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### SUBSIDIARY BODY ON SCIENTIFIC, TECHNICAL AND TECHNOLOGICAL ADVICE

Sixth meeting

Montreal, 12-16 March 2001

Item 4 of the provisional agenda\*

#### INVASIVE ALIEN SPECIES

##### *Case-studies and country comments on invasive alien species*

*Note by the Executive Secretary*

##### *Executive summary*

The present note, which is being circulated for the information of participants in the sixth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), is intended to supplement the Executive Secretary's progress report on matters identified in decision V/8, paragraphs 5, 11 and 14 and analysis of national reports as they relate to alien species (UNEP/CBD/SBSTTA/6/6). It is divided into three parts:

- (a) Part A, containing a preliminary analysis of the thematic national reports as they relate to alien species, which provides a statistical breakdown of national responses to complement the main findings from the reports as set out in section II of the above-mentioned progress report;
- (b) Part B, which lists all the information and case-studies received by the Secretariat and provides a more detailed analysis of the main issues than that contained in section III of the progress report; and
- (c) Part C, providing a detailed breakdown of the comments received by the Secretariat on the Interim Guiding Principles, a summary account of which is given in section IV of the above-mentioned report.

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\* UNEP/CBD/SBSTTA/6/1.

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## PART A: PRELIMINARY ANALYSIS OF THE THEMATIC NATIONAL REPORTS

### A. Introduction

1. As of 21 November 2000, 41 thematic reports were received and by 26 January 2001 five more had been received, from Austria, Dominican Republic, Jamaica, Poland and the United Kingdom (These five thematic reports were not available at the time of finalization of the progress report of the Executive Secretary on matters identified in paragraphs 5, 11 and 14 of decision V/8 (UNEP/CBD/SBSTTA/6/6).). All the thematic reports received on alien invasive species are available through the Convention's clearing-house mechanism (<http://www.biodiv.org/natrep-as/index.html>).

2. The information contained in the thematic reports submitted by the following 45 countries has been used in the preparation of this preliminary analysis: Argentina, Australia, Austria, Bangladesh, Belarus, Central African Republic, China, Comoros, Congo, Czech Republic, Dominican Republic, Eritrea, Estonia, Greece, Honduras, Hungary, Jamaica, Japan, Republic of Korea, Lebanon, Madagascar, Mali, Mexico, New Zealand, Niger, Norway, Oman, Pakistan, Panama, Peru, Philippines, Poland, Romania, Russian Federation, Seychelles, Singapore, Slovakia, Sri Lanka, Sweden, Switzerland, Thailand, Turkey, United Kingdom, Uruguay and Viet Nam.\*

### B. Results of the reports\*\*

<b>1. What is the relative priority afforded to implementation of this Article and the associated decisions by your country?</b>	
a) High	29%
b) Medium	51%
c) Low	27%
<b>2. To what extent are the resources available adequate for meeting the obligations and recommendations made?</b>	
a) Good	2%
b) Adequate	9%
c) Limiting	62%
d) Severely limiting	29%
<b>3. Has your country identified alien species introduced?</b>	
a) no	7%
b) only major species of concern	87%
c) a comprehensive system tracks introductions	13%

\* Senegal submitted a report in a format different from that recommended by the Conference of the Parties, and therefore the information received could not be reflected in the following analysis.

\*\* Note. The figures do not always add up to 100% because some countries chose more than one option.

**4. Has your country developed national policies for addressing issues related to alien invasive species?**

- |  |     |
|--|-----|
| a) no  | 40% |
| b) yes - as part of a national biodiversity strategy | 53% |
| c) yes - as a separate strategy                      | 24% |

**5. Has your country assessed the risks posed to ecosystems, habitats or species by the introduction of these alien species?**

- |  |     |
|--|-----|
| a) no  | 20% |
| b) only some alien species of concern have been assessed | 82% |
| c) most alien species have been assessed                 | 7%  |

**6. Has your country undertaken measures to prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species?**

- |                                    |     |
|------------------------------------|-----|
| a) no measures                     | 22% |
| b) some measures in place          | 76% |
| c) potential measures under review | 20% |
| d) comprehensive measures in place | 9%  |

**DECISION IV/1 - REPORT AND RECOMMENDATIONS OF THE THIRD MEETING OF SBSTTA:****7. Is your country collaborating in the development of projects at national, regional, sub-regional and international levels to address the issue of alien species?**

- |   |     |
|---|-----|
| a) little or no action                        | 47% |
| b) discussion on potential projects under way | 51% |
| c) active development of new projects         | 22% |

**8. Does your national strategy and action plan address the issue of alien species?**

- |                             |     |
|-----------------------------|-----|
| a) no                       | 18% |
| b) yes - limited extent     | 62% |
| c) yes - significant extent | 27% |

**CASE-STUDIES:****9. Has your country submitted case-studies on the prevention of introduction, control, and eradication of alien species that threaten ecosystems, habitats or species, in response to the call the fourth meeting of SBSTTA?**

- |        |     |
|--------|-----|
| a) no  | 73% |
| b) yes | 24% |

**10. How many case-studies are available that could be used to gain a better understanding of the issues surrounding alien species in your country?**

a) none	20%
b) 1-2 - limited understanding	36%
c) >2 - significant information available	40%

**TRANSBOUNDARY ISSUES:**

**11. Are known alien invasive species in your country also a problem in neighbouring or biogeographically-similar countries?**

a) not known	16%
b) none	2%
c) a few - but in general alien invasive species	33%
d) more than a few - in general we share common problems with other countries	53%

**12. Is your country collaborating in the development of policies and programmes at regional, sub-regional or international levels to harmonize measures for prevention and control of alien invasive species?**

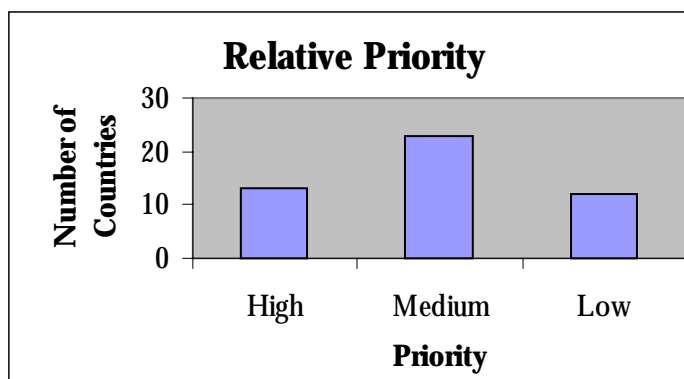
a) little or no action	38%
b) discussion on potential collaboration under way	42%
c) development of collaborative approaches for a limited number of species	31%
d) consistent approach and strategy used for all common problems	0%

3. It should be noted that the following Parties also completed the section of the national reporting questionnaire entitled "Further comments": Argentina, Austria, Australia, Bangladesh, Belarus, Central African Republic, China, Congo, Comoros, Czech Republic, Dominican Republic, Estonia, Honduras, Hungary, Jamaica, Japan, Republic of Korea, Lebanon, Madagascar, Mali, Mexico, New Zealand, Norway, Pakistan, Panama, Peru, Poland, Romania, Russian Federation, Seychelles, Singapore, Slovakia, Sri Lanka, Turkey, Viet Nam, Philippines, Niger, United Kingdom.\*

*C. Main findings*

*Priority of the issue*

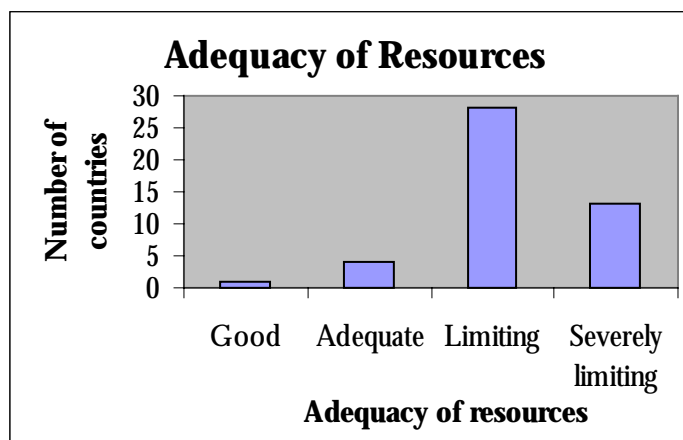
4. Most reports accorded the issue a high or medium priority. Only 12 stated that it was given a low priority. Even in those cases, however, the report often indicated that there were significant problems to be addressed.



\* Argentina, Austria, and Uruguay submitted the individual reports from the various government departments concerned, rather than compiling results into one comprehensive report, and this fact is reflected in the data.

### Available resources

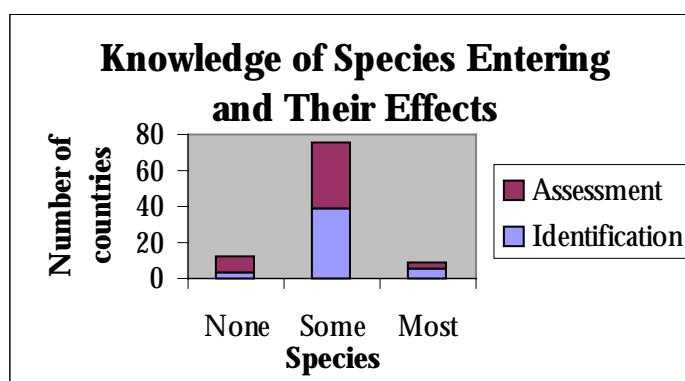
5. Only five reports considered that resources were good or adequate. All others considered that resources were a limiting or severely limiting factor.



### Identification and assessment of species

6. Most countries reported that only major species of concern had been identified. Only six reported a comprehensive tracking system and in one case this was only for some species.

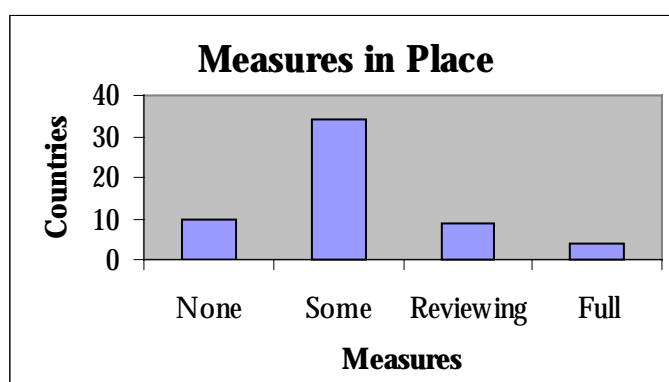
7. All but three countries had assessed either no alien species or only a few species of particular concern. Lack of knowledge about the species present and their effects was identified as a significant issue in a number of reports. Frequently, the work undertaken was focused on species of concern to agriculture, forestry or other economic sectors. Fewer reports cited work focused on biodiversity.



