biological diversity under threat at the taxon (mainly species) level; much less has been done at the ecosystem level; and very little at the genetic level (except in the agricultural context).

14. In addition to developing methodologies for identifying components of biological diversity under threat at the ecosystem, species and gene levels of biological organization, more research is needed on how these methodologies can be made to consider cause and effect in the larger socio-economic context. Ultimately, identifying action which might be taken under the Convention to address components of biological diversity under threat requires an understanding of all of the possible causes of threat.

15. The following sections and the corresponding annexes outline the most prevalent methods for identifying the components of biological diversity under threat at the ecosystem, species and genetic levels. The SBSTTA may wish to use this survey to assess any shortcomings of these methods in the context of the Convention.

3.1 Ecosystem Level

16. It has long been recognized in many countries that certain distinct ecosystems and habitats are threatened. However, little attention has been accorded to threatened ecosystems and habitats compared to that given to threatened taxa. There is one immediate reason for this. Different ecosystems (and different habitats) are much harder to distinguish from each other in a consistent way than different taxa are. There are no widely accepted ecosystem or habitat classification systems that are sufficiently detailed to be practically usable. Generalized classifications (eg: forest, woodland, grassland, wetland, lake, river, coast, etc.) are really of no use when it comes to identifying components of biological diversity that are under threat. In addition to this, ecosystems and habitats are dynamic, and they change much more rapidly than individual species.

17. More detailed classification systems for habitats and ecosystems have been developed in certain countries and regions and by certain organizations, and these can potentially form a good basis for identifying biodiversity components under threat at the regional/national levels. An overview of some of these systems is contained in annex I of this note.

18. It is important to devote more efforts to identifying components of biological diversity under

threat at the ecosystem level because it is practically impossible to evaluate all components of biological diversity at the taxon level (there being too many millions of species, most of them still undescribed). While it has proved possible to evaluate threats to the survival of many vertebrates and vascular plants, other life forms such as invertebrates, mosses, algae and fungi will inevitably receive much less attention. The best hope for conserving any such taxa that are under threat lies in the conservation of a wide range of ecosystems and habitats, particularly threatened ones. When ecosystems are lost, whole collections of taxa may go with them, often with an unknown loss of biological diversity.

19. Based on the systems identified above and detailed in annex I, the SBSTTA may wish to set in process a review of the criteria used to consider the ecosystems under threat and to survey other existing systems. This would provide more comprehensive information on which to base recommendations on how classification systems might be enhanced or developed.

3.2 Taxon Level

20. Although numerous different systems have been developed to identify threatened taxa, the systems fall into one of two main approaches. The first is a more objective, quantitative or semi-quantitative approach; the second is a more subjective, qualitative approach. The general trend over the past 30 years has been to move from more subjective to more objective systems for identifying threatened taxa. In considering systems to assess the threat to the components of biological diversity at the taxon level, the SBSTTA may wish to consider the pros and cons of objective versus subjective approaches. In general, the following criticisms have been made of the more objective systems:

(a) they require too much information;

(b) they are difficult to use in data-poor parts of the world;

(c) the levels set by the quantitative or semi-quantitative criteria are arbitrary; and

(d) they are misleading because they give a false impression of precision.

21. In assessing systems to identify threatened taxa, the SBSTTA may wish to analyze the basis for these criticisms. The first two may in many cases be based on misunderstandings of the objective, quantitative systems. The objective, quantitative systems described in annex II of this note do not require hard data, but rather the ability to make intelligent inferences and projections from what little is known. It has been found that enough is known about most taxa to be able to make some form of assessment of their threat status using these criteria.

22. The SBSTTA may also wish to investigate the practicality of the objective, quantitative systems, particularly in countries facing financial and capacity constraints. For a system to be effective and practically usable, it will need to simplify complex scientific issues. It must also help to pinpoint the need for any additional research required to clarify remaining problems, in particular those relating to lack of information on species' status.

23. The problems with the more subjective approaches may be more fundamental. These approaches tend to use undefined terminology, which can severely limit the results obtained from such systems. This runs the risk of making serious errors in national priority-setting processes. Although subjective systems may initially appear easier to use, their vagueness often makes them harder to use in practice than the more complex, objective systems that are now available.

24. The SBSTTA may wish to consider what needs to be done to enhance the criteria for classification of threatened species in the context of the Convention. This might include, for example, ensuring appropriate use of relevant non-biological factors (such as social, cultural and economic factors) in the criteria of systems for classifying threatened species.

3.3 Genetic Level

25. The third level of biodiversity, genetic diversity within species, is perhaps the most neglected level in terms of developing methodologies for identifying components under threat. A survey of existing methodologies is contained in annex III of this note. However, it is at this level that a substantial proportion of the global human population (mainly farming communities) is interacting with non-human biological diversity in a very direct way. This interaction is particularly visible in the diversification in many cultivated crops, domesticated animals and fish. This diversity also forms the basis for the continual improvement of agriculture and animal husbandry, as it provides the raw genetic material from which desired characteristics can be found. As such, it may form the basis for potential benefit-sharing arrangements for access to genetic resources under Article 15 of the Convention. The material is not limited to cultivated crops, domesticated animals and fish, but may also include other genetic resources such as wild animal and plant species, including microorganisms, with known medicinal properties and/or which are useful for industrial processes.

