UNEP

CBD

CONVENTION ON BIOLOGICAL DIVERSITY

Distr.
GENERAL

UNEP/CBD/SBSTTA/4/8
15 February 1999

ORIGINAL: ENGLISH

SUBSIDIARY BODY ON SCIENTIFIC, TECHNICAL AND TECHNOLOGICAL ADVICE
Fourth meeting
Montreal, Canada
21-25 June 1999
Item 4.5 of the Provisional Agenda*

# DEVELOPMENT OF GUIDING PRINCIPLES FOR THE PREVENTION OF IMPACTS OF ALIEN SPECIES BY IDENTIFYING PRIORITY AREAS OF WORK ON ISOLATED ECOSYSTEMS AND BY EVALUATING AND GIVING RECOMMENDATIONS FOR THE FURTHER DEVELOPMENT OF THE GLOBAL INVASIVE SPECIES PROGRAMME

Note by the Executive Secretary

## I. INTRODUCTION

1. At the occasion of its fourth meeting (Bratislava, Slokavia, May 1998), th Conference of the Parties (COP) to the Convention on Biological Diversity adopted decision IV/1.C on alien species that threaten ecosystems, habitats or species.

2. In this decision, the COP requested the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) to develop guiding principles for the prevention, introduction and mitigation of impacts of alien species and to report on those principles and any related work programme to the COP at its fifth meeting. According to decision IV/16 on institutional matters and the programme of work of the COP, alien species will constitute an item for in-depth consideration by the sixth meeting of the COP.

3. In its decision IV/1.C the COP also requested SBSTTA to identify the priority work pertinent to the issue of alien species in geographically and evolutionarily isolated ecosystems and to report thereon to the COP at its fifth meeting. SBSTTA, at its fourth meeting, should also examine the Global Invasive Species Programme (GISP), with a view to considering concerted action and developing proposals for further action under the Convention on this issue.

* UNEP/CBD/SBSTTA/4/1/Rev.1

4. This document refers to the significant adverse ecological and economic effect of certain alien species on biological diversity; it builds upon previous recommendations of the COP on both the provisions on alien species in relation to Articles 6 and 8 of the Convention, as well as on the issue of alien species in relation to inland water, marine and coastal, forest, agricultural, and other ecosystems' biological diversity; and, it elaborates on the importance of the precautionary and ecosystem approaches when dealing with issues related to alien species, as referred to in decision IV/1.C.

5. The document then assesses the outcome of relevant processes and activities, such as the activities of relevant international and regional organizations, and th results of main scientific endeavours, in particular DIVERSITAS and its Global Invasive Species Programme (GISP). This section of the document inter alia relies upon information deriving from expert events, in particular the Norway/United Nations Conference on Alien Species.

6. The document contains throughout considerations on the endemic biological diversity of geographically and/or evolutionarily isolated ecosystems, such as small islands, and the particularly damaging impacts, in terms of biological diversity loss, that species introduction can have on such ecosystems.

7. The document concludes by recommending options on steps to be undertaken for the development of guiding principles for the prevention of adverse impacts of alien species on biological diversity. The document also provides options for recommendations on priority areas of work on alien species in relation to isolated ecosystems and recommendations on how to further the development of GISP.

## II. ALIEN SPECIES IN RELATION TO ARTICLES 6 AND 8 OF THE CONVENTION

8. Paragraph (h) of Article 8 of the Convention on Biological Diversity, on "In-situ Conservation", states that "each Contracting Party shall, as far as possible and as appropriate (…) prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species."

9. This provision is also pertinent to other provisions within the Article, e.g. alien species are known to affect biological diversity whether within or outside protected areas and to influence ecosystems, natural habitats and surrounding populations.

10. The issue of alien species is also relevant to the implementation of Article 6 on "General measures for conservation and sustainable use." Paragraph (a) of this article calls upon the Parties to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in the Convention relevant to the Contracting Parties concerne Furthermore, paragraph (b) of Article 6 calls upon the Parties to integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies. In this respect, the COP, in its decision IV/1.C, invites the Parties to address the issue of alien species for the conservation and sustainable use of biological diversit

and to incorporate such activities into their national strategies, programmes and action plans.

11. An analysis of the National Reports received by the Secretariat up to January 1999 shows that the Parties to the Convention are indeed in the process of addressing the issue of alien species. Several Parties have already set, or are in the process of developing, strategies to deal with the issue of alien species, in accordance with the provisions in Article 8(h).

12. More specifically, some countries are reviewing their quarantine legislation regulations and practices so as to ensure that plants (or their propagules) or animals are not introduced in the country if there is a risk that they might become harmful. National controls being developed in some countries address both voluntary and involuntary or accidental introductions. Attention has focused both on the import of exotic species from outside and on the establishment of controls on introductions from one part of the country to another. The need to inform the general public of the possible dangers of alien species is also highlighted. Public education and awareness campaigns (in accordance with the provisions of Article 13 and decision IV/10.B) are helping in this regard.

13. In its work, SBSTTA has reiterated that the introduction of alien species is a major threat to biological diversity. At its third meeting, the COP endorsed the scientific, technical and technological advice of SBSTTA in tackling this issue; in particular, SBSTTA has recommended that collaboration should be explored with the Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU) and that their efforts to develop a global strategy be the basis for this collaboration. The COP also called for Parties to submit case-studies on the possible need for additional legal instruments, especially with regard to reckless or deliberate introductions. At that occasion, the COP stated that the conclusions of the Norway/United Nations Conference on Alien Species, which took place prior to COP-3, could be used by Parties while implementing Article 8(h).