### Strategies and measures

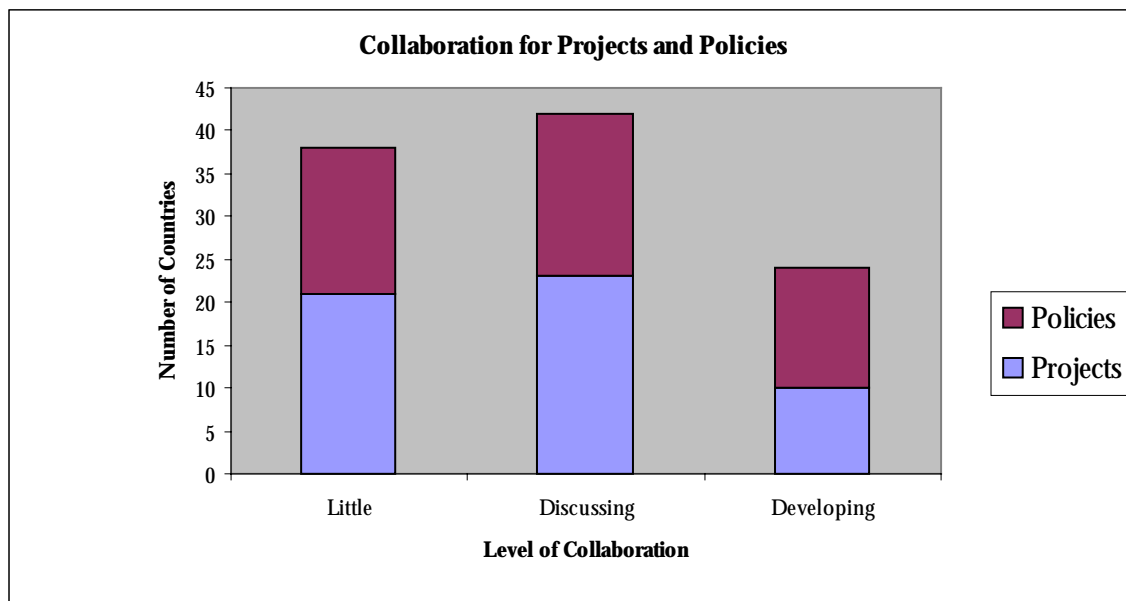
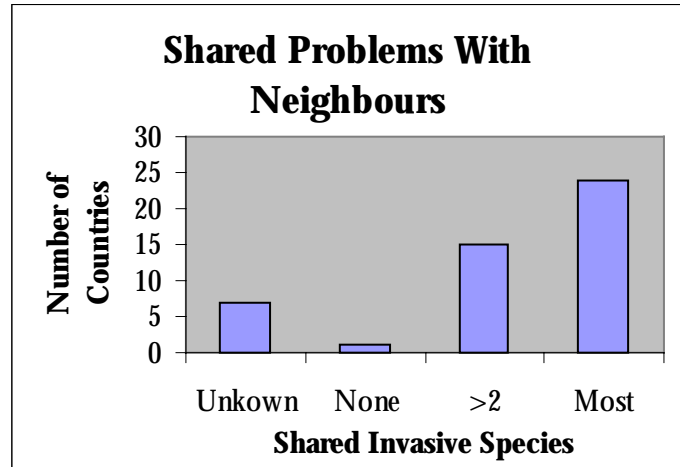
8. Almost all countries had some national policies in place or in preparation, usually as part of the national biodiversity strategy. In general, however, it appears that those strategies are limited in scope and effectiveness, often focused on species of economic interest rather than on species of biodiversity significance.

9. Most countries had some measures in place, or were developing measures, but only four reported comprehensive measures. Comments often highlighted the lack of measures critical to implementing the interim guiding principles (e.g., lack of ability to control the entry of species into the country).



### *Shared problems and collaboration*

10. While most alien species issues are to some extent unique, the responses indicate a high potential for collaborative effort on shared problems. Knowledge of the similarity of problems is variable, however. There is a relatively low level of current collaborative activity, even where countries recognize that most of their problems are shared with other States. It is encouraging to note, however, that many countries are currently discussing potential collaboration projects.



### *Availability and provision of case-studies*

11. Only 12 countries had provided case-studies along with their thematic reports. Thirty-three countries indicated that they could provide at least one case-study, and 18 of these indicated that they could provide more than two. This indicates that there is significant potential to increase the number of case-studies available to other countries.

### *Conclusions*

12. The national reports received indicate that the effect of alien species is a very important issue for biodiversity management, but that the ability for most countries to address the issue is extremely limited. Both national capacity-building and facilitation of collaborative efforts are clearly important areas to be tackled.

**PART B: INFORMATION RECEIVED, INCLUDING CASE-STUDIES***A. Introduction*

13. At its fifth meeting, the Conference of the Parties endorsed the outline for case-studies on alien invasive species proposed by SBSTTA. The Executive Secretary received the following information, including case-studies and other materials, in the period from November 1998 to January 2001. A review of case-studies is contained in section III of the progress report of the Executive Secretary (UNEP/CBD/SBSTTA/6/6). (The submissions from Estonia, Germany, Lebanon, Mauritius, Turkey and the Food and Agriculture Organization of the United Nations (FAO) had not been received at the time that progress report was finalized.) All the information received in response to the Secretariat's calls for case-studies is available on the Secretariat's website ([http://www.biodiv.org/alienspecies/case\\_studies.html](http://www.biodiv.org/alienspecies/case_studies.html)).

*B. List of information received, including case-studies***Argentina:**

1. Informe de la Dirección de Recursos Ictícolas y Acuícolas
2. Informe de la Dirección de Fauna y Flora de los casos más relevantes de invasiones biológicas en la República Argentina
3. Informe de la Dirección de Recursos Forestales Nativos

**Australia:**

4. Case-study on the Black Striped Mussel

**Austria:**

5. Introduced freshwater molluscs in Salzburg
6. Introduced freshwater crayfish in Salzburg
7. The horsechestnut–leafmining moth (*Cameraria ohridella*)

**Bulgaria:**

8. The accidental and intentional introduction of exotic species in the Black Sea

**Canada:**

9. Impact of invasive plants on species and habitats at risk in Canada

**China:**

10. *Eupatorium adenophorum* spreng
11. *Ambrosia artemisiifolia* L.
12. *Alternanthera philoxerodes* mart
13. Sweet potato black rot
14. *Liriomyza sativae* (Blanchard)

**Congo:**

15. *Etude des cas sur les especes envahissantes*



**Ecuador:**

16. Especies introducidas en las Islas Galapagos

**Estonia:**

17. Distribution of the European mink, *Mustela lutreola*, in Estonia: an historical review.
18. The continuing decline of the European mink *Mustela lutreola*: evidence for the intraguild aggression hypothesis. In: *Behaviour and Ecology of Riparian Mammals*
19. The role of *Cereopagispengoi* (Ostroumov) in Pdmu bay and the north-east part of the Gulf of Riga ecosystem
20. Distribution and invasion ecology of *Marezzelleria viridis* in the Estonian coastal waters.
21. Distribution and filtration activity of the zebra mussel, *Dreissena polymorpha*, in the Gulf of Riga and Gulf of Finland
22. Changes in the ecosystem of the Gulf of Riga from the 1970s to the 1990s
23. First record of the talitrid amphipod *Orcectia cavimana* in the northern Baltic Sea.
24. Consequences of invasion of a predatory cladoceran: report for International Council for the Exploration of the Sea.

**Finland:**

25. Alien species in Finland
26. Canadian beaver (*Castor Canadensis*)
27. Spiny water fleas (*Cercopagis pengoi*)
28. Himalayan balsam (*Impatiens glandulifera*)
29. Pinewood nematode (*Bursaphelenchus xylophilus*)

**Germany:**

30. Alien organisms in Germany
31. Black Locust (*Robinia pseudoacacia*)
32. Japanese Knotweed (*Reynoutria japonica*)
33. South African Ragwort (*Senecio inaequidens*)
34. Zebra Mussel (*Dreissena polymorpha*)
35. Muskrat (*Ondatra zibethicus*)
36. Mink (*Mustela vison*)
37. *Bursaphelenchus xylophilus* (Nematoda, Parasitaphelenchia)
38. *Ophiostoma novo ulmi*
39. *Aritoposthia triangulata* (Plathelminthes, Geoplanidae)

40. Introduction of non-indigenous organisms into the North Sea and Baltic Sea: investigations on the potential ecological impact through ship traffic
41. Neozoa (*Macrozoobenthos*) in the German North Sea coast

**India:**

42. Survey of *Parthenium* in Bijapur district – A case-study *Parthenium hysterophorus* L.
43. Lantana: Himalayan Environmental Studies and Conservation Organisation (HESCO)

**Ireland:**

44. An Unwelcome Addition to the Irish Fauna
45. Spread and Management of *Heracleum mategazzianum* along Irish River Corridors
46. A guide to the biology, ecology, pest status and control of feral American vison in Ireland

**Israel:**

47. Conservation and sustainable use of biological diversity in Israel
48. Alien invasive species in Israel
49. The principal alien species in the aquatic ecosystems of Israel

**Japan:**

50. Eradication of oriental fruit fly from Japan
51. Eradication of racoon
52. Mongoose

**Lebanon:**

53. Alien species in the marine environment (alien algae in Lebanon)
54. Alien species that threaten ecosystems, habitats or species (alien birds species in Lebanon, alien insect species in Lebanon)

**Mauritius:**

55. Alien species that threaten ecosystems, habitats or species

**Mexico:**

56. Un modelo predictivo sobre la ruta de invasion de especies exoticas: el caso de *Cactoblastis cactorum* (Berg) sobre las *Platypuntias* de Mexico

**New Zealand:**

57. Contaminated crops destroyed by MAF
58. White-Spotted Tussock Moth
59. Fifth Valdivia Group Coordinating Committee meeting – Alien Species
60. Eradication of Introduced Animals from the Islands of New Zealand
61. The Risks, Costs and Benefits of using brodifacoun to eradicate rats from Kapiti Island

- 62. Asian Gypsy Moth
- 63. Dutch Elm Disease
- 64. Heather
- 65. Koi Carp
- 66. Pohutukawa
- 67. Possums
- 68. Rainbow Lorikeet
- 69. Spartina
- 70. Stoats
- 71. Undaria
- 72. Water Lettuce
- 73. Southern Saltmarsh Mosquito

**Philippines:**

- 74. The introduction of exotic aquatic species in the Philippines by Juliano et al, 1989
- 75. Position paper on the African catfish
- 76. Culture trial in tank of craw fish to test the potential as pest on rice plant

**Seychelles:**

- 77. Eradication of introduced mammals in Seychelles in 2000

**Sweden:**

- 78. Case-studies from marine environment, introduction to the Baltic Sea and the Swedish west coast
- 79. Case-study: the limnetic environment
- 80. Case-study: land environment
- 81. Introduced birds and mammals and their ecological effects
- 82. Introduktion av frammande arter i svenska sjöar och vattendrag

**Thailand:**

- 83. Proceedings of the First International Workshop on Biological Control of *Chromolaena odorata*
- 84. *Leucaena Psyllid* in the Asia-Pacific region – implications for its management in Africa

**Turkey:**

- 85. Alien invasive species and agriculture in Turkey

**United Kingdom:**

86. Case-study on the Control of the North American Ruddy duck (*Oxyra jamaicensis*) in the United Kingdom

**United States:**

87. Pulling together – national strategy for invasive plant management

*Organizations*

**GISP**

88. Case-studies contained in the toolkit of best prevention and management practices for alien invasive species (UNEP/CBD/SBSTTA/6/INF/10)

**FAO**

89. Database on introductions of aquatic species (DIAS)

*C. Compilation of key points from the case-studies*

14. The compilation of key points from the case-studies has been organized into six main headings:

- (a) Prevention;
- (b) Detection;
- (c) Eradication;
- (d) Containment;
- (e) Control;
- (f) General.