26. The effective conservation, sustainable use and equitable sharing of benefits of the genetic diversity needs to be based on developing knowledge of the extent and distribution of diversity in those species and ecosystems at risk. While genetic erosion is a documented fact, effective criteria for defining levels of genetic erosion and for creating action plans have not been fully developed. Practical measures to mitigate against the effects of genetic erosion focus more on the population and/or varietal levels. Habitat destruction through development, population pressure, desertification, overgrazing, among other things, are primary threats in many parts of the world rich in biological diversity. Identifying threats should include an explicit concern for the inter-and intra-specific diversity which is useful to a local community

27. Genetic diversity is greatly threatened, and has been severely eroded already, by processes of ecological, economic and cultural change in all countries. It is therefore critical that progress be made on identifying threatened components of biological diversity at the genetic level. Using the information contained in annex III as a starting point, the SBSTTA may wish to consider how it can start the process of exploring what needs to be done to enhance or develop new methodologies for identifying components of biological diversity under threat at the genetic level.

4. IDENTIFICATION OF ACTION WHICH COULD BE TAKEN UNDER THE CONVENTION

28. The range of options available for taking action to conserve the threatened components of biological diversity (be they genes, taxa or ecosystems) is almost limitless. However, the most important and frequently-used options are in fact spelled out in the Articles of the Convention, in particular:

Article 8: *In-Situ* Conservation;

Article 9: *Ex-Situ* Conservation;

Article 10: Sustainable Use of Components of Biological Diversity;

Article 12: Research and training;

Article 13: Public awareness and education;

Article 14: Environmental impact assessment and minimizing adverse impacts;

Article 17: Exchange of information; and

Article 18: Technical and scientific cooperation.

29. Annex IV of this note summarizes some of the more prevalent approaches to action in use to conserve threatened components of biological diversity. The Convention is important, however, not because it merely underpins existing methodologies, but because it promotes important new concepts such as benefit-sharing, incentives and their integrated implementation. These concepts are of direct relevance to effective action to conserve and sustainably use the components of biological diversity. For example, it is rarely sufficient to arrest the decline of a particular species. For a species to recover, a well-coordinated approach which seeks to identify and remove the effects of threatening processes is essential. This may involve, *inter alia*, *in-situ* and *ex-situ* conservation efforts, the removal of perverse incentives and establishing positive incentives. Ultimately, regardless of which particular component of biological diversity is under threat, action will usually need to be taken in accordance with many of the Convention's provisions simultaneously. Indeed, in asking the SBSTTA to identify action which could be taken under the Convention, the COP created an opportunity to analyze the practical relationship among the Convention articles and its implications for effective action.

30. Deciding whether or not to take action will relate to the importance attached to the particular component under consideration. Identifying what action should be taken will depend on understanding the causes of the threat. Identifying and labelling the components of biological diversity in some order of importance and classifying their status are important first steps. In isolation, however, these steps do not point to the action necessary to address the threat. Only when coupled with an understanding of the actual threats, mechanisms and forces driving destruction and degradation can the necessary action be determined.

31. The Convention offers an opportunity for a new approach, embracing many different but inter-related actions, to stemming loss of biological diversity. The SBSTTA may wish to consider how it can further the assessment and implementation of new approaches under the Convention. The COP clearly recognized that at its first meeting the SBSTTA could only *start* what is a complex and ongoing process of considering and addressing the components of biological diversity under threat. The SBSTTA may therefore wish to consider establishing a panel of experts to continue and further this process. The panel could be asked to look at the following four questions:

(a) How can the components of biological diversity be identified and prioritized in the context of the Convention?

(b) What can be done to enhance existing or to develop new criteria and classification systems for threatened components of biological diversity at the levels of genetic, species and ecosytem diversity?

(c) What are the processes and categories of activities which threaten the components of biological diversity?

(d) Having identified those activities and processes that threaten the components of biological diversity, how can the actions which need to be taken to conserve and sustainably use them be identified?

32. In addition, the SBSTTA may wish to consider advising the COP on the benefits of the following actions as a start in the process of considering and addressing the components of biological diversity under threat:

(a) Monitoring Status of Biological Diversity

33. It is clear that the process of identifying priorities, including threatened components, requires the availability of data and information on the status of biological diversity at all three levels (ecosystems, species, genes). The SBSTTA may wish to consider advising the COP on the need to develop guidelines and standards for ongoing monitoring programmes on the status of biological diversity at the national level, drawing on relevant work by UNEP, FAO, UNESCO, IUCN, CGIAR and others. National monitoring programmes would provide the information needed to support the strategies and action plans that are implemented under the Convention. The Conference of the Parties, in its consideration of such programmes, should consider the identification and monitoring of threats, in addition to the monitoring of components of biological diversity *per se*.