14. Within the context of the Convention's work on thematic areas, the issue of alien species was initially addressed by SBSTTA at its first meeting in Paris in September 1995. At that meeting, SBSTTA elaborated recommendations on alien species in relation to the conservation and sustainable use of marine and coastal biological diversity. On this basis, the COP at its second meeting (Jakarta, November 1995), in its decision II/10 on the conservation and sustainable use of marine and coastal biological diversity, further elaborated on the serious threats to marine and coastal biological diversity caused by diverse factors, including the introduction of alien species.

15. At subsequent meetings of SBSTTA and of the COP, Parties recognized that negative impacts of alien species on biological diversity concern not only marine and coastal, but also inland water, agricultural and forest ecosystems. Furthermore, alien species pose problems to indigenous and local communities and negatively affect local and national economies, which explains the considerations on alien species found within several other issues of the Convention. This ultimately led the COP to decide, at its fourth meeting, that alien species is a cross-cutting issue for implementation of many of the themes of the Convention.

## III. ADVERSE ECOLOGICAL AND ECONOMIC EFFECTS OF CERTAIN ALIEN SPECIES ON BIOLOGICAL

DIVERSITY

Ecological aspects

16. The ecological aspects of alien species are well addressed in a large number of scientific papers, including review papers. A comprehensive assessment of the ecological aspects of alien species is presented in the Global Biodiversity Assessment (GBA) (UNEP, 1995), which provides detailed information regarding how those species interact with the host ecosystems and the implications of those interactions Within the GBA, scientific findings often anticipate some possible links with the policy implications of those findings. In view of the above, the GBA therefore represents an appropriate starting point to assess what we know about this issue.

17. According to the GBA, the interaction of local species with alien species that spread naturally or are transported by humans to new environments causes changes in the biotic environment. These and other environmental changes (loss of habitat, changes in habitat quality, habitat fragmentation, and persecution and exploitation of populations) represent the main cause of increase in the extinction rate of local species by exerting a negative influence on the natural mechanisms of extinction.[1]

18. It is common scientific understanding that, globally, the negative impacts of alien species on native communities are second only to habitat destruction; in certain countries they represent the most important threat to biological diversity. These threats are particularly serious on oceanic islands of small area and characterized by species having a highly specific ecological function; however, even in ecosystems covering larger areas there is no guarantee of durability of the native species once alien ones have been introduced. In addition to those alien species interacting with the native species' ecological niches, the latter species are also threatened by hybridization with non-indigenous species and other forms of genetic introgression. This has been observed, in particular, in certain groups of birds, mammals and fishes.

19. The issue of alien species in geographically and evolutionarily isolated ecosystems, such as oceanic islands, is a particularly grave one. In these environments, human activities have already caused the extinction of species on a very large scale; this is true, for example, for extinction of bird species, with an estimated 1 per cent being extirpated in historic times, mostly in oceanic islands.[2] Furthermore, the introduction of non-local species in oceanic islands may further worsen the negative impacts that other human activities already have on the biological diversity of those fragile environments.

20. However, ecological 'islands' also exist on main lands, examples of which are Lake Victoria and Cape Floral Kingdom in South Africa, the latter representing a wholly terrestrial 'island.' The impacts of alien species on ecologically isolated ecosystems worsen the already dramatic degradation of habitats: biological diversity deteriorates both outside ecological 'islands', because of habitat fragmentation and loss, and within those 'islands', inter alia because of negative impacts of alien species. It is thought that, eventually, the negative effects of alien species on biological

1 Furthermore, these different kinds of environmental changes may interact with each other and often have a cumulative effect.

2 But the GBA states that this figure is a gross underestimate of the true number of island extinctions in recent times.

diversity might surpass those due to habitat fragmentation and loss.

21. When addressing the issue of alien species, it is important to differentiate between natural invasions and human introduction of species into new environments. Species do spread naturally. For example, climatic variation provides opportunities for the introduction of species into new ecosystems. As a general rule, when a species enters an ecosystem in which it previously did not occur, it has some effects on the ecosystem composition, but not always large, observable effects on the ecosystem processes (the latter is true, for example, for microbial species, particularly of plant pathogens). However, effects can be dramatic, depending on the characteristics of the system that is being invaded.

22. Most of the invasions are human-induced. The reasons for which species are introduced into alien habitats are in fact, according to the GBA, three-fold: (i) species are introduced accidentally; (ii) species are imported for a given purpose, but then escape; and (iii) species are deliberately introduced. In most cases, species are introduced for food purposes and for providing other services to people. In the case of species introduced for agricultural purposes, in most of the world it is indeed imported species that provide the large extent of food sources. Furthermore, in order to maintain the health of those economically important introduced species, the introduction of additional species is often required, the latter being used in biological control programmes, for example, to import natural enemies of agricultural pests.

23. Human introductions may have enriched the biological diversity of certain geographical areas, such as in the case of the British mammalian fauna and the central European flora. However, there is evidence of overall negative effects of alien species at both the local and global levels. Globally, some 20 per cent of the vertebrates that are thought to be in danger of extinction are threatened by invasive species.

24. Alien species introductions involve many thousands of species and many of the become invasive, that is to say, in the past their establishment often led to the threatening of ecosystems, habitats or species. There are several factors that determine the potential for alien species to establish and become invasive.

25. One important factor is geography. Invasive species have been found virtually everywhere in the world, including protected areas and nature reserves. However, no all ecosystems are equally affected. A 'gradient' seems to exist in the distribution of invasive species, with mixed island systems leading in terms of higher numbers of invasives, both absolutely and proportionally, than continental biomes. Within the latter systems, drought-resistant environments tend to have a lower number of invasive species, while reserves in temperate regions show decreasing South-North patterns.