*1. Prevention*

**(a) *Invasiveness cannot be reliably predicted.***

15. There have been attempts to develop tools to predict whether a species is likely to become invasive. There has been some success in this work. In some cases, it may be possible to identify that a species is highly likely to be invasive, for example, because it has been invasive in a similar habitat. Saying with certainty that a species will not be invasive appears to be more difficult, however, and the case-studies include examples of where predictions about behaviour were incorrect. For this reason, it can be concluded that a precautionary approach would be to treat every alien species as potentially invasive until there is evidence to indicate that it is not.

16. One way of approaching the issue being used or considered by some countries is to establish a three-list system. Species on the black list are known or believed to be invasive. Species on the white list are considered to be unlikely to be invasive. Inclusion on this list may be because the species has been previously introduced and has not been invasive. This approach must be used with caution; however, because the lag time between introduction and invasion by weed species may be many decades (*Mimosa pigra* in Australia was “dormant” in one site for 80 years before spreading rapidly). Furthermore changes in climate may make some species, which previously were considered “safe”, more

able to survive in the wild. An example of inclusion on a white list could be because there is no suitable habitat (e.g., tropical fish introduced into a temperate country). Between the black and the white list is a grey list, where any introduction would require a detailed risk assessment. By way of illustration:

(a) *Metrosideros excelsa* was introduced to South Africa from New Zealand. It was promoted as a safe hedge plant, to replace the highly invasive *Leptospermum laevigatum*. Unfortunately, the *Metrosideros* is now also invasive, affecting biodiversity in the Western Cape region;

(b) Australia has introduced a system for assessing the likely invasiveness of plant species proposed for introduction. A general assessment of its effectiveness found it to be around 80 per cent, but was significantly less reliable for grass species.

**(b) No taxonomic group can be treated as a low risk. Prevention, detection and control systems need to be able to handle all groups, including microorganisms.**

17. Case-studies and scientific literature provide examples of invasive alien species in all major taxonomic groups. It is, therefore, apparent that no such group can be treated as low-risk, and prevention, detection and management systems would ideally be able to handle all groups, including microorganisms. An understanding of the species' reproduction strategies and habitat requirements is needed to assess its invasiveness, and general rules based on its taxonomic type do not apply.

18. Examples of the range of invasive species include:

- (a) Microorganisms (e.g., *Phytophthora palmivora*, *Bursaphelenchus xylophilus*)
- (b) Algae (e.g., *Caulerpa taxifolia*)
- (c) Ferns (e.g., *Salvinia molesta*)
- (d) Grasses (e.g., Kikuyu grass, *Pennisetum clandestinum*)
- (e) Vines (e.g., Old Man's Beard, *Clematis vitalba*)
- (f) Shrubs (e.g., guava, *Psidium cattleianum*)
- (g) Trees (e.g., *Miconia calvescens*)
- (h) Insects (e.g., *Orthezia insignis*)
- (i) Echinoderms (e.g., Pacific Seastar, *Asterias amurensis*)
- (j) Molluscs (e.g., Rosy Wolfsnail, *Euglandina rosea*)
- (k) Fish (e.g., brook trout, *Salvelinus fontinalis*)
- (l) Reptiles (e.g., brown tree snake, *Boiga irregularis*)
- (m) Amphibians (e.g., *Colothesus littoralis*)
- (n) Birds (e.g., Ruddy Duck, *Oxyura jamaicensis*)
- (o) Mammals (e.g., rats, including *Rattus norvegicus*, *R. rattus* and *R. exulans*).

- (c) ***A species that in its natural range is not considered invasive, may behave very differently in a new environment. Behaviour in the originating environment may indicate potential problems, but is unlikely to be an indicator of safety.***

19. The case-studies indicate that species in their natural environment may exhibit quite different characteristics when they are translocated elsewhere. While behaviour in the originating environment may indicate potential problems, it is therefore unlikely to be an indicator of safety.

20. In many cases, species that became invasive outside of their natural range did not show invasive characteristics in their natural environment. In some cases, the species even became endangered in their natural habitat. For example:

(a) *Pinus radiata*, a serious invasive weed in a number of countries, is of restricted distribution in the United States (it originates from the Monterrey peninsula);

(b) One of the wallaby species that is invasive in New Zealand is a threatened species in its originating country, Australia.

21. The scientific literature includes discussion of a number of reasons why a species may behave differently in a new environment. Lack of natural predators and diseases is a frequently cited reason, and successful biological control operations illustrate this point. Biological control of an invasive scale insect (*Orthezia insignis*) on St Helena was successfully used to save an endemic tree (*Commidendrum robustum*) from extinction in the wild. The control organism used was a predatory beetle.

22. Another reason may be differences in the ability of the native species in the invaded habitat to cope with the tactics used by the invader. A recent study of the effects of *Centaurea diffusa*, an invasive weed in North America, concluded that grasses in the areas to which *Centaurea* were native were adapted to chemical allelopathy by *Centaurea*, while those in the new habitat were unable to effectively respond.

- (d) ***Every country is a potential risk to its neighbours and trading partners.***

23. All regions of the world and most countries have been the origin for invasive alien species causing problems in other locations. Thus, every country is a potential risk to its neighbours and trading partners.

(a) China was the original source of a longhorn beetle in the United States of America;

(b) North America was the original source of rainbow trout in Peru;

(c) South-eastern Brazil was the original source of the aquatic weed *Salvinia molesta* in many parts of the world including Africa;

(d) Southern Africa was the original source of *Pennisetum clandestinum* (Kikuyu grass) in the Pacific;

(e) New Zealand was the original source of a predatory flatworm in the United Kingdom;

(f) Europe was the original source of the cats and rats on many Indian Ocean islands.

(g) Muskrat (*Ondatra zibethicus*), a native of North America, were initially released for hunting purposes in Prague and is now affecting rare fish species that deposit their eggs in bivalves in Germany.

- (e) ***It is not just alien species that have crossed national boundaries that are potentially invasive. Movement of indigenous species to new areas within their home country may result in detrimental effects on biodiversity.***

24. The case-studies include cases of species that have become invasive when moved to areas outside their home range within national boundaries (and are therefore alien to their new location), for example:

(a) In Peru, an amphibian species (*Colothetus littoralis*) has been moved from its natural range to new areas, where it has become an invasive species;

(b) New Zealand's *Metrosideros excelsa* is one of a number of *Metrosideros* species found in the Pacific. Its natural range in New Zealand is limited to the northern part of the North Island. Garden cultivation has now resulted in the tree becoming widespread outside its natural range. As well invading natural ecosystems, it is hybridizing with the southern *Metrosideros* tree species. In the meantime, *Metrosideros kermadecensis*, introduced to northern mainland New Zealand from the offshore Kermadec Islands, is hybridizing with *M. excelsa*, threatening that species within its natural range.

25. Speciation is in part a product of the existence of natural barriers to the movement of genetic material. These include the isolation of habitats such as lakes, islands, reefs, and estuaries by distance or physical barriers. Any species that is moved across that barrier through human intervention can be treated as alien to its new home. Political borders and biological borders do not always coincide. In many cases, political borders cut across continuous habitat, or encompass areas that are not biologically connected. Most "border control" work has been focused on political borders, but increasingly countries are developing regional or sub-national controls on the movement of alien species.

- (f) ***The rate of invasions can be reduced by a border control system (including prevention of movement across the border, and surveillance around the entry points to allow early detection of failures). The border used for this purpose may match the political border, or be within the country, or be regional. Prevention systems can significantly reduce the number of problems that need to be tackled, even if some failures are inevitable.***

26. Cross-border movements of goods and people are frequent, and increasing. This means that even a fairly ineffective vector can result in a high rate of invasions over time. Prevention systems are not able to detect all possible importations of alien species, although with sufficient effort it may be possible to reduce the risk to levels close to zero. Less than perfect systems may still greatly reduce the rate of invasion, and therefore the effort needed for management. Interim Guiding Principle 2 states that prevention is generally the most cost-effective approach. The rate of invasions can be reduced by a border control system, backed up by surveillance around the entry points to allow early detection of failures, and immediate eradication of new incursions. The border used for this purpose may match the political border, or be within the country, or be regional. Prevention systems can significantly reduce the number of problems that need to be tackled, even if some failures are inevitable. On average, the United States agricultural inspection programme makes two million interceptions each year at the borders. Other example drawn from the case-studies include:

(a) Australia has introduced a system for assessing the likely invasiveness of plant species proposed for introduction. Properly implemented, the system should reduce the number of weedy species introductions;

(b) The Asian gypsy moth (*Lymantria dispar*) is considered to be a serious risk to New Zealand's biodiversity, and is a frequent arrival at the border (e.g., on average an egg mass is found for every 2,000 imported cars inspected). Stringent prevention measures are in place, including inspection of

imported goods, and surveillance around likely ports of entry. So far these measures have been completely successful;

(c) New Zealand recently destroyed 15 hectares of a planted crop because of the use of unauthorized seed contaminated by the seeds of plants not found in New Zealand.

(g) ***There are numerous vectors for alien species.***

27. Alien species can be moved by people deliberately or accidentally but can also spread naturally from an original invasion site, for example:

(a) Movement of contaminated gravel, soil and dirty machinery for construction works, in potted plants, or on the shoes of visitors, is now considered the main vector for long distance spread of *Miconia calvescens*, a highly impacting tree species, in French Polynesia;

(b) Movement of military equipment is implicated in the invasion of brown tree snake into Guam and German wasps into New Zealand. The Australian Defense Force undertook a major exercise (300 staff operating 20 wash stations 18 hours every day for three months) to remove all potential alien species contamination from military equipment being returned to Australia from East Timor;

(c) The invasion of the Mediterranean coast by *Caulerpa taxifolia* is attributed to escape from Monaco Aquarium. Half the 75 naturalized and breeding fish species in United States waterways are known to have resulted from aquarium releases or escapes;

(d) Deliberate introduction of biological control species has resulted in some invasion problems. For example, *Cactoblastis cactorum* moth introduced to the Caribbean to control alien *Opuntia spp* was probably the source of the invasion into Florida and Mexico which is threatening indigenous cactus species;

(e) African catfish (*Clarias gariepinus*) have escaped from fish farms in the Philippines during floods;

(f) Marine bait worms collected on the Atlantic coast of the United States have been moved around the United States and from the United States to other countries packed in an intertidal seaweed which is likely to contain other marine organisms. The packing is often disposed of in coastal waters. At least three alien species established on the Pacific coast of the United States are probably from this source;

(g) Pacific oysters (*Crassostrea sp*) introduced into Australia and New Zealand have become invasive. The oyster diseases MSX (*Haplosporidium nelsoni*) and microcell disease (*Bonamia ostreae*) have been moved into new regions where they have devastated shellfisheries. Over 60 species of marine organisms have arrived in San Francisco harbour transported on oysters;

(h) Rainbow lorikeets (*Trichoglossus haematodus*) were released into the wild in New Zealand by a breeder who considered that they would be a positive addition to the environment;

(i) Movement of logs, timber and wooden packaging can move tree pathogens. Examples of such introductions include Dutch elm disease and white pine blister rust;

(j) Contaminated pasture seed is the most likely vector for the introduction of *Chromolaena odorata* (Siam weed) into northern Australia;



(k) Construction of the channel opening a communications link between the Black and Baltic seas made it possible for Zebra mussel to migrate to the inland waters of eastern central Europe.