(b) *Development of Classification Systems and Methodologies to Identify Threatened Components of Biological Diversity at the Ecosystem, Species and Genetic Levels*

34. As has been evident from the preceding discussions, the development of classification systems for identifying the components of biological diversity under threat at the genetic, species and ecosystems levels would appear to be a priority that needs to be addressed by the Conference of the Parties. The development of some international criteria, which can then be applied nationally, might assist Parties in setting priorities at the ecosystem and habitat, species and genetic levels. The SBSTTA may wish to consider advising the COP on the need to develop some criteria for identifying threatened ecosystems, species and genetic strains and breeds.

(c) Developing an Understanding of Sustainable Use

35. Much work is being carried out on how to understand the factors (ecological, economic, social, cultural, institutional) that determine whether or not uses of components of biological diversity are likely to be sustainable. The SBSTTA may wish to advise the COP on how it could usefully help to draw together this body of learning to assist countries as they work to develop and implement sustainable use strategies.

(d) Sharing Experiences of What Works and What Does Not

36. As explained in the previous recommendation, there is much experience worldwide in the conservation, management and monitoring of biological diversity. In particular, there have been some important evaluations of the success of different initiatives. The SBSTTA may wish to advise the COP on the need to develop a means of ensuring that such experience is shared more effectively. This could be considered in relation to the establishment of the clearing-house mechanism.

ANNEX I

Components of Biological Diversity under Threat: Ecosystem Level

A. *TNC Conservation Status Ranking System*

One of the most advanced efforts in identifying and assessing ecosystem components of biodiversity is the Conservation Status Ranking System of The Nature Conservancy and the Natural Heritage and Conservation Data Center Network. This is described in annex II in terms of its application to species, but it is designed to be applied at both the species and the ecosystem levels. TNC uses a coarse filter/fine filter approach for identifying and protecting biodiversity, with the coarse filter based on unique or representative ecosystems or habitats, and the fine filter based primarily on restricted or imperiled species.

Because the lack of compatible classification schemes has been a major obstacle to using ecosystems and habitats as conservation units, TNC and its partners have worked for more than a decade to develop a hierarchical classification system for application at local and national levels. The TNC/Heritage system is based on existing rather than potential natural vegetation. The system builds on the physiognomic classification of Unesco, which was selected in part for its global applicability. This low resolution system was then modified by TNC and its Heritage partners for use at finer scales. The higher levels of the resulting TNC/Heritage classification system thus follow Unesco in focusing mostly on structure, while the lower levels are based primarily on species composition. The finest scale in this classification hierarchy is the natural community element, defined as unique repeating assemblages of species that occur in similar environmental and ecological settings.

The TNC/Heritage method for assessing the conservation status of these ecological units uses the same 1-5 ranking scale as that used for taxa (see annex II). This includes the attributes of that method (discussed further in annex II), including its applicability at nested geographic levels (global, national, and subnational). Using the same ranking scale allows comparability between species and ecosystems in priority setting, a major advantage in carrying out a comprehensive programme for the conservation and sustainable use of biological diversity. Rank definitions and criteria, however, are modified slightly to accommodate the specific attributes of ecological units. The two primary criteria for determining ecological status ranks are: (i) number of occurrences of a particular ecosystem (or habitat) type and (ii) the range wide coverage or extent of the ecosystem (in acres or hectares). Secondary criteria include measures of geographic distribution, trends in status (expanding or contracting range), trends in condition (declining, stable, or improving condition of remaining extent), threats, and fragility. The reasons for an ecosystem's rarity -- whether natural or anthropogenic -- also are assessed and documented. For each ecosystem assessed, these criteria are documented using a standardized format, which allows review and reconsideration of the rank as new information becomes available.

B. *Coordination of the Information on the Environment Information System*

One of the most sophisticated ecosystem classification systems is the Coordination of the Information on the Environment Information System (CORINNE), which is used in parts of Europe. The SBSTTA may wish to consult this when it is formulating advice for the COP on assessing threats to ecosystem diversity.

C. *Proposed New ANCA System*

The Australian Nature Conservation Agency (ANCA) is currently considering a new approach for identifying ecological communities under threat. Although this system is still being developed, it already provides some useful insights into how this issue might be addressed.

This new approach defines an endangered ecological community as one which is "likely to become extinct in nature unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate". The following provisional criteria have been proposed to define an endangered ecological community:

The community is subject to current and continuing threats likely to lead to extinction as demonstrated by one or more of:

1. Loss of taxa;
2. Marked decrease in geographic distribution;
3. Marked alteration of composition or structure;
4. Community is approaching non-sustainability;
5. Loss or decline of species that play a major role in community function;
6. Small geographic range such that the community could be lost rapidly by the action of a known threatening process;
7. Community processes being altered to the extent that interaction between the community components will be impeded.

Although designed for ecological communities, this new system could probably be expanded to address habitats and ecosystems. However, for it to be expanded more widely, the issue of developing some global standards for the classification of ecosystems and habitats is going to have to be addressed.