26. Alien species seem more successful in those ecosystems that are disturbed by human activities, although undisturbed ecosystems are commonly affected as well. Another important factor is the degree of diversity of the host ecosystems, i.e. low-diversity ecosystems seem to be more susceptible to invasions, as well as those with a simpler ecological structure (in terms of not only trophic interactions, but also competition). Climatic and soil/sediment similarities are also a factor influencing the establishment of alien species.

27. Examples of ecosystems with relatively limited component species and more susceptible to species invasions are islands and perhaps boreal forests. Tropical forests, on the other hand, provide an example of a species-rich biome, the ecosystem processes of which are expected to have a better resilience to biological invasions than species-poor biomes. However, other systems, for example freshwater ecosystems, seem to be sensitive to introductions and invasions in all climatic zones.

28. In the end, whether or not a given introduced species will be able to spread into the new environment will depend on its biology and the biology of the native species with which it will interact. The ecological effects of some alien species on native communities of the affected ecosystems are quite well known. For example, native species may be eliminated directly by predators or through the browsing effect of herbivores; when alien species are not naturally removed, they tend to generate a series of changes in the hosting community (for example, in terms of community composition and energy flow), which have been studied and are quite well understood. This knowledge is most important when identifying and selecting management measures to deal with the containment of the effects of introductions.

29. It is not likely to be possible to predict *a priori* what the effects of introductions will be, and therefore prevention remains the best means to tackle the potential negative effects of alien species. There are however ways to predict invasions, namely through a statistical approach, by identifying the physiological requirements of the species in question, and by developing models - one example of the last being models based on reaction-diffusion processes of invasions into ecologically uniform areas. [3]

30. Even though there are no records of global extinction of a continental species as a result of invasive species, many examples of local eliminations or species brought to the verge of extinction are known, among them the elimination of the Atlantic salmon (*Salmon salar*) in many rivers in Norway as a result of the introduction of the Baltic salmon for aquaculture purposes, and the massive changes in the species composition of temperate grasslands in Australia, South America and north-western America as a result of the introduction of ungulates which have destroyed native plant communities.

31. Records of biological invasions are frequent for island and marine and coastal ecosystems. Examples are: the American comb jelly (*Mnemiopsis leidyi*) that has invaded the Azov and Black Seas, adding a further negative impact on the anchovy fisheries of those regions; the Indo-Pacific mussel *Perna viridis* that has invaded the Caribbean Sea, establishing monoculture-like populations in mangroves and other hard substrates; Asians copepods that have invaded Eastern Pacific waters, often causing changes in native zooplankton populations; several species of dinoflagellates that have appeared in south-eastern Australia, causing harmful blooms and thus impacting local shellfisheries.

32. The removal of invasive species from the biota that has been invaded may lead to the recovery of the local diversity or abundance of the populations and return the community structure closely to its original condition. This is, however, a very slow process and, furthermore, eradication of invasive species using currently

---

3 This important aspect is presented in a number of scientific publications and was, among others, dealt with by the Norway/United Nations Conference on Alien Species, the outcomes of which are presented in a separate section of this note.

available methods can be very expensive or even impossible. While large mammals can be reduced in numbers and even exterminated on small islands or in restricted areas, smaller animals and invasive plants are almost impossible to eradicate in any situation.

33. The cost of finding and introducing natural parasites and predators for the large number of invasive species is also prohibitive, bearing in mind safety considerations for other species, and such procedures have often resulted in further ecological disasters. Additionally, when local species have been exterminated (such as in the case of island and aquatic systems), recovery proves to be impossible. Measures to prevent the introduction of species into new environments are therefore to be preferred to restoration actions.

Economic aspects

34. The economic consequences of the introduction of species are obvious if considered in the light of their ecological implications. Changes in the ecosystem functioning imply changes in the provision of services and goods by those ecosystems, sometimes with huge economic implications. Local economic activities such as agriculture, forestry and fisheries are generally affected by introductions of species, which often result in loss of income. Harmful algal blooms induced by species introduced through ships' ballast waters may have significant impacts on tourism activities. Often regional economies affected by invasive species-induced problem are obliged to go through transformations, sometimes negative, as in the case of certain fishery activities in certain regional seas.

35. The economic implications of the introduction of species into new environments can be summarized thus: loss of income; costs for recovery; termination of certain activities in some instances when recovery is not possible; protection costs; monitoring costs; costs for pest control (as opposed to control by natural enemies). As an example, Cornell University ecologists have estimated that a few of the non-indigenous species in the United States cost $123 billion a year in economic losses, with a list that runs from alien weeds (cost: $35.5 billion) and introduced insects ($20 billion) to human disease-causing organisms ($6.5 billion) and even the mongoose ($50 million).

36. One factor to take into account when dealing with alien species is the implications of trade for components of biological diversity (or biological resources), in that trade often provides vectors for the transport of species. The relationship between trade and alien species has not been sufficiently explored, especially from the point of view of the economic implications of certain trade activities; a common example is shipping, which often introduces alien species into new habitats where they can threaten native species and destabilize ecosystems. Trade policies need to take into account this particular aspect of the interactions between trade activities and the conservation and sustainable use of biological diversity.

## IV. ALIEN SPECIES IN RELATION TO THE BIOLOGICAL DIVERSITY OF INLAND WATER, MARINE AND COASTAL, FOREST, AGRICULTURAL, AND OTHER ECOSYSTEMS AND IN RELATION TO CROSS-CUTTING ISSUES WITHIN THE CONVENTION

Inland water biological diversity

37. The introduction of invasive alien species is indeed one of the major factors affecting the biological diversity of in and water ecosystems. The introduction of alien fish species, especially the Nile perch and the Nile tilapia, as well as the South American water hyacinth resulted widely in changes in fish and plant composition including the loss of up to seventy-five p r cent of endemic species. The introduction of alien species, either intentionally or accidentally, can also have severe implications for human health. Twenty-four instances of species being introduced into inland water ecosystems, mainly in Asia, were shwn to have had deleterious effects on native biological diversity or on the local people, an example of the latter being that of snail-contaminated aquarium plants imported from South America to Hong Kong, which introduced the human pathogen Schistosoma mansoni. In some cases, some alien species, for instance those used for biological control, have had beneficial effect on wetlands.