## 2. Detection

**(a) *Early detection is an important component of any prevention/eradication approach. There are many ways in which the rate of early detection can be increased.***

28. The Guiding Principles recognize that early detection is an important component of any prevention/eradication approach. The comprehensive review of activities for the prevention, early detection, eradication and control of invasive alien species (UNEP/CBD/SBSTTA/6/INF/3) includes a range of ways in which the rate of early detection can be increased. Several case-studies show that the ability to successfully undertake eradication is often dependent on early action. In addition, case-studies show that rapid response to an invasion may be essential to prevent irreversible damage occurring. The case-studies and the comprehensive review include examples where early detection can be achieved through formal monitoring/surveillance programmes, as well as through less formal means, including public reporting of new species. Relevant examples from the case-studies include:

(a) *Undaria* (a marine seaweed) in New Zealand has been subject to different control approaches in different regions, depending on the degree of establishment. A small new incursion in the Chatham Islands was immediately eradicated without difficulty. A more established population on Stewart Island is the subject of an eradication attempt with about a 50 per cent chance of success. Well-established populations on the mainland are being treated as ineradicable;

(b) An Australian committee set up to examine the response to the Darwin black striped mussel (*Mytilopsis sp*) invasion concluded that the delay in raising the alarm was a matter of concern.

**(b) *Having contingency procedures in place facilitates early response.***

29. Normal decision-making processes for activities such as eradications can be protracted. In the cases considered it would be necessary to allow considerable time for technical assessments, public consultation, and any necessary legal processes. In addition, response may be slowed by lack of available funding, and by uncertainty about what agency is responsible and has the necessary authority. Having contingency procedures in place facilitates an early response..

30. Several case-studies indicate that the ability to mount a rapid response would be greatly enhanced if there were already in place:

(a) A clear allocation of responsibilities to agencies with the ability to undertake the work;

(b) Authority to take actions already established (e.g., the use of certain types of poisons may have already been approved through the normal process, ready for when they are needed, or relevant laws may be in place);

(c) Established funds, or access to a fast-track funding process;

(d) The ability to undertake actions that would not normally be allowed (e.g., blocking the movement of goods and vehicles, destroying private property) where this is needed to respond to an emergency;

(e) Clearly understood and established procedures for responding to new incursions, which outline who is responsible for taking initial actions, rules for gaining additional government funding, how

decisions will be taken on an appropriate response, and what actions can be taken to prevent further spread.

31. Examples of early response detection systems include:

(a) A detection plan is in place for hibiscus mealybug (*Maconellicoccus hirsutus*) in the Bahamas. This involves the use of monitoring programmes and encouragement of public reporting through a hotline;

(b) New Zealand's Department of Conservation has developed a contingency plan for the detection of new invasions of plants or animals on offshore nature reserves. This sets out the steps to be taken if staff detects a new invasion;

(c) Norway has put in place a monitoring system for the salmon parasite *Gyrodactylus salaris*, in part to allow detection of new occurrences of the species.

### 3. Eradication

***Eradication is possible, and can result in significant benefits for biodiversity.***

32. Eradication is recognized in the Interim Guiding Principles to be the preferred method for dealing with invasive alien species if prevention is not successful. The Guiding Principles recognize that this depends on it being cost-effective. The case-studies include examples where eradication was difficult and expensive. They also include examples, however, where eradications were successful and cost effective, and show that our knowledge base and capacity to undertake eradication is increasing. In a number of cases where eradications were undertaken, the benefits reported were wide-ranging and include the prevention of expected damage, and recovery of ecosystems:

(a) Australia took urgent and extensive actions to eradicate black striped mussel (*Mytilopsis* sp) from Darwin Harbour in 1999. These efforts included work by over 300 personnel, the use of chemicals to kill all mussels in the infected areas, and the tracking and treatment of vessels which had left the affected site;

(b) New Zealand has probably eradicated Dutch elm disease (*Ophiostoma novo-ulmi*), by removal and destruction of infected elms, and use of pheromone traps (no disease has been detected for two years).

(c) New Zealand has eradicated the water weed *Pistia stratiotes* (water lettuce). This species, a serious problem in other countries, was deliberately introduced by the aquarium trade. The threat was recognized at an early stage, and the plant made illegal. Two small wild populations were removed by hand, and aquarium populations also destroyed;

(d) Giant African snails were eradicated from Florida in a process involving over seven years of detection and eradication work over several sites, at a cost of around \$1 million;

(e) New Zealand undertook a successful eradication programme for an alien moth (white-spotted tussock moth, *Orgyia thyellina*), which involved spraying a bacterial insecticide over a suburban area populated by around 80,000 people;

(f) After rabbits were eradicated from Phillip Island in the South Pacific (a very rugged 260 hectare island), species that had been believed to be extinct reappeared and others significantly recovered;

(g) Oriental fruit fly (*Bactrocera dorsalla*) were eradicated from three islands in Japan, during 1980, 1985 and 1986, through the use of insecticides and attractants to kill males, and the release of sterile males.

#### 4. Containment

33. Containment is recognized in the Guiding Principles as a useful approach, and the case-studies provide a number of circumstances where this approach has been employed. These include its use as a temporary measure while long-term measures are being decided, to prevent the spread of the species to new areas, or to allow localized eradication without the cleared area being immediately re-invaded.

(a) Fencing has been used in Mauritius to protect small areas of vegetation from pigs and deer. With the removal of invasive plants from within the fence, these small areas are providing major biodiversity benefits;

(b) Quarantine systems are in place on a number of offshore islands in New Zealand. These systems employ bait stations or traps to intercept and kill new invasions of species such as rats. In addition, goods arriving on the islands (including personal luggage of staff) are unpacked in a special room, allowing any stowaways (e.g., mice) to be detected and killed;

(c) Norway is using a range of mechanisms to reduce the impacts of *Gyrodactylus salaris*, a parasite affecting salmon. These methods include the obstruction of fish passage to prevent salmon entering infected rivers to spawn so that the disease will be eliminated after 5-7 years above the obstruction;

(d) Saltmarsh mosquito, *Aedes camptorhynchus*, has recently invaded New Zealand. An eradication programme is in place, and an important early stage in this is containment of the populations while decisions on management are taken. These measures include the spraying of aircraft leaving the infected area, and, in some populations, reduction work to reduce the risk of spread;

(e) New Zealand has taken action to prevent the spread of an unwanted alien freshwater fish species (*Cyprinus carpio*) across an internal “natural border”, that is from the North Island to the South Island. A newly identified population in the South Island (caused by illegal release) was rapidly eradicated. Increased penalties for illegal releases, research into improved technologies for eradication of populations, and increased monitoring are being employed to increase the ability to prevent establishment of the species in the South Island.

#### 5. Control

##### ***Biological control is a valuable option, but not without risks***

34. The case-studies include both successful use of biological control, and problems created by poorly designed projects. Careful research and assessment is necessary in any proposed biological control programme. There are examples where biological control has failed, and has introduced a new invasive species with even greater biodiversity and economic costs:

(a) Cane toad (*Bufo marinus*) was introduced to Australia as biological control for the greyback cane beetle (*Lepidoderma albobirtum*). They not only failed to control the beetle, but it then became a serious invasive species. As many as 5,000 per hectare may crowd around waterholes;

(b) Rosy Wolfsnail (*Euglandina rosea*) was introduced to a number of islands as a biological control agent, particularly to control giant African snail. It has, however, caused the extinction

of many indigenous snail species (e.g., 24 extinctions in Mauritius, seven in French Polynesia, 15-20 in Hawaii);

(c) Biological control of an invasive scale insect (*Orthezia insignis*) on St Helena was successfully used to save an endemic tree (*Commidendrum robustum*, Asteraceae) from extinction in the wild. The control organism used was a predatory beetle;

(d) Biological control is providing substantial impacts on three invasive waterweeds: water hyacinth (*Eichhornia crassipes*), salvinia fern (*Salvinia molesta*), and water lettuce (*Pistia stratiotes*);

(e) Mist flower (*Ageratina riparia*) is a weed invading natural habitats in northern New Zealand. A gall fly (*Procecidochares alani*) has been approved for use as a biological control agent. Approval followed rigorous examination of potential impacts. Host range testing was undertaken, and experience with the species in other countries examined to determine that it was very host specific. The authorities considered its potential effect on an already present biological control agent. They also identified that it may be attacked by a native parasitoid, which normally attacks native gall-forming tephritid flies. There was concern that increased numbers of the parasitoid resulting from increased food supply might have negative effects on the native species if the population of *P. alani* collapsed. It was concluded that rapid decline of *P. alani* is unlikely.;

(f) Browsing by Galloway cows, sheep and goats completely eliminated Japanese Knotweed (*Reynoutria japonica*) on the banks of the Nordrach in Germany. Control of *R. Japonica* requires three to four grazing animals per year (minimum of 20 animal per hectare). An area of 10 hectare has been cropped very successfully this way.