Annex II

**Components of Biological Diversity under Threat:
Taxon (Species) Level**

At the global level, two main systems for the identification of threatened taxa exist in the objective, quantitative category. These are the IUCN *Red List Categories*, the Conservation Status Ranking System used by The Nature Conservancy (TNC) and the Association for Biodiversity Information (ABI) (in the Network of Natural Heritage Programs and Conservation Data Centers, mainly in the Americas).

A. *IUCN Red List Categories*

In November 1994, IUCN adopted its new system of categories and criteria for listing taxa (in this case, species and subspecies) in the global IUCN *Red list*. The new system, which was developed through a global consultation process among scientists and conservationists lasting almost six years, is quite complex in its details, but contains three basic threat categories, with the following definitions:

Critically Endangered:	50% probability of extinction within 10 years or 3 generations, whichever is longer.
Endangered:	20% probability of extinction within 20 years or 5 generations, whichever is the longer.
Vulnerable:	10% probability of extinction within 100 years.

In reality, of course, it is very difficult to classify taxa according to the above definitions because there are no simple rules to translate basic ecological information into measures of extinction risk. To overcome this problem, a set of quantitative criteria were developed that can be used operationally for assigning taxa to particular categories. These criteria have been designed to assist the application of the definitions listed above. For each of the categories, quantitative criteria are based on the following biological parameters:

(a) Rapid rates of decline.

(b) Restricted geographic distribution, together with population fragmentation or concentration, an overall decline, or population fluctuations.

(c) Small population size, together with population fragmentation or concentration, or an overall decline.

(d) Very small population size.

In addition, the Vulnerable category has a fifth criterion:

(e) Very restricted geographic distribution.

In deciding which of these biological criteria apply, full use is made of relevant non-biological

factors affecting the taxon in question (such as social, cultural, economic and political realities). To qualify for any category, a taxon has to satisfy at least one of the above criteria. For each of these criteria there are quantitative levels, set so that the most threatened taxa are included in Critically Endangered, while progressively less threatened taxa are included in Endangered and Vulnerable. The criteria are applied to make use of the best available information, which in many cases is derived from informed guesses based on the small amount of data that is available on different taxa. The categories and criteria have been tested through their development phase on several thousand animal and plant species, and it has been found that the vast majority of taxa can be successfully classified, including those that occur in developing countries, where there is often very little information. In the few cases where information is insufficient, the taxon is classified as Data Deficient. For each taxon classified as Critically Endangered, Endangered, or Vulnerable, the criteria used to trigger the listing are displayed alongside the category, thus ensuring that the basis for listing is both transparent and can be challenged on the basis of new information or differing interpretations of the evidence.

In addition, the new IUCN system contains a few other more specific categories:

Extinct:	Taxa for which no individuals survive.
Extinct in the Wild:	Taxa that survive only in *ex-situ* situations (for example, zoos, botanic gardens, or seed banks).
Conservation Dependent:	Taxa that are not threatened, but would be were it not for ongoing conservation programmes.
Near Threatened:	Non-threatened taxa that are close to qualifying for Vulnerable.
Least Concern:	Taxa that do not appear to be under any immediate likelihood of threat.
Not Evaluated:	Taxa that have not yet been assessed for their degree of threat.

B. *TNC Conservation Status Ranking System*

The TNC Heritage System is in essence similar to the new IUCN system. The most obvious difference is that the different status ranks are not related to particular extinction probabilities. The global ranks ("G") may be summarized as follows:

G1. critically imperiled globally (typically 5 or fewer populations or occurrences, 1,000 or fewer individuals).

G2. imperiled globally (typically 6 to 20 populations or occurrences, 3,000 or fewer individuals).

G3. rare or uncommon but not imperiled (typically 21 to 100 populations or occurrences, 10,000 or fewer individuals).

G4. not rare and apparently secure, but with cause for long-term concern (usually more than 100 occurrences).

G5. demonstrably widespread, abundant, and secure.

GH. of historical occurrence (possibly extinct; still searching with the expectation that it may be rediscovered).

GX. presumed extinct throughout its range.

G?. not yet ranked.

While the ranking system uses objective criteria that are thoroughly documented in supporting databases, each rank represents a hypothesis based on the best available information. Where there is insufficient information to assign a specific rank, the system has a mechanism to assign a range of ranks. There is also a mechanism to rank infraspecific taxa, as well as a code to indicate that a taxon is of questionable taxonomic status.

As with the IUCN *Red List* categories, the ranking of a species is based on objective information for a number of criteria. These criteria are:

(a) The number of populations or other occurrences throughout the taxon's global range.

(b) The global abundance of the taxon (measured by population size, area, or stream length).

(c) The size of the taxon's geographic distribution.

(d) The trend in the taxon's population status over its global range.

(e) The severity of threats to the taxon.

(f) The fragility or susceptibility of the taxon to threatening processes.