38. The issue of alien species in inland water ecosystems is sometimes related to other problems affecting those systems. The Workshop on Freshwater Biodiversity held in Selbu, Norway, June 1997, in support of the third meeting of SBSTTA, addressed five major themes, including pollution. [4] In its report, the working group dealing with the theme concluded that the thermal pollution that may occur in connection with industrial uses may, inter alia, lead to invasion by undesirable species, which may cause changes in ecosystem function. Furthermore, in many cases warm water species are deliberately introduced by man. These alien species also represent a potential threat to biological diversity in adjacent natural ecosystems.

39. In its decision IV/4 on status and trends of the biological diversity of inland water ecosystems and options for conservation and sustainable use, the COP also addressed the issue of alien species. The COP recommended that Parties should undertak assessments of threatened species and conduct inventories and impact assessments of alien species within their inland water ecosystems. The COP also recommended that Parties raise awareness of the possible problems and costs associated with the deliberate or accidental introduction of alien species, in coordination with SBSTTA's work in relation to decision IV/1.C.

40. Alien species is an emerging issue for the Ramsar Convention and is being considered as a special topic at the seventh meeting of its COP, which will take place in Costa Rica in May 1999. This topic is also one of the elements of the joint work plan of the CBD and the Ramsar Convention, which was adopted by the COP at its fourth meeting (decision IV/15).

Marine and coastal biological diversity

41. At the second meeting of the COP (Jakarta, 1995), Parties expressed their concern on the serious threats of the invasion of alien species to marine and coastal biological diversity. In paragraph (xi) to Annex I to decision II/10 it is stated that some Parties thought that "(…) because of the difficulties of complete containment, introduction of alien species, products of selective breeding, and living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of marine and coastal biodiversity should be responsibly conducted using the precautionary approach."

---

4 The report of the Workshop was circulated at the third meeting of SBSTTA as document UNEP/CBD/SBSTTA/3/Inf.18.

42. Alien species constitutes one of the five thematic areas of the Jakarta Mandat on Marine and Coastal Biological Diversity. Through its decision IV/5 on the conservation and sustainable use of marine and coastal biological diversity, the CO adopted a multi-year programme of work, of which one element deals specifically with alien species and genotypes. Three operational objectives were identified within the above-mentioned programme element: (i) to achieve better understanding of the causes of the introduction of alien species and genotypes and the impact of such introductions on biological diversity; (ii) to identify gaps in existing or proposed legal instruments, guidelines and procedures to counteract the introduction of and the adverse effects exerted by alien species and genotypes which threaten ecosystems, habitats or species, paying particular attention to transboundary effects, and to collect information on national and international actions to address these problems, with a view to prepare for the development of a scientifically-based global strategy for dealing with the prevention, control and eradication of those alien species which threaten marine and coastal ecosystems, habitats and species; and (iii) to establis an "incident list" on introductions of alien species and genotypes through the national reporting process or any other appropriate means. These operational objectives will be addressed through a specific series of activities, several of which are already being implemented. (More detailed information is provided in document UNEP/CBD/SBSTTA/4/3 on the progress report on the work within the thematic areas).

Agricultural biological diversity

43. Modern agricultural production relies heavily on the introduction of alien species. The Joint Food and Agricultural Organization of the United Nations (FAO)/CBD Secretariat Workshop on Farming Systems Approaches for the Conservation and Sustainable Use of Agricultural Biological Diversity and Agroecosystems (Rome, 19-20 June, 1997) concluded that "(…) the introduction of an alien (introduced) organism may provide increased economic benefits, but may in the long term endanger some local species. Strategies are required to reduce risks to the absolute minimum. A holistic cross-sectoral approach including biological, social, economic issues will be needed for policy makers to weigh up the different effects, to introduce protection and control measures and to make responsible decisions. Mechanisms for such cross-sectoral approaches and consultation between environmental and agriculture, forestry and fisheries forums are needed at national and international level."

44. Alien species is likely to constitute one of the elements of the multi-year programme of work on agricultural biological diversity, whichwill be considered by the COP at its next meeting. The on-going assessment on agricultural biological diversity that is being compiled by the Secretariat will include a section on thi topic.

Forest biological diversity

45. The programme of work on forest biological diversity contained in decision IV/7 of the COP includes considerations on alien species. For the programme element on a comprehensive analysis of the ways in which human activities, in particular forest-management practices, influence biological diversity and the assessment of ways to minimize or mitigate negative influences, the approach adopted by the COP is to promote activities to minimize the impact of harmful alien species on fores biological diversity, particularly in small island developing States. In activity terms, this is translated into the compilation of case-studies on assessing impacts of fires and alien species on forest biological diversity and their influences on

the management of forest ecosystems and savannahs.

46. The element of the same programme of work dealing with further research and technological priorities identified in recommendation II/8 of SBSTTA, as well as issues identified in the review and planning process under the work programme, refers to research on analyzing measures for minimizing or mitigating the underlying causes of forest biological diversity loss, one of these causes being harmful alien species. There is a need for a better understanding of the underlying social, cultural and economic causes of forest biological diversity loss and the improvement of measures for mitigating those causes.