## 6. General points

### (a) *Failing to take early enough action can result in intractable problems and potentially irreversible impacts*

35. The case-studies include examples where failure to take early enough action resulted in intractable problems and potentially irreversible impacts. They also include examples indicating that eradication, containment and control of invasive alien species become progressively more difficult as the population of the species, and its geographic extent, increase. The case-studies show that established invasive species can cause significant impacts to biodiversity, and those impacts may sometimes be irreversible:

(a) Scientists in Italy have concluded that eradication of grey squirrel (*Sciurus carolinensis*) is no longer feasible. When the eradication project (which was delayed by legal problems) was first proposed in 1997, eradication was considered feasible however due to delays in implementing the measures the population expanded. *Undaria* (a marine seaweed) in New Zealand has been subject to different control approaches in different regions, depending on the degree of establishment. A small new incursion in the Chatham Islands was immediately eradicated without difficulty. A more established population on Stewart Island is the subject of an eradication attempt with about a 50 per cent chance of success. Well-established populations on the mainland are being treated as ineradicable;

(b) In 1982 a large alien ctenophore (*Mnemiopsis leidyi*) was first recorded in the Black Sea. By the end of the 1980s the total biomass of the population was estimated at 1,000,000,000 tons, and the major commercial fishery had collapsed;

(c) Forest ecosystems on Isabela Island (Galapagos) have been converted to grasslands by goats;

(d) Until the early twentieth century, chestnut was one of the most abundant hardwoods of eastern deciduous forests in the United States (up to 25 per cent of all trees). The nuts were a staple food for wildlife. Introduction of fungal chestnut blight from China killed as many as one billion trees over 91 million acres. The tree is now so rare that it is no longer an effective part of the ecosystem, permanently changing the ecology of the forests;

(e) Rainbow trout introduced to Peru from North America have virtually extinguished various native edible fish from the High Andes;

(f) Water hyacinth (*Eichhornia crassipes*) removes nutrients from water, causes oxygen deficiency, and shades bottom growing vegetation, and as a result has major impacts on fish biodiversity in infected waterways in many parts of the world;

(g) *Melaleuca quinquenervia* introduced from Australia to Florida is having a major impact on the Everglades, particularly by converting wetland to dampland through the creation of dense stands. It now infests around 200,000 hectares.

**(b) Many new invasions can be sourced to an earlier invasion. Invasions are therefore a risk not only to the area they have invaded, but also to other parts of the same region, and other parts of the world.**

36. Many invasions documented in the case-studies did not occur by direct transfer from the country to which the species is indigenous. Often the species spread from an earlier invasion source. In some cases, invasions have resulted in very high population numbers, and active dispersal behaviour, increasing the likelihood of spread to new areas. In addition, the case-studies indicate that the chance of humans moving the species deliberately or accidentally is increased if there are more potential sources:

(a) The cane toads (*Bufo marina*) that are invasive in Australia were brought from Puerto Rico in 1935. Puerto Rico had acquired the toads from Barbados in 1920, which had imported them before 1844 from Guyana in South America;

(b) Hibiscus mealybug (*Maconellicoccus hirsutus*) entered the Caribbean by introduction (by unknown vector) to Grenada. The initial infection site resulted in huge populations, providing a source of spread to neighbouring islands. Over 15 territories in the Caribbean are now affected;

(c) Zebra mussel (*Dreissena polymorpha*) was originally imported to Lake St Clair, between Canada and the United States. From there it has spread naturally throughout the waterways of eastern United States and Canada;

(d) *Salvinia molesta* in Senegal is reported to be increasing its population at a rate that results in a doubling of the population every 2.5 to 7 days.

**(c) Genetic contamination of indigenous species is a significant potential impact of alien species invasions**

37. Some case-studies identified genetic contamination of indigenous species as a significant impact from alien species invasions. In some cases, the result has been the effective extinction of the native species. Even where the effect was not as severe, the case-studies cite a loss of fitness of some species, or impacts on the ability to undertake recovery work on threatened species:

(a) Mallards introduced into Hawaii, Florida and New Zealand have hybridized with native ducks;

(b) *Lantana depressa*, a species found only on a few dune and limestone ridge habitats of peninsular Florida, is suffering from hybridization with introduced *Lantana camara*.

(c) The production of sterile hybrids between introduced brook trout (*Salvelinus fontinalis*) and native bull trout (*S. confluentus*) in parts of the western United States is reducing the reproductive capacity of the rare bull trout;

(d) Red mulberry, *Morus rubra*, found only in Ontario, Canada, is endangered by hybridization with white mulberry (*M. alba*).

**(d) *The economic costs of invasions can be very high. Identifying these costs can be a major factor in gaining support for prevention and control programmes.***

38. A number of case-studies documented the direct economic costs of alien species invasions. The economic costs of invasions provided in some of these cases were very high. Identifying these costs was identified in some cases as a major factor in gaining support for prevention and management programmes. Most of the economic studies focused on alien species in the primary-production sectors, rather than those affecting biodiversity, but these species often also have biodiversity impacts. The economic costs of alien species identified in the case-studies included:

(a) The direct and indirect costs of prevention, eradication or control (including delays to the movement of goods and passengers);

(b) The direct effects on economic sectors (e.g., agriculture, forestry, shipping);

(c) Effects on human health, resulting in lost productivity and medical costs;

(d) Indirect costs to the economic sector, for example from loss of markets or damage to the tourism industry.

39. Specific examples of such costs include:

(a) South Africa has estimated that the water lost through the effect of invasive tree species amounted to around 9 per cent of the run-off of the country, significantly reducing water available for agriculture, industry and domestic use;

(b) Zebra mussel (*Dreissena polymorpha*) in North America is expected to have caused \$5 billion in damages by the year 2002;

(c) Brown tree snakes on Guam are estimated to cause power outages costing \$1 million per annum, and resulting in significant problems for the population;

(d) Water hyacinth can reduce the effective capacity of water reservoirs by up to 400 cubic meters per hectare. The weed also impacts on the ability to navigate boats and use fishing nets. In some cases, fishing communities in west Africa have been abandoned as the result of the arrival of water hyacinth;

(e) The United States spends around \$100 million a year on the control of waterweeds;

(f) The eradication of just one species of moth in New Zealand cost around \$10 million;

(g) It is estimated that one species of insect (*Lyriomyza sativae*) is causing crop losses in parts of China of between 30 and 100 per cent, and could affect 40 species of vegetables, as well as cotton;

(h) The annual budget to organize the control measures for muskrat (*Ondatra zibethicus*), in Weser-Ems region of Germany, is 900,000 Deutsche marks (DM) and another DM 1 million for their implementation.

40. Economic cost analyses were seen in some case-studies as being helpful in informing decision-making processes, and generating commitment to management programmes, for example:

(a) Both South Africa and the United States of America have used economic cost analyses to justify the establishment of or greater priority for programmes to control alien species. For example, South Africa's analysis showed that removing alien trees was a lower-cost way to deliver increased water than building new dams;

(b) A cost-benefit analysis by the Norwegian authorities showed that control of *Gyrodactylus salaris*, a parasite affecting salmon, delivers 4-10 times the economic benefit for each unit of costs;

(e) ***There is a wide range of prevention, eradication, and control options available. The best option needs to be carefully chosen, taking into account effectiveness, costs, and impacts of its use. Successful operations require careful planning and design. Sometimes drastic measures are justified. In addition, the effect of controlling one invasive species on the impacts of other invasive species must be considered.***

41. While there is a wide range of prevention, eradication and control options available, the overriding message from the scientific literature (see UNEP/CBD/SBSTTA/6/INF/3) indicates that the best option needs to be carefully chosen, taking into account effectiveness, costs, and impacts of its use. The successful operations reported generally included careful planning and design. Sometimes, drastic measures were considered to be justified. In addition, some case-studies indicate that the effect of managing one invasive species on the impacts of other invasive species must be considered. Experience from the case-studies suggest that the planning process should be able to draw on relevant experience elsewhere, but that the approach taken needs to be tailored to the particular circumstances of the affected country. Information collection and research were important elements of some of the successful case-studies provided, as were public consultation and involvement.

42. Developing a response to an alien species problem requires clear identification of the nature of the problem, and careful selection of the best option to address it. While the planning process can (and should) draw on relevant experience elsewhere, each programme must be tailored to the very particular circumstances of the affected country.

43. Information collection and research have been important elements of many successful programmes. So have public consultation and involvement.

44. There is a wide range of control measures to mitigate the impacts of alien invasive species. The most frequently mentioned methods for mitigating the effects of alien species are mechanical removal, biological control, poisons, and trapping. But the case-studies provide a variety of other options, including developing physical barriers to the movement of species and changing the nature of potential vectors. Sometimes measures have been adopted which produce significant short-term impacts (e.g., damage to other biodiversity), or have had significant social effects (e.g., restricting the movement of

people, animals or goods). Besides the success stories, the case-studies include failed programmes, which also provide valuable information for other Parties.

45. Where an area is subject to more than one invasion, the removal of one species may result in changes in the populations of the other species that may then result in a greater overall problem for biodiversity. It is therefore essential that any control programme examine the likely effects of the programme on other invasive alien species. Some examples of control measures contained in the case-studies include:

(a) Changing flight and boat departure times and restricting lights on shipping in La Réunion and Mauritius is being used to reduce the spread of an invasive beetle;

(b) The use of beagles has been successfully introduced in a number of border-control programmes, including the United States of America and New Zealand. These dogs have the ability to very precisely detect scents. For example, it is reported that a New Zealand border control beagle can detect a pressed flower between the pages of a book at a distance of 10 feet;

(c) Control of introduced herbivores through fencing to protect a wetland area is considered the probable cause of the subsequent spread of a weed (*Rorippa nasturtium-aquaticum*), in New Zealand. The cessation of cattle browsing, and subsequent weed expansion necessitated the introduction of weed control. Unfortunately, hand removal of that weed resulted in the creation of bare areas that were invaded by a worse weed, which then spread into the adjacent areas of native vegetation. No solution to this new problem has yet been identified;

(d) The eradication of rabbits from Phillip Island in the South Pacific was initially attempted using myxoma virus. Loss of the supply of the vector fleas resulted in the programme failing. Poisoning with bait stations removed further rabbits. Trapping, gassing and shooting were finally used. The last rabbit was shot on an inaccessible ledge in 1988;

(e) An attempt to eradicate introduced fire ant (*Solenopsis invicta*) from southern United States of America failed completely, and resulted in serious damage to non-target organisms from the mirex poison being used;

(f) Australia is using helicopter surveying for a serious weed (*Chromolaena odorata*) in parts of Queensland where access is difficult. Flying at tree-top level at around 10 knots ground speed has proven to be a means of detecting even quite small plants. Fixing plant location by dropping coloured streamers, marking on aerial photos and recording GPS positions has proven 100 per cent reliable if all three are used;

(g) Estimates of seed movement by tourist cars in Kakadu National Park, Australia, were considered to be low enough to suggest that resources were best spent on detecting and eradicating new weed infestations rather than controlling this form of seed movement;

(h) For water hyacinth, a range of methods are available to control the extent and effects of the plant. These include manual removal, constructing booms, mechanical harvesting, biological control and chemical control. Experience suggests that different techniques are useful in different circumstances, and that often a combination of techniques is optimal;

(i) Altering the habitat by planting perennial grasses is seen as an effective control measure for *Ambrosia artemisiifolia* in China;



(j) *Bacillus thuringiensis* (Bt) is a natural bacterium, used particularly to control caterpillars (Lepidoptera) pests. The “insecticide” is highly specific to the target species. Successful use requires the use on the correct target species at the right stage of development, and at the correct temperature;

(k) The United States of America imposed a ban on the importation of unprocessed logs from Siberia, after a risk-assessment process identified that there was no treatment option that would remove the risk of disease importation.