Like the IUCN system, the TNC Heritage System is quite complex in its details, but has proved, over a period of 15 years, to be usable in both developed and developing countries. The TNC Heritage System, unlike the IUCN system, is designed to assess conservation status rather than extinction risk. However, in practice, the criteria used under the TNC Heritage System all relate to extinction risk, and so the two systems are in fact much more similar than has sometimes been realized. The TNC system was also designed to deal with components of biological diversity not only at the species level, but also at the ecosystem level (see annex I). The possibility of exploring the degree of equivalency between the two systems has been discussed between IUCN and TNC, and will probably be pursued in the near future. If the relationship between the two systems can be defined and understood, then it will avoid the need for Parties to choose between the two.

C. *Other Global Quantitative Systems*

Among the other global systems that are based on an objective approach, the most obvious is the listing criteria adopted by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in November 1994. The new CITES listing criteria are based on the same principles at the new IUCN *Red List* Categories, but with a number of detailed modifications to meet the particular needs of CITES as a trade-regulating convention.

D. *Using the IUCN and TNC Systems to Assess Threat at the National Level*

The IUCN and TNC categories and criteria represent the most comprehensive global systems available for identifying the level of threat to components of biological diversity at the taxon level. However, the Convention on Biological Diversity is clearly concerned with identifying components of biological diversity under threat at both the global and the national levels, especially since the focus of implementation of the Convention is at the national level. The TNC conservation status ranking system is designed so that it can also be applied hierarchically at different geographical levels (subnational, national and global). The 1-5 ranking scale is identical to the global ranks, but "G" (i.e., global) is replaced by "N" (i.e., national), or "S" (i.e., subnational). Thus a taxon's conservation status may be fully characterized by its combined global, national, and subnational status ranks. For instance, a species that is globally common, nationally rare, and critically imperilled at the local level would be ranked G5/N3/S1. The criteria used to assign a taxon to one of these national or subnational ranks are similar to the global criteria, with certain adjustments to fit national and local circumstances.

The IUCN *Red List Categories* are based on quantitative criteria that are designed to identify threatened taxa at the global level; they are not designed to identify taxa that are not threatened globally, but that may be threatened either regionally or nationally. However, IUCN is currently working with government agencies and research institutions that are responsible for producing and maintaining national red lists (of which there are a very large number around the world) to produce guidelines for applying the IUCN criteria at regional, national and subnational levels. These guidelines will inevitably be flexible, given the enormous variation in local conditions in different parts of the world. Nevertheless, it is clear that many countries are keen to work towards a degree of standardization in the way in which they approach the process of identifying taxa under threat at the national level. It is hoped that the process of developing these national guidelines will be largely completed during 1996. These guidelines are being designed to evaluate the effects of immigration of individuals of a taxon from surrounding populations. If the IUCN criteria are applied without considering the issue of immigration, it is likely that in certain instances the extinction risk of a species will be exaggerated. Under both the IUCN and TNC systems, any globally-threatened taxon is necessarily considered to be threatened at the national level within the countries in which it occurs.

E. *Other Regional, National, or Sub-national Quantitative Systems*

There are many other systems that attempt an objective, quantitative or semi-quantitative approach to identifying taxa under threat. Most of these operate at the national or subnational level. Indeed, the great majority of national red lists and red data books, both in developing and developed countries, are now using approaches that are at least semi-quantitative.

F. *Subjective and Qualitative Approaches*

A number of more qualitative systems for identifying taxa under threat have been used over the years. Perhaps the best known was the old global-level system for IUCN *Red List Categories*, now no longer in use. The old IUCN categories were defined as follows:

Extinct:	Taxa not definitely located in the wild during the past 50 years.
Endangered:	Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included are those taxa whose numbers have been reduced to a critical level or whose habitats have been so

drastically reduced that they are deemed to be in immediate danger of extinction. Also included are taxa that may be extinct but have been seen in the wild in the past 50 years.

Vulnerable: Taxa believed likely to move into the 'Endangered' category in the near future if the causal factors continue operating. Included are taxa of which most or all the populations are decreasing because of over-exploitation, extensive destruction of habitat, or other environmental disturbance; taxa with populations that have been seriously depleted and whose ultimate security has not yet been assessed; and taxa with populations that are still abundant but are under threat from severe adverse factors throughout their range.

Rare: Taxa with small world populations that are not at present 'Endangered' or 'Vulnerable', but are at risk. These taxa are usually localized within restricted geographical areas or habitats or are thinly scattered over a more extensive range.

Indeterminate: Taxa known to be 'Endangered', 'Vulnerable' or 'Rare', but where there is not enough information to say which of these categories is appropriate.

Insufficiently Known: Taxa that are suspected but not definitely known to belong to any of the above categories, because of lack of information.