Alien species and indigenous and local communities

47. The introduction of alien species onto the lands and territories traditionally used by indigenous and local communities has had mixed social, cultural and economic consequences for those communities. While the introduction of an alien species (or a number of species) has threatened particular components of ecosystems, and in some cases whole ecosystems, they have also provided alternative forms of subsistence an opportunities to participate in the cash-economy. Studies in Australia have shown that the combined introduction of rabbits, foxes and cats and the impacts of feral camels, horses, pigs and goats in the arid lands of Australia, many of which are inhabited by indigenous communities, have threatened many species of native fauna, while providing subsistence and economic opportunities for those communities. For many indigenous communities in Central Australia, rabbits became an important subsistence food source, while feral camels and horses were trapped for domestic breeding purposes and for the pet-food industry.

48. The introduction of alien species into ecosystems that have been traditionally conserved and utilized by indigenous and local communities can therefore have both positive and negative consequences for those communities. The positive ones include additional (and sometimes replacement) subsistence species which may prove a welcome addition to the diet; and new or alternative cash resources which can help provid much-needed income to enable their participation in their national economy. The negative ones include threats to, and sometimes the disappearance of, traditionally important species which may undermine the local traditional economy; the disappearance of a particular native species as a consequence of the introduction of an alien species (or a number of such species), which may also be accompanied by the redundancy of, and ultimately the loss of, the traditional knowledge associated with that species (redundant knowledge, however, can be reactivated in, for example, species recovery programmes); and, the actual disappearance of a traditionally important species resulting in the loss of variouscustoms/practices associated with that species, or even the loss of a way of life, particularly if, for example, the species is of religious or economic significance to the community concerned.

49. Alien species can therefore have impacts on the effective implementation of Articles 8(j) and 10(c) of the Convention. The presence of alien species can lead to the loss of traditional knowledge, innovations and practices associated with components of biological diversity which are threatened or lost as a result of such a presence. Likewise, customary uses of biological resources in accordance with traditional cultural practices may be inhibited or, in the worst case, discontinued completely. As intimate users of local biological diversity, indigenous and local communities are also best-situated to monitor the impacts of alien species on local ecosystems and their components (Article 7), to identify when those species become invasive, and also to be involved in eradication and mitigation programmes (Article 8(h)).

50. The Inter-sessional Workshop on Article 8(j), held in Madrid from 24 to 28 November 1997, dealt with the issue of alien species in the broader context of an approach involving modern techniques and practices [which] could be introduced, as appropriate, to help communities overcome problems they have not traditionally had to deal with such as over population, presence of alien species, specific pollution problems, tourism or restoring degraded landscapes to productive uses."

Environmental impact assessment

51. Like the other elements of Article 8, paragraph (h) is supplemented by many of the other provisions of the Convention. Of particular importance to Article 8(h) are the provisions dealing with environmental impact assessment in Article 14. Provisions dealing with activities that have an adverse impact (i.e., Article 7 and Article 10(b)) are also important.

52. As referred to in several thematic decisions of the COP, environmental impact assessment, and especially risk assessment, should be an integral part of the procedures to deal with alien species. The risks posed by alien species are serious and should therefore be assessed most carefully, within the limits posed by present methodologies. In several instances, the risks associated with alien species have been compared to those posed by other potential threats to biological diversity. As an example, according to the UNEP International Technical Guidelines for Safety in Biotechnology, "it is generally anticipated that, in most cases, there will be low environmental risk from introducing into a similar environment (…) well known crop plants after they have been modified by adding only one or a few genes, especially when compared with the risks of introducing entirely new or alien species."

53. A regulatory programme to control intentional introductions can be based on a permit system. Permits are granted only when research has determined with reasonable certainty that the introduction will not cause significant harm to indigenous ecosystems and habitats, species and communities, or genomes and genes. This kind of system is usually risk-based. Also, there is a need to identify pathways leading to unintentional introductions and combine regulatory and other measures to address their contributions to invasive problems.

## V. THE IMPORTANCE OF THE PRECAUTIONARY AND ECOSYSTEM APPROACHES WHEN DEALING WITH ISSUES RELATED TO ALIEN SPECIES

54. As stated in the section dealing with ecological implications of alien species, the ecological threats posed by those species are potentially and often actually

enormous, they tend to evolve in an unpredictable way, and are virtually irreversible; the economic implications that derive from those threats are equally serious. The COP in its decision IV/1.C noted the importance of taking a precautionary and ecosystem approach when dealing with issues related to alien species. The need for adopting a precautionary approach to dealing with alien species is justified by both the distribution of the knowledge we have on the issue as well as the magnitude of the knowledge itself. Knowledge on alien species is scarce in certain locations, while it seems to be concentrated in others. Despite the frequently excellent quality of such knowledge, access to it is very limited. On the other hand, since we cannot predict which species will invade, and what impacts it will have if it invades, there is every reason for a precautionary approach to alien species.

55. An ecosystem approach to dealing with alien species represents almost by default a framework within which the issue of how alien species impact biological diversity should be considered; this should also encompass societal impacts. The work within the different thematic areas of the Convention is already considering alien species through an ecosystem approach perspective, as in the programmes of work on forest and marine and coastal biological diversity.