**(f) *Cost-effective and/or acceptable control or eradication techniques are not available for many existing or likely alien species problems.***

46. Several case-studies state that cost-effective and/or acceptable control or eradication techniques were not available for many existing or likely alien species problems. While there is evidence in the case-studies of significant work being undertaken to manage the effects of alien species on biodiversity, they also showed that in some cases the ability to undertake this work is limited by the lack of a technique which is effective, affordable, acceptable to the public, and does not have unacceptable negative effects on other biodiversity values or on other sectors, for example:

(a) Currently the only effective way to eliminate Asian Long-horned Beetle (*Anoplophora glabripennis*) is to remove infested trees and destroy them, and the eggs and larvae within them by chipping or burning. This is only a viable control method in small areas, and has significant impacts on the values that the control work is seeking to protect;

(b) Bullfrogs escaped from frog farms have become invasive in the Republic of Korea. Their spread has been accompanied by decline in the diversity of other species. The Government has not been able to identify a method to successfully eradicate this species;

(c) *Acacia saligna* is a serious weed in coastal areas of Israel. The most effective method currently available is a combination of cutting shrubs and treating the stumps with an herbicide, and spraying seedlings or removing them manually. This treatment is expensive and time-consuming, and the procedure has to be repeated several times. The method is inadequate to allow the problem to be solved;

(d) Stoats (*Mustela erminea*) are an invasive species causing significant predation impacts to biodiversity in New Zealand. No cost-effective and sustainable solution for managing this species is available, and a \$3.3 million research programme is currently under way to seek better control methods;

(e) A range of options have been used or examined for controlling Pacific Seastar (*Asterias amurensis*) in Australian waters. These include hand removal, traps, use of quicklime, dredges and trawling. None provides a suitable method for major infestations in areas where other biodiversity would be vulnerable to collateral damage;

**(g) *Prevention, eradication and control can be very costly. Prioritizing is therefore likely to be an important element in any country's alien species work.***

47. Some case-studies included information indicating that prevention, eradication and control can be very costly, and that therefore prioritizing actions was an important element in that country's work on alien species. Priority-setting has been used to allow scarce resources to be targeted to where they would achieve optimal benefit. This prioritisation included deciding what actions would not be taken in the foreseeable future, and what actions would be deferred. In some cases, partial actions were undertaken to retain future options, but with a complete response deferred (until a suitable management method was available):

(a) The South Pacific Regional Environment Programme has undertaken a process to priorities efforts on alien species within Pacific Island countries. This identified priorities for alien species management work itself (particularly a priority for prevention), and also for capacity building efforts;

(b) Australia has developed a process for determining weeds of national significance. This process involves the nomination of weeds by states and territories and their assessment against prioritizing criteria;

(c) Mauritius developed priorities for alien invasive species management through a national workshop;

(d) Hawaii's Alien Species Action Plan, developed through a cooperative process involving a wide range of sectors, identifies key priority actions.

**(h) *Integration between the sectors can greatly increase the cost-effectiveness of alien species work.***

48. The case-studies show that alien species may threaten many sectors of society. Several case-studies identified the need for integration between the sectors to increase the cost-effectiveness of alien species work. Key sectors mentioned were health, agriculture, forestry, fisheries, aquaculture, tourism, shipping, and construction. In addition, there were examples showing that the way in which invasive species were managed had implications for affected sectors, including implications for economic and social development. Example of intersectoral integration include:

(a) South Africa's "Working for Water" project is achieving a number of social objectives. The project includes a large weed control programme in water catchments, to reduce their impacts on water flows. The programme is also designed to serve biodiversity, workforce training, and social assistance goals;

(b) In Hawaii, the above-mentioned Alien Species Action Plan involves over 40 government, non-profit and private agencies, organizations and businesses. A permanent Co-coordinating Group has also been formed, including state transportation and health departments, the Hawaii Visitors Bureau, the Hawaii Farm Bureau Federation, the United States Postal Service, the military and non-profit biodiversity conservation agencies. The group is administered by the Department of Agriculture, with additional staff support from the Nature Conservancy;

(c) In French Polynesia, an "Inter-Ministerial Technical Committee to Control Miconia and Other Invasive Plant Species Threatening the Biodiversity of French Polynesia" has been established. This Committee provides a mechanism for integrating the work of a large number of government agencies;

(d) New Zealand has a formal mechanism for achieving integration between government agencies for biosecurity work. A single elected minister oversees the work. A committee of chief executives of the affected agencies meets regularly, and is supported by a technical group of officials;

(e) Australia has developed a National Weeds Strategy to facilitate the integration of effort in weed control;

(f) In the Seychelles, ecotourism operators are funding rat eradication programmes on small islands;

(g) In New Zealand, farmers are agreeing to legally protect areas of natural vegetation on the Chatham Islands, in return for fencing assistance. Fencing is necessary to reduce the problems created by domestic cattle escaping into the forests and becoming a problem for both the biodiversity in those forests and the farming operations on the adjacent land.

(i) ***Equitable cost-sharing between those creating the problem, those suffering as a result of the problem, and those who would benefit from the control programme is an important part of planning an invasive-species response.***

49. Many of the alien species described in the case-studies were reportedly introduced as a result of a deliberate decision, or by the unintentional introduction of the species where that could have been prevented. Where the species subsequently created a problem this led to a cost on parties who were not subject to the decision that resulted in importation. Case-studies included steps to “internalize” those costs back on the party which were responsible for the problem.

50. In some cases equitable sharing of costs between those creating the problem and those suffering as a result of the problem was seen as an important part of planning an invasive alien species response. There are three main players: those who may be exacerbating the problem (e.g., landowners who have areas of weeds that are producing wind dispersed seeds which will affect neighbouring properties), those who would benefit from the control work (e.g., water users who benefit from improved water flow and quality in a catchment cleared of weeds), and any funding body (e.g., the government or a donor). Specific examples of cost-sharing initiatives in the case-studies include:

(a) South Africa is considering the possibility of levying stream-flow reduction charges on landowners who retain invading alien plants on their properties;

(b) New Zealand has a sub-national planning process for dealing with invasive alien species. The Regional Pest Management Strategies produced under this process provide a mechanism for determining where costs of control will lie. The local government agency responsible is able to force landowners to pay their share of the costs.

(j) ***Public attitudes to alien species problems can greatly affect the effectiveness of prevention, eradication and control programmes. There is a wide range of ways in which the public attitudes can be influenced.***

51. Several case-studies exemplified how public attitudes to alien species problems can greatly affect the effectiveness of prevention, eradication and control programmes. Public willingness to comply with border control restrictions, for example, was cited as having a major influence on their effectiveness. Several case-studies show that the public affected political decision-making, and/or had a direct control over the ability to undertake management actions. Public opinion was cited in several cases as a major factor in determining accessibility to management methods such as the use of poisons, the killing of vertebrates, and the temporary destruction of habitat (e.g., draining a pond to eradicate fish). Case-studies ranged from examples where public opinion resulted in opposition to the work, to those where it resulted in active support for alien-species-management work. Public-awareness campaigns in some cases were reported to have greatly enhanced public understanding of the impacts of alien species, and the practicalities and risks of various management options. Public-awareness campaigns can take a wide range of forms. Reported cases of relevance include:

(a) Opposition to a proposed eradication programme for introduced grey squirrel in Italy, resulted in court action which delayed the programme until it became unfeasible, even though the

programme had been designed through an extensive public consultation process that satisfied almost all groups;

(b) New Zealand undertook a successful eradication programme for an alien moth (white-spotted tussock moth, *Orgyia thyellina*), which involved spraying a bacterial insecticide over a suburban area populated by around 80,000 people. Public concerns about the potential health effects of the spray programme were overcome by an extensive public-awareness programme, which achieved a very high acceptance or support for the eradication campaign;

(c) Public opposition to control of feral horses has resulted in blocking or serious modification to control programmes in New Zealand and the United States of America, reducing the ability to protect the environment;

(d) Photographic documentation of the effects of *Miconia calvenscens* in Tahiti was used to convince people in Hawaii of the need to take prompt action to manage this weed;

(e) The Seychelles has used television programmes targeted at young people to address environmental issues, including alien species. Specific television campaigns on particular alien species problems (e.g., pond plants) has considerably increased public cooperation in prevention and control work;

(f) The government Australian Northern Territory worked with yachting interests to achieve a high level of cooperation for hull-fouling inspection work to prevent re-infestation of Darwin harbour and other ports by the black striped mussel (*Mytilopsis sp.*), which had been eradicated from the city;

(g) In North America a “dirty dozen” list of unwanted alien species has been produced;

(h) New Zealand is currently seeking to eradicate wild populations of rainbow lorikeet (*Trichoglossus haematodus*), which are considered to be a threat to indigenous species and agriculture. A breeder who considered that they would be a positive addition to the environment deliberately released these birds into the wild. In the long term, eradicating the existing wild populations, and preventing re-establishment of the bird in the wild, will depend on convincing breeders of the birds that they are a threat and should not be released. Eradication will also depend on gaining public support for the killing of an attractive animal.

**(k) *The community and outside volunteers are a major resource that should be harnessed.***

52. Part A of the present note shows that almost all the thematic national reports on invasive alien species identified a lack of resources as a major limiting factor for alien species response work. Some case-studies included examples of the use of community and international volunteers in detection and management programmes. These case-studies suggest that the use of communities and volunteers may represent a significant untapped resource for other programmes, for example:

(a) An Australian committee set up to examine the response to the black striped mussel (*Mytilopsis sp.*) invasion in Darwin concluded that early detection of such incidents could be significantly enhanced by stimulating voluntary reporting by the public;

(b) A public-awareness campaign on the risks posed by *Miconia calvenscens* in French Polynesia resulted in reports of infestations being made by local communities and hunters, allowing these infestations to be destroyed before they became intractable;

(c) A public-awareness campaign, including provision of a hotline, is being used to encourage public reporting of any hibiscus mealybug entry into the Bahamas;

(d) Australia is also working to involve communities in monitoring of new marine pests. Several agencies are jointly funding a pilot community-monitoring programme. This programme will involve a broad range of groups, including divers, fishers, boaters, marine naturalists, surfers, beachcombers, and school groups;

(e) Mauritius has used international volunteers to contribute to weed-management projects;

(f) Spread of a biological control agent for *Salvinia molesta* up the Sepik River in Papua New Guinea was largely achieved by local villagers, responding to a radio message. This resulted in very rapid spread of the agent, and rapid control of the weed.

**(I) Cooperative efforts between countries can provide major benefits, and are sometimes essential.**

53. The case-studies included examples showing that cooperative efforts between countries provided major benefits, and in some cases were essential for the effective treatment of the problem. The reasons for cooperative arrangements varied and included:

(a) The countries shared threatened biodiversity;

(b) The countries were the source of the alien species, and the site of the invasions (this was particularly relevant for biological-control work);

(c) The countries faced similar problems, and sharing of experiences or cooperative development of new information or techniques benefited both;

(d) The countries had political relationships, e.g., a donor-recipient relationship;

(e) The work (e.g., management of border-control arrangements) needed to be operated at a regional level;

(f) Mitigation effort in one country was considered to be fruitless because of the threat of constant re-invasion from a neighbouring country that was not carrying out mitigation actions.