This system was introduced in 1963, and in many ways spearheaded the many attempts to identify threatened taxa. However, countries very soon found the system to be too imprecise for their purposes, and most countries producing red lists or some other form assessment of threatened taxa developed their own more objective, and often quantitative, systems. The problems with the old IUCN system listed above are fairly clear. First, the definitions are somewhat circular in nature and are excessively subjective. As a result, different individuals using the same data could obtain widely different results for the same taxon. This is because there are no real definitions of the terms used, which results in a wide, and confusing, spectrum of interpretation. For instance, the following terms, used in the definitions quoted above, are undefined: *in danger of extinction; survival is unlikely; critical level; drastically reduced; near future; seriously depleted; ultimate security; severe adverse factors; small populations; at risk.* The new IUCN system does not have the problem of undefined terms.

There are several other subjective systems that are, or have been, used. One of the most subjective was the 'Berne Criteria', which, until November 1994, formed the basis for making listing decisions for the CITES Appendices. The Berne Criteria contained no definitions and no criteria, and as a result led to frequent disputes over the status of species and the merits of listing or delisting. The system used by the U.S. Fish and Wildlife Service (USFWS) uses a somewhat more objective, but still basically qualitative, approach to listing species as 'Endangered' or 'Threatened'. Under this system, species are ranked 1-12 (in descending order of importance) according to magnitude of threats (high, moderate, or low), immediacy of threats (imminent or non-imminent), and taxonomic distinctiveness (monotypic genus, species, or subspecies). Despite the lack of definitions, this system appears to have worked much better than either the old IUCN system or the former Berne Criteria under CITES (both of which were much more vague than the current USFWS system).

Annex III

Components of Biological Diversity under Threat:
Genetic Level

The identification of components of biological diversity under threat at the population level needs to take into account the conservation of adaptative capacity provided by genetic variation such as: heterozygosity, genetic polymorphism and allelic diversity.

Concern for "threatened genes" usually centres around one or both of the following:

(a) Genes of high or potentially high social, economic and/or scientific value (hence the interest in wild relatives of crop plants, livestock, and economically valuable fish species); and

(b) Species and populations that are suffering severe genetic erosion through inbreeding and genetic drift (this often being in reality a precursor to extinction at the taxon level).

This annex therefore addresses the first concern: genes of high or potentially high economic value. These are considered in the next three sections: plants; domestic animals; and aquatic genetic resources.

A. *Plant Genetic Diversity and Its Sub-components*

Genetic diversity may be defined as 'the presence of allelic or genotypic differences within and between populations of a species at a given time'. The extent and distribution of genetic diversity within a plant species is a result not only of its biological characteristics, its distribution, and ecological characteristics, but also of the way in which people use species or ecosystems. Conservation needs and methods will vary depending on whether the species is cultivated or wild. Different approaches to conserving infra specific genetic diversity will be required depending on whether one is dealing with crop and forage species, their wild relatives or with agroforestry or forestry species.

The significance of genetic erosion for the future well-being of mankind has been recognized by many national and international bodies, such as FAO and the CGIAR, who have ensured that, today, over 4.5 million accessions of useful plants and their wild relatives are maintained *ex-situ* in collections throughout the world. For a number of major crops, these accessions undoubtedly represent a substantial fraction of the total diversity that exists within the crop species. There remain, however, major risks of substantial genetic erosion for the minor crop species important to local communities and to their wild relatives. The loss of diversity within useful forestry species (e.g. bamboo and rattan) is also a cause of much concern. Further, while *ex-situ* conservation is an effective way of stopping erosion, it does not allow for continuing adaptation and evolution for which *in-situ* conservation is needed and which can provide a basis for limiting erosion and supporting sustainable development.

B. *Domestic Animal Genetic Diversity*

Domestic animal diversity is a global asset which remains underutilized. The full extent of existing genetic diversity, especially in the animal populations indigenous to the tropics, is neither known nor understood. On the other hand, research on crops indigenous to the tropics has contributed significantly to improving production of both food and cash crops. Conservation efforts for animal genetic resources have generally been limited to wildlife. However, the basis for sustainable production

of animal products in the tropics will, of necessity, have to depend on indigenous livestock primarily because of their adaptation to local biotic and abiotic stresses. A major concern is the conservation of genetic diversity found in indigenous breeds of a given species (cattle, sheep, goats, pigs, chickens, etc.) and in related wild species.

The diversity in domestic animal genetic resources embraces the variability within and among species of domestic animals, as well as that in their wild relatives. Breeding for higher efficiency for a particular product or set of products or commodities (eg: in dairy cattle breeds, beef cattle breeds, dual purpose (dairy and beef) cattle breeds, dairy goats, meat goats, wool sheep, mutton sheep, etc) in developed countries, where selection for specific characteristics has been done for hundreds of years, decreases genetic variation and accelerates loss of local breeds.

A breed is threatened if it is subject to some force of change which affects its likelihood of continuing indefinitely either to exist or to retain sufficient numbers to preserve the genetic characteristics which distinguish it from other populations. The term "threat" is general and embraces such precise descriptions as vulnerable, endangered, critical, etc. Various attempts have been made to develop systems for identifying the level of threat to an animal genetic resource. The variables which determine threat categories include population size (especially the number of breeding females), reproductive rates, herd/flock sizes, degree of isolation, survival rates, etc.