## VI. OUTCOMES OF RELEVANT PROCESSES AND ACTIVITIES AND LEGAL REGIMES ON ALIEN SPECIES AND THEIR IMPLICATIONS FOR THE WORK OF THE CONVENTION IN THIS AREA

### Legal instruments that address alien species, guidelines and codes of practice

56. A significant number of legal regimes, which include provisions on, or are devoted to, the prevention and control of alien species already exist. A good basis is the list provided in the chart on "Non-indigenous species introductions: references in international instruments", which was distributed for comments at the Norway/United Nations Conference on Alien Species. In addition to the Convention on Biological Diversity, this list includes, inter alia: Agenda 21 (UNCED 1992), the United Nations Convention on the Law of the Sea, the International Council for the Exploration of the Sea (ICES) Revised Code of Practice to Reduce the Risks from Introduction of Marine Species, the Bonn Convention on Migratory Species Guidelines for Agreements under the Convention, the Bern Convention on the Conservation of European Wildlife and Natural Habitats, and the Convention on International Trade of Endangered Species of Wild Flora and Fauna (CITES). Other measures taken internationally include provisions on microbial, plant and animal pests and pathogens (the International Plant Protection Convention, for example, establishes a system of export certificates designed to confirm that exported plant items are insect-free and conform to the importing State's phyto-sanitary regulations, and the International Office of Epi-zootics has established health and sanitary guidelines for the export and impor of animals); and risks related to ballast waters (the International Maritime Organization (IMO) has approved guidelines for the control and management of ships' ballast water to minimize the transfer of harmful aquatic organisms and pathogens).

57. These treaties and agreements would require a thorough, as well as a comparativ analysis in order to assess to what extent they meet the provisions on alien specie within the Convention. This is already being addressed by the Global Invasive Species Programme (GISP) (dealt with in a separate section of this note). Further work ma be needed, based on SBSTTA's priorities, to assess the relevant components of these instruments and identify the modalities of how they can assist the work of the

Convention in this area.

58. Guidelines on how to deal with alien species have already been, or are being, compiled. These includes the World Conservation Union (IUCN) draft Guidelines for the Prevention of Biodiversity Loss Due to Biological Invasions. The guidelines, produced in 1996 through IUCN's Invasive Species Specialist Group, deal with the prevention, management and support, and information aspects of alien species and ar presently under review for formal adoption by the Union. Another example is the activities of the World Bank, which has included guidelines on escape of farmed specimens in its Mariculture Guidelines.

The Norway/United Nations Conference on Alien Species and other relevant processes

59. An important consultation on alien species, one of the most specific in supporting the provisions of the Convention in this area, took place in Trondheim, Norway, from 1 to 5 July 1996. The "Norway/United Nations Conference on Alien Species" addressed itself directly to Article 8(h) of the Convention and was intended as a contribution to, and a concrete step in facilitating the implementation of, the Convention. [5] The objectives of the Conference were: (i) to contribute to the development of a sound scientific knowledge base on issues related to alien species, inter alia on ecological and socio-economic impacts, prevention and management of introductions, and control eradication, thereby contributing to the conservation and sustainable use of biological diversity; (ii) to provide a forum for cross-sectoral and multi-disciplinary dialogue between scientists and policy-makers on research and management issues related to alien species, and contribute to on-going deliberations in other international and national fora.

60. The Conference addressed both the accidental and deliberate introduction of alien species and, particularly, the problems relating to environment, health and socio-economic aspects regarding those alien species that become invasive. The Conference offered its conclusions and recommendations to the Parties of the Convention as a contribution to its work programme in implementing Article 8. These conclusions and recommendations are as follows:

(a) Introductions can be accidental or deliberate, and each may require differen policy management responses. The most important vectors for accidental introductions of invasive species are related to international transport, i.e. to trade and commerc and to travel and tourism, while the most important vectors for deliberate introductions are related to biological production systems, e.g. agriculture, forestry and fisheries. When deliberately introducing an alien species, there is a need to undertake pre-introduction screening and to strike the right balance between the benefits of using the species with the costs involved, including long-term impacts, and to take due concern for uncertainty.

(b) Alien species are species that occur in places different from their area of natural distribution. Some alien species become invasive, meaning that they threaten ecosystems, habitats or species. Several factors affect the potential for alien species

5 The Conference was held at the invitation of the Norwegian Ministry of the Environment, in collaboration with the United Nations Educational Cultural and Scientific Organization (UNESCO), the United Nations Environment Programme (UNEP), the World Conservation Union (IUCN), and the Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU). At the Conference, scientists, managers and policy advisors from eighty countries and representatives from several UN bodies, institutions and organizations discussed and shared experiences related to the control of invasive alien species.

to establish and become invasive. Our growing physical and chemical influence on the ecosystems increases the likelihood of these aliens becoming invasive.

(c) Invasive species were identified as a serious global threat to biological diversity, and in some countries the most important threat. Such species threaten the natural and productive systems, which they invade and have in many cases caused disruption of ecological systems, homogenization of biota and extinctions. This has often resulted in significant environmental, economic, health and social problems, imposing costs in billions of dollars and seriously affecting a large number of people.

(d) The environmental problems resulting from invasive species need to be addressed at the genetic, species and ecosystem levels. Important areas for management follow-up include capacity-building, quarantine measures, risk assessment and risk analysis, and review and development of legal and economic instruments. More focus is needed on the economic costs of alien species, while at the same time taking into consideration conflicting interests and distribution effects.

(e) All sectors involved in activities related to invasive species must have a role in implementing preventive and corrective action. This includes the transport sector, involving e.g. shipping, tourism and trade, and the primary production sector, e.g. agriculture, forestry and fisheries. Technical and practical cooperation, both nationally and internationally, is needed between environment, veterinary, phytosanitary and health authorities working with aliens, in such a way that prompt and appropriate action can be taken when needed.

(f) Information and education strategies on invasive species are urgently needed at the national level.

(g) International compilation of information on invasive species (comparable to that available for agricultural pests and infectious diseases), and the dissemination of this information, is a high priority.

(h) Support of networks of specialists providing expertise relating to prevention and management of invasive species should be strengthened.

(i) Developing countries need various sorts of assistance, not least to facilitate capacity-building, that will enable them to strengthen their work related to alien species.

(j) A scientifically based global strategy and action plan to deal with the problem of invasive species is urgently needed. Such strategies and plans should also be developed at the national and regional level.