54. Cooperative arrangements can greatly increase effectiveness and efficiency, for example:

(a) Mauritius identified in their national priorities a number of cases where they could draw from the experience of other countries, or could participate in new cooperative work on shared problem species. These included the development of an international project on *Psidium*, involving the many countries that have a problem with this species, in order to increase available resources to develop solutions, and learning from the recent progress in Australia and New Zealand in fencing technology for excluding alien species from protected areas;

(b) A cooperative arrangement is in place between Russian, Finish and Norwegian authorities to address the effects of *Gyrodactylus salaris*, an alien parasite of salmon present in all three countries;

(c) A research programme on horse chestnut leafminer involved scientists from Austria, Switzerland, Czech Republic, Germany, Italy, France, Bulgaria and Greece. Meetings and e-mail exchanges were used for communication between the researchers;

(d) New Zealand has contributed experience in island eradication work to many other countries, including the Seychelles, Mauritius, Ecuador, the United Kingdom, the United States of America, and the Pacific Island countries;

(e) The Australian-based Marsupial Co-operative Research Center has drawn together expertise of about 40 scientists working in a range of fields, to provide information for managing endangered marsupials, and also for controlling brush tailed possums which are an invasive species in New Zealand. New Zealand contributes to the funding for the Center.

## **PART C: SUMMARY OF COMMENTS ON THE INTERIM GUIDING PRINCIPLES**

### *A. Introduction*

55. In decision V/8, the Conference of the Parties requested Parties, other Governments, relevant bodies and other relevant international and regional binding and non-binding instruments, in the light of discussions by SBSTTA at its fifth meeting, to submit to the Executive Secretary written comments on the interim guiding principles, to be taken into account, together with the case-studies, in the further elaboration of the interim guiding principles, to be considered by the Subsidiary Body prior to the sixth meeting of the Conference of Parties, and requested the Executive Secretary to distribute those comments through the national focal points.

56. As of 29 January 2001, comments had been received from the following countries: Australia, New Zealand, Seychelles, the United States of America; and the following organizations: the Food and Agriculture Organization of the United Nations (FAO), the Global Invasive Species Programme (GISP), the secretariat of the International Plant Protection Convention (IPPC) and Defenders of Wildlife.\* All comments received by 29 January 2001 are available through the Secretariat's website (<http://www.biodiv.org/alienspecies/html/ntf-2000-11-27-alien-e.html>). The present section provides a summary of general comments and a detailed breakdown for each principle.

### *B. General comments*

57. A range of changes to the title were suggested, to clarify the English, provide a more appropriate description of the content, and to emphasize that these are non-binding guidelines rather than binding principles. Australia and GISP suggested that the term "guidelines" might be more appropriate than "guiding principles", in order to emphasize the non-binding nature of the principles. Alternatives to the term "alien invasive species" were offered in a number of comments, including to achieve greater consistency with GISP terminology or to achieve consistency with the Convention wording.

58. Defenders of Wildlife commended the retention of the title as "Guiding Principles". They noted that "principles" offer themselves as a basis for the future development of concrete arrangements, commitments, and diverse instances of capacity-building.

59. The IPPC secretariat noted inconsistency in the use of the terms, particularly the word "introduction". It was suggested that the term "introduction" be used in relation to the intentional or unintentional movement of the species into the area to which it is alien.

60. FAO noted that the term "invasive" may be misinterpreted or redundant and therefore confusing in the context of introduced species, based on the ecological literature. Specific mention was made of aquatic species in the fishery sector, and it was suggested to drop the term "invasive" from use under the Convention on Biological Diversity.

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\* The comments from Defenders of Wildlife had not been received at the time the progress report of the Executive Secretary (UNEP/CBD/SBSTTA/6/6) was finalized and are therefore not reflected in section IV of that document, which reviews comments on the Interim Guiding Principles.

61. New Zealand, proposed that the document should contain the minimum possible explanatory material, with any elaboration placed in supporting documents. GISP suggested that SBSTTA consider whether further guidance is required for each of the guiding principles. The note by the Executive Secretary on options for future work on invasive alien species (UNEP/CBD/SBSTTA/6/8) considers the issue of further guidance.

62. GISP suggested that SBSTTA might consider clarifying the purpose of the principles. All the Governments addressing this issue (New Zealand, Australia, the United States of America) supported the concept of guiding principles that provided a non-binding aim or objective for Parties to move towards in their implementation work. This is compatible with the call from GISP to recognize the variability in countries' ability to address the issue of alien species.

63. FAO provided information on guidelines and codes of practice for the promotion and responsible use of alien species (in particular the FAO Code of Conduct for responsible Fisheries and the Codes of Practice of the International Council for the Exploration of the Sea (ICEL)), and proposed that the Convention on Biological Diversity acknowledge that alien species are a proven and effective means of increasing food production and economic benefit from the aquatic environment. FAO suggested these mechanisms and instruments be referenced in the Guiding Principles.

64. The IPPC secretariat noted that several principles deal with information exchange and expressed the view that there needs to be further examination of the issue of databases.

### *C. Guiding Principles 1 to 15*

#### *Guiding Principle 1: Precautionary approach*

65. Australia, New Zealand and the United States of America sought changes in the wording to achieve consistency with the wording of the Rio Declaration on Environment and Development. The arguments for this included the need for precision, to avoid confusion, and to promote consistency and consensus between international instruments. Australia proposed that the title of the principle should read "Precautionary approach contained in the Rio Declaration principle 15" and that that wording should be repeated in the first sentence, with the second and third sentences being deleted. New Zealand proposed the use of the Rio Declaration wording in the text. The United States of America proposed the following words: "Given the potential serious effects of invasive alien species on biological diversity, efforts to identify, prevent or minimize the introduction or spread of invasive alien species should fully take into account the precautionary approach of Rio Principle 15."

66. GISP noted that the wording in the principle was wider than that in Rio Principle 15, as it included social and economic risks. They noted that this could increase the possibility of conflict among trading partners and neighbouring States. They suggested that if social and economic considerations were to be added, human health considerations should also be added.

67. In contrast, Seychelles strongly endorsed the clear statement in the text. They also supported the position of this as the first principle.

68. FAO suggested that the Convention on Biological Diversity should take steps to define the precautionary principle operationally.

69. Defenders of Wildlife suggested that by providing specific guidance on the meaning of precaution in particular context, the Guiding Principles should mitigate potential concerns about the vagueness of the of the precautionary principles as a decision making tool.

70. The United States of America proposed the addition of “full” before “scientific certainty”, and the inclusion of “derivative” before “social and economic risk.” They suggested that “cost-effective” be inserted before “preventative action” and before “eradication, containment or control measures”.

*Guiding principle 2: Three-stage hierarchical approach*

71. New Zealand sought addition of the words “as has been shown by work with quarantine for pests of plants and diseases of animals for over fifty years” at the end.

72. Seychelles sought clarification of the term “cost-effective”. The United States of America considered that the potential for changes in costs and benefits over time needed to be recognized. They suggested changing the wording of the last sentence to: “Any examination of benefits and costs (both environmental and economic) should be designed to incorporate variations over time.” GISP suggested that the wording specify that any examination of benefits and costs should consider the values of the full suite of stakeholders, public and local communities.

73. The United States of America considered that the approaches need to be integrative rather than hierarchical, and suggested removing the words “three-stage hierarchical” from the title.

74. The United States of America also suggested adding “where practicable” before “prevention” in the first sentence, and deleting the word “far”.

75. The United States of America suggested that the principles should remain focused on movement between States, and suggested removing the words “both between and within States” from the second sentence.

76. GISP suggested some wording changes to the text, specifically:

(a) Adding wording on early detection and rapid action for species which have just entered the country;

(b) Elaborate the wording “both between and within States” to address the issue of movement of native species outside its natural range, or cover this issue in a definitions section;

(c) Make clear that any alien species should be treated as potentially invasive until convincing evidence indicates that this is not so.

77. GISP also questioned whether the use of the concept of hierarchy ignores the need for integrated work, for example, continuing prevention of new entries of a species being eradicated.

78. The IPPC secretariat expressed concern that the term “entry” was unclear.

*Guiding principle 3: Ecosystem approach*

79. Seychelles endorsed the principle.

80. The United States of America were concerned that capacity problems might make the application of the ecosystem approach impractical and the principle restrictive. They suggested changing the wording to “Measures to deal with invasive alien species may benefit by an emphasis on the ecosystem approach, as described by the relevant...”

81. GISP suggested changing “All measures to deal with alien invasive species should be based on” to “Where relevant, measures to deal with alien invasive species should be in the context of”, because



some actions such as border control are not based on the ecosystem approach. The IPPC secretariat also noted that not all measures required the ecosystem approach.

82. GISP also proposed that ecosystem restoration be considered in conjunction with mitigation measures. They also suggested that States be encouraged to integrate the issue of invasive alien species in national strategies, including biodiversity strategies.

83. Defenders of Wildlife suggested making explicit reference to the decision V/6, on the ecosystem approach, to clarify the centrality and responsiveness of this concept in the management of invasive-species threats.

*Guiding principle 4: State responsibility*

84. New Zealand, the Seychelles and GISP raised concerns about the practicality of aspects of this guiding principle, particularly in relation to controlling exports of species. This is further addressed in the note by the Executive Secretary on options for future work on invasive alien species (UNEP/CBD/SBSTTA/6/8). New Zealand suggested that the words “where possible” be added after “States have a responsibility”. Giving examples, GISP suggested that regional cooperation can usefully complement national approaches, and that the wording should reflect this potential.

85. The United States of America were concerned that the title implied liability. They suggested changing it to “State cooperation”. They suggested combining principles 4 and 9, with the new principle to read:

“The effective prevention and management of the spread and introduction of invasive alien species involves significant cooperation between States. Depending on the situation, a State’s response might be purely internal (within the country), or may require a cooperative effort between two or more countries. Such efforts might include:

(a) A clearing-house mechanism for the efficient collection, management and dissemination of information relating to the prevention and management of invasive alien species. This might include an international registry of invasive alien species;

(b) Capacity-building programs for states that lack the expertise and resources, including financial, to assess the risks of introducing alien species. Such capacity-building may involve technology transfer and the development of training programmes;

(c) Cooperative research and funding efforts toward the identification, management and prevention of invasive alien species;

(d) Bilateral or multilateral agreements regarding trade in certain alien species, with a focus on particularly damaging invasive species.”

86. Defenders of Wildlife supported the principle and noted that by emphasizing State responsibility the Convention constructively offers other agreements, regimes and Governments the opportunity to enhance or reform their programmes or understandings that bear on alien species.

87. The IPPC secretariat stated that it was unclear in subparagraph (b) how a State can have responsibility for a risk of subsequent spread with a human vector. They suggested changing the wording to “increased risk”.

*Guiding principle 5: Research and monitoring*

88. The Seychelles raised concerns about capacity.

89. The United States of America also raised concerns about capacity to implement the principle, and suggested the following wording changes. They suggested that the first sentence be changed to read, “In order to develop an adequate knowledge base to address the problem, it is important States undertake...” and the second sentence to “These efforts should document, as possible, the history...”. They suggested that the final sentence of the section might better read: “Where possible, monitoring could include targeted and general...”