C. *Aquatic Genetic Resources*

The taxonomy of most aquatic species other than finfish is not precise, and intraspecific genetic variation has been little studied for any aquatic groups. This severely constrains efforts to use aquatic genetic resources sustainably. Fisheries and aquaculture depend not only upon the genetic resources of the fished or farmed species, but also upon many other aquatic organisms that comprise aquatic food webs and that contribute to maintaining environmental quality. Most farmed aquatic organisms are undomesticated and, with very few exceptions, lack breeding histories comparable to those for crops and livestock. A global program is needed to document aquatic genetic diversity in an easily, accessible, standardized, linked database system. In addition, efforts are needed to evaluate aquatic genetic diversity, including assessments of its importance for fisheries and for the performance of farmed and potentially farmable aquatic organisms. These evaluations must encompass studies of distinct populations within species: i.e., populations that are Evolutionary Significant Units (ESU's).

Freshwater species are particularly vulnerable because of their restricted habitats. Some 500-700 finfish species, about 3% of the total, have become extinct during this century. Almost all are freshwater species which have been largely eliminated by human activities. The recent rate of extinction of finfish is about one species per year and, at present, 764 species of finfish are considered threatened.

Overfishing of marine species and widespread degradation of marine habitats, such as coral reefs, pose fewer threats to species extinction, but may threaten ESU's. Transfers and escapes of aquatic organisms (and of the disease, parasites and predators that accompany them) associated with aquaculture, fisheries, and the aquarium trade, can have negative impacts on wild and captive aquatic biota. Existing International Codes of Practice and national quarantine measures designed to safeguard against this are rarely applied.

D. *Classification Systems*

Most countries have a incomplete inventory of the genetic diversity they possess. No country has a complete characterization of the its genetic diversity in relation to crops, livestock, fish and their wild relatives. There is a need to distinguish between localized/rare and commonly available components of biological diversity at the genetic level. In addition, there is very inadequate understanding of the complex factors leading to diversification, such as the agricultural practices and innovations found in traditional farming communities. As is the case with habitats and ecosystems, a great deal of work also needs to be done at the genetic level to define exactly what it is we are talking about. With both genes and ecosystems, there are enormous problems of classification and standardization that are by comparison very simple at the taxon level.

No universally acceptable definition or criterion appears to exist for what constitutes a threatened gene or genome, though the FAO has moved a step towards this with its recently published World Watchlist for Livestock. Guidelines could be built up for one or more of the following definitions of what constitutes a threatened gene or genome:

(a) A component which was once common, but has been reduced to highly localized sites of occurrence.

(b) A component which is presently common, but is facing pressures which could cause severe decline.

(c) A component which is traditionally localized or rare, and is facing biological and/or social pressures which could result in its loss.

(d) A component which has been wiped out from its *in-situ* occurrence, but may still be found in *ex situ* conditions.

(e) A component which is found in neither *in-situ* nor *ex-situ* conditions (extinct?).

It follows that all processes which lead components to such levels of occurrence constitute threats.

The most significant progress in terms of risk classification is the FAO Framework for Risk Classification of Breeds and Programme for Action. This includes a system for classifying threatened breeds, principally on a national basis. The basis of the system is the number of breeding females. If this number is less than 100, the breed is classified as Critical; for 100-1,000 the classification is Endangered; 1,000-5,000 Vulnerable; and 5,000-10,000 Rare. However, if special considerations with respect to the population place it a greater risk than is usual for its population size, then its listing should be moved up to the next category of higher risk. In other words, a breed listed as Vulnerable on the basis of the number of breeding females would be transferred to Endangered on the basis of "special considerations". Such considerations include: degree of cross-breeding in the population; reproductive rate and generation interval; special peculiarities of the production system (intensive, extensive, nomadic, etc); historical and current rates of decline; geographic isolation of the population; and concentration of the population in one or a few locations. There are some clear parallels with this system and the new IUCN *Red List* categories.

Annex IV

Action Orientation

In identifying the appropriate actions that can be taken for the conservation of the components of biological diversity, it is helpful to go through a logical sequence of questions, as follows:

(a) What are the priorities? In other words, what components of biological diversity are considered to be important (see section 2 in this note)?

(b) Where are the sites in which these components occur?

(c) What needs to be done to start the processes of conserving and managing the important components of biological diversity at these sites?

(d) What needs to be done in the long-term to ensure that these sites are managed for conservation and sustainable use?

(e) How effective are these measures? All conservation and sustainable use programmes need to be evaluated in terms of their effectiveness in achieving the original goals (the maintenance of particular important components of biological diversity).

Site-based Approaches

The site-based approach is of fundamental importance for the conservation of biological diversity. This frequently requires the establishment and management of protected areas. It is important to recognize that protected areas do not refer only to strict nature reserves and national parks, but also to a variety of site-specific forms of management, including protected landscapes, resource reserves, anthropological reserves, and multiple use management areas. Many protected areas have been established for the objective of conserving components of biological diversity, though sometimes the original justification was worded somewhat differently from this. The global protected area estate now amounts to nearly 10 percent of the world's land surface, but relatively few protected areas are yet well-managed enough to achieve the objectives of the Convention. At the IV World Congress on National Parks and Protected Areas, held in Caracas, Venezuela, in February 1992, some 1800 of the world's leading experts in protected area design and management met to determine the steps that needed to be taken to ensure that protected areas are able to contribute to global conservation objectives.