(k) The Trondheim Conference urged national governments and international organizations and institutions to seriously address the issue of invasive species in their on-going deliberations related to biological diversity.

61. The Trondheim Conference on alien species offered its conclusions and recommendations to the Conference of the Parties to the Convention on Biological Diversity as a contribution to its work programme in implementing Article 8. It also offered its conclusions and recommendations to other relevant and appropriate international organizations and agreements working with issues related to alien

species. At its third meeting (Buenos Aires, 1996), the COP noted the conclusions and recommendations of the Trondheim Conference and suggested that Parties might wish to use these results in their implementation of Article 8(h) (decision III/9).

Research on Alien Species: the Global Invasive Species Programme of DIVERSITAS and other relevant activities

62. The Scientific Committee on Problems of the Environment (SCOPE), in conjunctio with IUCN, CAB International and UNEP, launched in 1996 a Global Invasive Species Programme (GISP). This programme is now an integral part of DIVERSITAS - The International Programme on Biodiversity Science. GISP was developed to build the knowledge base that is needed to address the siege under which human being and natural ecosystems are held by a growing number of invasive species. Most of GISP's components are now in their full operational phase.

63. GISP has two components: "the knowledge base", which comprises ecology, huma dimensions, pathways, global change, and present status worldwide; and the "new tools component." The latter is co-funded by GEF and includes economic aspects, legal aspects, risk assessment, early warning systems, controls and management, and educational aspects, which fall under a project named "Development of best practice and dissemination of lessons learned for dealing with the global problem of alien species that threaten biological diversity."

64. The GEF-co-funded project - a global endeavour - has as its objectives to determine what is being done at the current time to recognize, evaluate and mitigate against invasive species, and to disseminate information on what practices are most successful. Envisaged outcomes are: global accessible early warning systems on alien invasive species; and best practices and lessons learned in dealing with invasive species disseminated worldwide. The legal component appears to be very important in establishing a knowledge base on existing international and national legal measures on invasive species.

65. Envisaged activities and products of GISP are: (i) to assemble the best information and approaches for prevention and management of invasive species; (ii) to disseminate them in the form of databases, manuals and capacity-building training programmes to governments and communities; and (iii) to lay the groundwork for new tools in science, information management, education and policy that must be developed through collaborative action. These activities will ultimately lead to the development of a global strategy to deal with invasive species.

66. The programme relies for its implementation on an international team of biologists, natural resource managers, economists, lawyers and policy-makers. The team's goal is to enable local, national and multi-national communities to draw on the best available tools to prevent invasive species and enable a control system to be introduced immediately, and to identify priorities for the development of new tool needed to achieve longer-term success.

67. At its third meeting, the COP encouraged SCOPE and the Invasive Species Specialist Group of IUCN to continue their efforts to develop a global strategy and action plan to deal with the problem of alien invasive species.

Examples of relevant activities at the international and regional levels

68. The Food and Agriculture Organization of the United Nations (FAO) has compile codes of practices to deal with alien species. Products have also been developed, such as the FAO database on introductions of aquatic species, initiated in the early 1980s. This database at first considered only freshwater species of fish; the databas was then expanded to include additional taxa, such as mollusks and crustaceans, and marine species. In the mid 1990s a questionnaire was sent to national experts to gather additional information on introductions and transfers of aquatic species in their countries. The database now contains about 3,150 records and can be improved by users aware of other introductions of aquatic species not already included. The information is periodically validated and added to the database. In 1987, FAO created an electronic, interactive, multimedia compendium of plant protection information called the Global Plant and Pest Information System. The system also includes information related to alien species.

69. The United Nations Educational Scientific and Cultural Organization (UNESCO is integrating ethical considerations related to the environment and envisages exploring ethical aspects related to alien species, which range from issues linked to distribution of costs and benefits in society from aliens to safe-guarding the integrity of native species, populations and ecosystems. It would also include the role of training and education vis-à-vis inter-generational obligations. UNESCO envisages providing a forum for discussion (e.g. Internet) and eventual development of a set of ethical guidelines or principles in the field of alien species.

70. In addition to its Invasive Species Specialist Group, IUCN is in the process of establishing a cross-sectoral programme on invasive species. Elements of this programme will be an invasive information service, a rapid response service and the provision of technical and legal assistance to developing countries. IUCN is also a partner in the GEF-co-funded project within the GISP. Furthermore, the Union has launched a programme called 'People and invasive species: dealing with the human dimensions of the problem.'

71. The International Council on the Exploration of the Sea (ICES), the Intergovernmental Oceanographic Commission of UNESCO (IOC) and the International Maritime Organization (IMO) established in 1996 a joint ICES-IOC-IMO Study Group on Ballast Water and Sediments. The Study Group met for the first time in France in April 1997 and a second time in the Netherlands in March 1998 with the following terms of reference: (i) to consider the scientific, sampling, management and international cooperative issues relative to ballast waters and sediments; (ii) to summarize information on the dissemination of particular groups of organisms by ballasts (human health pathogens, phytoplankton and other plants and animals); (iii) to propose options for the control of the dissemination of organisms by ballasts of ships; (iv) to evaluat the role of ballast inoculations in the subsequent establishment of invasive species; (v) to develop an inventory of databases on, e.g., algal blooms and invasion hot spots, relevant to ballast water issues; and (vi) to assess the contributory role of other ship-associated vectors (e.g. hull fouling). The study group recommended means to address the challenges of these problems and exchanged information on research programmes, and coordination and calibration of sampling techniques. The activities of the Study Group are complemented by those of the IOC-UNEP Intergovernmental Panel on the Health of the Oceans (HOTO). The HOTO Panel is concerned with ballast water issues from the perspective of human health risks and the interests of IMO in minimizin environmental hazards associated with ballast water transport.