90. GISP suggested changing the first sentence to read “In order to develop... it is important that States document...”, and the second sentence to “This should document, as far as possible, the history...”. They suggested that the last two sentences may need to be reworded to fit the format.

91. The IPPC secretariat suggested that a comparison be made with the International Phytosanitary Standard – *Guidelines for Surveillance*. They stated that the recommendation on research placed too much emphasis on history.

*Guiding principle 6: Education and public awareness*

92. The Seychelles endorsed this principle.

93. The United States of America commented that the importance of public education should be highlighted, by changing the wording to read:

“Raising the public’s awareness of the invasive alien species issue is crucial to the successful management of invasive alien species. Therefore, it is important that States facilitate...”

94. GISP commented that:

(a) Education and outreach efforts for all aspects of the issue need to be facilitated, not just for the risks of introduction;

(b) Education and outreach efforts need to consider all stakeholders, public and local communities and adequately consider their different values and beliefs with regard to invasive alien species;

(c) Stakeholders, public and local community participation should be encouraged and facilitated.

*Guiding principle 7: Border control and quarantine measures*

95. The Seychelles and GISP requested that reference be made to prevention within political borders as well, most notably with regard to distinct ecosystems and in particular geographically and evolutionarily isolated ecosystems. GISP also raised the issue of measures to address regional movements of species.

96. The United States of America expressed concern about implementability of the principle. They suggested the following wording changes.

(a) The first sentence should be changed to read: “States should implement, as possible, border...”;

(b) In paragraph 1 (a), the words “of invasive alien species” should be inserted after “intentional introductions”;

(c) The first sentence of paragraph 2 should be changed to read: “These measures should be based, as possible, on a scientific assessment...”

97. GISP sought addressing of the capacity limitations by adding the words “to their fullest capacity” after “implement”. They also suggested referring to the potential use of existing sanitary, phytosanitary and zoosanitary arrangements.

98. The IPPC secretariat sought addition of the word “invasive” after “alien” in paragraph 1 (b). They also sought the addition of the words “their mandate” after “strengthened and” in the final text. They sought clarification of the meaning of paragraph 1 (a) and raised the issue of “least restrictive measures”.

*Guiding principle 8: Exchange of information*

99. The Seychelles sought screening and verification of any information placed in databases.

100. The United States of America suggested changing the wording to read: “States should support, as appropriate, an inventory and analysis of existing relevant databases and the development of a comprehensive database...”, in order to reflect the need for inventories of existing databases, and for making comprehensive databases that are standardized, comparable and easily adapted to new technologies.

101. GISP comments covered:

- (a) The fact that databases are not the only source of information;
- (b) The need for information to be widely and freely available;
- (c) The possible need for a comprehensive database;
- (d) Issues affecting the usefulness of databases.

*Guiding principle 9: Cooperation, including capacity building*

102. The Seychelles endorsed this guiding principle.

103. The United States of America suggested combining this with principle 4 (see detailed comments under that principle in paragraph 85 above).

104. GISP suggested that the first sentence be reworded to read: “A State’s response may be...”

105. The IPPC secretariat sought:

- (a) Clarification of the term “environment”;
- (b) Clarification as to why a country would allow importation of an invasive species;

- (c) Widening of capacity-building to cover issues other than risk assessment.

*Guiding principle 10: Intentional introduction*

106. New Zealand suggested adding “where possible” before “neighbouring States” to address the issues they raised in relation to guiding principle 4. They suggested that the last sentence might be redundant given principle 1.

107. Australia sought the addition of “and any existing international rights and obligations” to the last sentence, to remind countries that the guidance was additional to any obligations under other agreements.

108. Australia also suggested the addition of the following text:

“Importations of invasive alien species already present in a country should be restricted to locations where the species occurs and to genetic varieties that are already present in these locations.”

109. The United States of America suggested rewording the principle to read: “Science-based risk assessments should, as appropriate, inform a decision to intentionally introduce alien species. States should make all efforts to knowingly permit only those species that are unlikely to cause unacceptable harm to ecosystems, habitats or species.” This proposal reflected their concerns about practical difficulties associated with risk analysis, and the fact that precaution is already covered in principle 1.

110. GISP raised the following points:

- (a) It is important to clarify that the importing state must be responsible for authorization;
- (b) The term “risk assessment” should be replaced by the wider term “risk analysis”;
- (c) It should be clarified that risk assessment and environmental impact assessment are separate procedures;
- (d) All relevant cultural values need to be applied in risk assessment;
- (e) They questioned the meaning of “strongly” in relation to assessing benefits and costs;
- (f) States may wish to review the extent to which their existing systems provide a basis for achieving the principle.

111. Defenders of Wildlife supported the retention of this principle in its strongest form.

*Guiding principle 11: Unintentional introductions*

112. New Zealand suggested the following change at the end of paragraph 1: “These should include the setting of new statutory...responsibilities or the extension of those already existing for phytosanitary or zoosanitary purposes. They should have sufficient operational resources for...”

113. The United States of America suggested the following wording changes to reflect capacity issues:

- (a) The first sentence of paragraph 1 be modified to read: “All States should attempt to establish, as appropriate, provisions to address unintentional introductions...”;

(b) The second sentence should read: “These may include...”;

(c) The first sentence of paragraph 2 might set a more feasible threshold if it were to read, “Common pathways leading...identified and, where possible, appropriate provisions...”

114. The United States of America and GISP suggested changing the wording to remove the link between legislation and environmental impact reporting. GISP referred to the possibility of using existing quarantine arrangements.

115. FAO suggested that transshipping be added as an activity.

*Guiding principle 12: Mitigation of impacts*

116. New Zealand suggested that the wording should recognize the use of existing systems, perhaps by adding the words “Phytosanitary and zoosanitary systems may provide a basis for such measures”.

117. Australia suggested additional wording to address the higher risk that already naturalized species pose compared to new introductions:

“Surveillance and risk assessment of naturalized species should be undertaken, and control measures implemented for those species where a specific risk is identified.”

118. Seychelles urged caution in the interpretation of “socially, culturally and ethically acceptable”. They suggested removing the words “culturally and ethically”. GISP also raised concerns about the phrase.

119. Seychelles also reiterated their concerns about the term cost-effective. GISP was concerned that this might lead to inadequate mitigation.

120. The IPPC secretariat questioned whether the reference to “safe” referred to safety or acceptable risk.

121. The United States of America suggested adding the words “as appropriate” before “such as eradication” to reflect capacity limitations. They were also concerned that the principle might limit the use of effective tools, and suggested changing the wording of the second sentence to “Techniques...should be, in the long term, cost-effective...”. They also suggested removing the reference to the precautionary approach, as it was covered in principle 1.

122. GISP urged the use of prior risk assessments and environmental impact assessments before deciding on mitigation measures.

123. FAO suggested the first line be modified to read: “Once adverse impacts of an alien species have been detected, States should ...”. It further suggested the inclusion of a new sentence, reading: “Once the presence of an alien species is detected, monitoring and surveillance should be initiated to determine if the species has become established and if it is likely to cause adverse impacts.”.

*Guiding principle 13: Eradication*

124. New Zealand suggested that the wording should recognize the use of existing systems, perhaps by adding the words “Phytosanitary and zoosanitary systems may provide a basis for such measures.”

125. The Seychelles reiterated their concerns about the term cost-effective. GISP was concerned that this might lead to inadequate mitigation.

126. The United States of America suggested changing the wording of the first sentence to: “Where it is feasible and cost-effective, eradication is often the best course of action to deal with...”, reflecting capacity issues. They further suggested changing the final sentence to read: “Community support, built through comprehensive consultation, is often an integral part of eradication projects and should be sought as appropriate.”

127. GISP suggested rewording the final sentence to read: “Community support, built through comprehensive consultation, is an integral part of achieving successes in eradication projects and should be sought as appropriate.”

128. The IPPC secretariat sought an explanation of what “comprehensive consultation” meant, and pointed out that emergency measures may preclude consultation.

*Guiding principle 14: Containment*

129. New Zealand suggested that the wording should recognize the use of existing systems, perhaps by adding the words “Phytosanitary and zoosanitary systems may provide a basis for such measures.”

130. The Seychelles endorsed the principle.

131. The United States of America suggested changing the first sentence to read: “When eradication is not appropriate, limitation of spread (containment) is an appropriate strategy in cases where the range of an invasive species strategy is small enough to make such efforts technically feasible and cost-effective.” They also suggested deleting the words “within defined boundaries” in the first sentence as containment within an undefined boundary is not possible.

132. GISP proposed rewording the first sentence to read: “When eradication is not feasible, limitation of spread (containment) is an appropriate strategy though mainly in cases where the range of the invasive species, either entirely or in a population, is small and can be physically restricted.”

*Guiding principle 15: Control*

133. New Zealand suggested that the wording should recognize the use of existing systems, perhaps by adding the words “Phytosanitary and zoosanitary systems may provide a basis for such measures.”

134. The Seychelles endorsed the principle.

135. The United States of America suggested changing the wording of the first sentence to read “When designing and implementing control measures it is important to emphasize not only reducing the number of invasive alien species, but also on reducing the damage cause by these species.” They felt this change would better recognize capacity limitations.

136. GISP suggested the first sentence to read: “When designing and implementing control measures it is important to emphasize not only reducing the number of invasive alien species, but also on reducing the damage cause by these species.” They also suggested the following additional wording to be placed after “...integrated techniques” for the purposes of clarity: “including mechanical control, chemical control, biological control, habitat management and integrated pest management”.

137. FAO suggested that the regional response to control should also be considered.

*D. Additional principles*

138. Australia suggested two additional principles.

*User-pays guideline*

139. Australia suggests that under the user-pays concept domestic users benefiting from the import of an alien species could be asked to meet some of the cost of risk assessment and any specified import measures. The text suggested reads as follows:

“Consideration should given to arrangement such that the domestic users who will benefit from the introduction of an alien species pays for risk assessment and any management measures specified. Consideration of cost recovery would need to be balanced against public benefits and the likelihood that high risk assessment and management costs could significantly increase illegal imports.”

*Polluter-pays guideline:*

140. Australia suggests that the polluter pays concept would seek assistance from the domestic user of an alien species to meet the costs associated with clean up and biodiversity restoration where the user has failed to comply with the regulatory environment and address the risks associated with the use of the species. The text suggested reads as follows:

“The polluter pays guideline should be applied to the domestic use of alien species. The user should bear costs of clean up and biodiversity restoration where it is established that they failed to comply with the regulatory environment, and/or failed to take management measure specified.”

141. Australia further suggested that the user-pays guideline be inserted in section C as principle 12 *bis* and the polluter-pays guideline in section D as principle 16 *bis*. It stated that, while these are important issues to consider, they are provided as possible mechanisms to ensure robust domestic regimes and are not intended to introduce concepts of liability.

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