The result was the Caracas Action Plan and a number of detailed technical publications which contain detailed guidelines and advice. The essential elements of the Caracas Action Plan are as follows:

(a) Integrate protected areas into larger planning frameworks:

(i) Develop and implement national protected area system plans;

(ii) Integrate national protected area system plans into economic development planning frameworks;

(iii) Plan protected areas as part of surrounding landscapes;

(iv) Develop techniques for assessing and quantifying benefits of protected areas.

(b) Expand support for protected areas:

(i) Identify the key protected areas interests of various groups;

(ii) Recognize the priority concerns for local communities;

(iii) Stimulate informed advocacy.

(c) Strengthen the capacity to manage protected areas:

(i) Expand training opportunities at all levels;

(ii) Improve management of protected areas;

(iii) Develop means of increasing financing and generating revenue;

(iv) Improve the application of science to management;

(v) Give attention to the special requirements for managing marine protected areas.

(d) Expand international cooperation in the finance, development, and management of protected areas:

(i) Clarify the roles and functions of institutions at all levels;

(ii) Develop international and regional action plans to support implementation of priorities established in national protected area system plans;

(iii) Re-invigorate existing frameworks for international cooperation.

Although applied to protected areas (in their broadest sense), the fundamental principles of the Caracas Action Plan apply to other of the site-specific actions to conserve biological diversity (such as local sustainable use projects, or other programmes to integrate conservation and development in specific sites). The Caracas Action Plan provides a useful framework upon which countries can develop a wide range of policies and programmes for conservation and sustainable use.

Recovery plans

Recovery plans are an important framework for effective measures to conserve threatened components of biological diversity. In the context of the Convention on Biological Diversity, the following would appear to be important considerations:

(a) Even in developed countries, it has not proved possible to develop and implement recovery plans for all threatened taxa. The scale of the problem is simply too large. This calls for two actions: first, a clear means of determining the highest priorities for recovery planning at the national level; and second, the extension of recovery planning to include threatened ecological communities (thereby covering many more threatened taxa in one plan);

(b) Priority should be given to training in all countries, north and south, on the principles of recovery planning;

(c) National plans and strategies for biological diversity conservation should include provision for developing conservation programmes at least in part through recovery plan processes; and

(d) Projects funded through the financial mechanism that address threatened components of biological diversity should be based on the effective use of recovery plans.

Conservation of Genetic Diversity

As with threatened species and ecosystems, there are some lessons of particular relevance to the conservation of genetic diversity (in this case, crops, livestock, economically valuable fish and their wild relatives). If genetic diversity is to be conserved and used sustainably, it is clear that the various threats need to be addressed. This would include both proximate and fundamental threats. However, even this is not adequate, pro-active policies and programmes are needed to encourage the conservation of this diversity as an integral part of agricultural development in any country.

Since it will not be possible to conserve the entire range of genetic diversity components in the immediate future, and perhaps not even in the long-run, countries may also want to prioritize the targets of their conservation strategies. This is especially relevant in the case of *in situ*-conservation. The following criteria could be used for such prioritization (just a selection, not exhaustive):

(a) Components which have a known desired characteristic which is or will be of economic use;

(b) Components which have a known desired characteristic which is of scientific, cultural, or other social use;

(c) Components which have close linkages to other desirable aspects, e.g. wild relatives, unique cultures;

(d) Components which are threatened, or are traditionally rare, localized, or endemic;

(e) Components with a high degree of distinctiveness or uniqueness;

(f) Regions which are exceptionally rich or important in genetic diversity;

(g) Populations which possess a high level of genetic diversity; and

(h) Marginal populations of wild relatives of crops and livestock, which are likely to have some distinct, and possibly important, genetic characteristics.

Actions which should follow include:

(a) Eliminating or minimizing the proximate and root factors causing the erosion of genetic diversity, including reviewing agricultural policy and subsidies with negative impacts;

(b) Spreading alternative forms of resource management which encourage conservation and use of genetic diversity, e.g., biodiverse organic farming;

(c) Extending *ex-situ* facilities to cover representative components of genetic diversity, as a back-up to *in-situ* attempts, and repatriating genetic material from *ex-situ* facilities to *in-situ* conditions, wherever possible, both within a country, and between countries;

(d) Encouraging intellectual rights regimes which promote diversity and the sustainable and equitable use of its components;

(e) Increasing awareness of the importance of intra-specific variation when governing movements of genetic material;

(f) Controlling the use of introduced, non-native species, including those resulting from hatcheries (as in the case with fish) and selective breeding; and

(g) Facilitating international cooperation in regards to the use of exotic species, and living modified organisms.