72. At the regional level, an assessment of the distribution of alien species is contained in the Third Periodic Assessment of the Status of Environment of the Baltic Sea (1997), produced by the Helsinki Commission on the basis of the Baltic Monitoring Programme. Studies on the distribution, ecological physiology and effects on local communities are conducted on both national and international (European Commission, Nordic Council) levels. A specific working group on alien species has been established by the Baltic Marine Biologists (BMB) - a scientific non-governmental organization working in the Baltic region.

## VII. CONCLUSIONS AND RECOMMENDATIONS

73. In view of the great importance of the effects of alien species on the conservation and sustainable use of biological diversity, as well as the relevance of this issue to most of the themes under the Convention, SBSTTA may wish to consider the following options for recommendations on alien species:

### On the development of guiding principles for the prevention, introduction and mitigation of impacts of alien species

74. SBSTTA may wish to establish a multidisciplinary ad hoc technical expert group on the development of principles to deal with alien species, the draft terms of reference for which are provided in document UNEP/CBD/SBSTTA/4/5. In carrying out its work, the Ad Hoc Technical Expert Group would take into account the following guidance:

- the results and recommendations of the Norway/United Nations Conference on Alien Species, including use of the definition of alien species as a working basis for the Group;

- the economic implications of alien species for sectoral human activities (e.g. agriculture, fisheries, forestry, etc.) and the role of those and other sectors and activities with respect to introduction of alien species;

- particular attention should be given to prevention and risk assessment procedures to deal with the introduction of alien species, as well as the general principles of the Convention and decision IV/1.C;

- attention should be given to the importance of managing the effects of existing introductions.

### On the priority work pertinent to the issue of alien species in geographically and evolutionarily isolated ecosystems

75. In view of the very high sensitivity of ecosystems with relatively limited component species and geographically or evolutionarily isolated ecosystems to the impacts of alien species, SBSTTA may wish to recommend that:

Recalling that the Conference of the Parties in its decision IV/1.C "Invites Parties to develop country-driven projects at national, regional, sub-regional and international levels to address the issue of alien species and requests the financial mechanism to provide adequate and timely support for those projects",

- Parties urgently submit available case-studies on alien species to the Executive Secretary, with the aim to assist the work of SBSTTA on the issue, for consideration by the COP at its sixth meeting. The case-studies should follow the structure in the annexed proposed indicative outline. The information should be compiled by the Secretariat, analyzed by the Ad Hoc Technical Expert Group mentioned above, peer-reviewed on the basis of a methodology to be elaborated by the Executive Secretary, and posted through the clearing-house mechanism;

- the proposed Ad Hoc Technical Expert Group, in the execution of its work, as stated in its draft terms of reference (document UNEP/CBD/SBSTTA/4/5), give priority to small island developing States and other geographically and evolutionarily isolated systems.

On the further development of the Global Invasive Species Programme (GISP)

76. SBSTTA may wish to recommend to the COP that it take the following action:

- to instruct the Executive Secretary to ensure communication and concerted action between the agencies responsible for the implementation of GISP and the Secretariat when making the results of GISP and other relevant information available to the Parties through the clearing-house mechanism on a continuous basis and when using the results of GISP to facilitate the implementation of the activities and provisions on alien species within the thematic and cross-cutting programmes of work of the Convention;

- to invite GISP to give priority to the implementation of its component on new tools, including legal aspects, with a view to assessing the extent to which current relevant treaties and agreements meet the provisions on alien species within the Convention, and identify economic, risk assessment, control and management, and educational measures, as well as early warning systems, to meet those provisions;

- to invite GISP, in developing a global strategy to deal with alien species, to ensure consistency with the provisions on alien species in Article 8(h) of the Convention and relevant provisions within other Articles, taking into full account considerations on alien species within relevant decisions of the Conference of the Parties on, for example, the conservation and sustainable use of inland water, marine and coastal, and forest biological diversity;

- to instruct SBSTTA to make recommendations to the COP, based on recommendations by the Ad Hoc Technical Expert Group on Alien Species, on the best use of products and approaches assembling the best information, and for prevention and management of invasive species, which are being developed by GISP and will be developed by the Ad Hoc Technical Expert Group, in accordance with the Group's terms of reference.

ANNEX

PROPOSED INDICATIVE OUTLINE FOR CASE-STUDIES ON ALIEN SPECIES

To the extent possible, case-studies should be short, succinct summaries of experiences on alien species at the country and regional levels. A case-study should focus on the prevention of the introduction, control, or eradication of alien species that threaten ecosystems, habitats or species. If possible, case-studies should be provided in hard copy and an electronic version (by floppy disk or via e-mail). Case-studies should follow, to the extent possible, the proposed structure outlined below.

1. **Overview:** main actors involved (alien species involved and the different stakeholders concerned); the time frame addressed; relationship with relevant articles of the Convention, decisions of the COP and/or the recommendations of SBSTTA.

2. **Description of the ecological context:** description of the status of the ecosystem, the species and the genetic diversity relevant to the introductions in question and impacts of alien species on ecosystems, habitats and species; activities aimed at assessing the scientific aspects of the invasions; monitoring activities.

3. **The institutional and legal context:** institutions mandated to deal with the problem and existing/planned legislation.

4. **Management measures to deal with the introductions:** decision-making process to deal with the invasion; description of the reasons for, and objectives of, the different measures put into place, including legal and policy measures.

5. **Contribution to an "incident list" of introductions of alien species.**

6. **Impacts on conservation and sustainable use of biological diversity.**

7. **Relevant conclusions: lessons learnt and replicability** (this section should include indicators, if any).

---