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Item 5 of the provisional agenda*

INVASIVE ALIEN SPECIES

Note by the Executive Secretary

I. INTRODUCTION

1. In decision XII/16, the Conference of the Parties adopted voluntary guidance on devising and implementing measures to address the risks associated with the introduction of alien species as pets, aquarium and terrarium species, and as live bait and live food. In the same decision, the Conference of the Parties requested the Executive Secretary, in collaboration with the Convention on International Trade in Endangered Species of Wild Fauna and Flora and relevant organizations, to explore ways and means to address the risks associated with trade in wildlife introduced as pets, aquarium and terrarium species, and as live bait and live food, noting that some trade is unregulated, unreported or illegal, including by enhancing cooperation with authorities responsible for the control of wildlife trade and to report to the Subsidiary Body prior to the thirteenth meeting of the Conference of the Parties (decision XII/16, para. 4).

2. In decision XII/17, the Conference of the Parties requested the Executive Secretary:

(a) To develop, in collaboration with relevant organizations, and taking into consideration the proposed assessment of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on invasive alien species, decision-support tools for assessing and evaluating the social, economic and ecological consequences of invasive alien species; cost-benefit analyses for eradication, management and control measures; and tools for examining the impacts of climate change and land-use change on biological invasions (para. 9 (c));

(b) To explore with relevant partners, including the standard-setting bodies recognized by the World Trade Organization (the International Plant Protection Convention, the World Organisation for Animal Health, and the Codex Alimentarius Commission) and other members of the inter-agency liaison group on invasive alien species, methods of alerting suppliers and potential buyers to the risk posed by invasive alien species sold via e-commerce,¹ and to report on progress to the Subsidiary Body prior to the thirteenth meeting of the Conference of the Parties (para. 9(d));

(c) To compile, in collaboration with the International Union for Conservation of Nature and through the Global Invasive Alien Species Information Partnership, information from Parties, scientific

* UNEP/CBD/SBSTTA/20/1/Rev.1.

¹ See CPM Recommendation CPM-9/2014/2 - Internet Trade (E-Commerce) in Plants and other Regulated Articles.
<https://www.ippc.int/en/core-activities/governance/cpm-recommendations/ippc-aquatic-plants-trade-commerce/>

institutions, and other relevant organizations on experiences in the use of biological control agents against invasive alien species, in particular the release in the wild of alien species for this purpose, including positive and negative cases and cases of the application of appropriate risk assessment, to submit a synthesis of this information to the Subsidiary Body on Scientific, Technical and Technological Advice prior to the thirteenth meeting of the Conference of the Parties, and to make this information available through the clearing-house mechanism (para. 9(g)).

3. Accordingly, the Executive Secretary issued a series of notifications (2015-052,² 2015-079,³ 2015-096,⁴ 2015-097⁵ and 2015-109⁶) and convened an expert meeting to collect up-to-date information and experts' opinions on the subjects mentioned in paragraphs 1-2 above. The expert meeting was held in Montreal, Canada, from 28 to 30 October 2015⁷ with financial support from the Governments of Sweden and Germany.

4. Drawing upon the work of the expert meeting and additional information received from members of the inter-agency liaison group on invasive alien species, the present note reviews: approaches to addressing the risks associated with trade in wildlife and with e-commerce (section II); experiences in the use of biological control agents against invasive alien species (section III); and decision-support tools (section IV).

5. The present note is complemented by a number of information documents, including the report of the expert meeting.

II. ADDRESSING THE RISKS ASSOCIATED WITH TRADE OF ALIEN SPECIES

A. Ways and means to address the risks associated with trade in wildlife

6. A range of processes under different international agreements address various aspects of risks of biological invasions associated with wildlife trade, including but not limited to trade in wildlife as wildlife introduced as pets, aquarium and terrarium species, and as live bait and live food. In this section, existing mechanisms and related guidance, and their possible application by Parties, other Governments, cross-border traders and relevant biodiversity stakeholders, are summarized.

Convention on International Trade in Endangered Species in Wild Fauna and Flora

7. The regulatory framework under the Convention on International Trade in Endangered Species in Wild Fauna and Flora (CITES) aims to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild. It does not contain measures to reduce the risk of biological invasion as a consequence of trade in wildlife. However, CITES Resolution 13.10 (Rev. CoP14⁸) recommended considering opportunities for synergies between CITES and CBD and to explore appropriate cooperation and collaboration on the issue of introductions of alien species with risk of biological invasions. In that context, some countries and regions have included invasive alien species of concern in wildlife trade regulations as part of the implementation of the CITES framework at the national or regional level.

8. Under CITES, species may be listed on one of three appendices, depending on the level of protection they require. International trade in specimens of CITES-listed species is authorized by government authorities, generally through the issuance of permits that allow the trade when it is found not to be detrimental to the survival of the species. Countries that are signatories to CITES must submit annual reports providing the number and type of permits and certificates granted, the States with which

² <https://www.cbd.int/doc/notifications/2015/ntf-2015-052-ias-en.doc>

³ <https://www.cbd.int/doc/notifications/2015/ntf-2015-079-ias-en.doc>

⁴ <https://www.cbd.int/doc/notifications/2015/ntf-2015-096-ias-en.doc>

⁵ <https://www.cbd.int/doc/notifications/2015/ntf-2015-097-ipbes-en.pdf>

⁶ <https://www.cbd.int/doc/notifications/2015/ntf-2015-109-ias-en.pdf>

⁷ <https://www.cbd.int/doc/?meeting=IASEM-2015-01>

⁸ <https://cites.org/eng/res/13/13-10R14.php>

such trade occurred, the quantities and types of specimens, and the names of species as included in Appendices I, II and III. The trade data submitted by CITES Parties is accessible through the CITES Trade Database.

9. This database currently holds over 15 million records of trade in wildlife and over 34,000 scientific names of taxa listed in the CITES Appendices. It represents a unique monitoring tool that can support informed decision-making; it also offers opportunities to detect emerging trends and identify important trade routes.

10. It is important to note that the risk of biological invasions posed by trade of live species for a distinct biogeographic region is not limited to the taxa listed in Appendices I-III of CITES. Any live organisms that can survive and subsequently reproduce may carry some level of risk ranging from acceptable to not acceptable in a distinct biogeographic region of the importing country. In order to regulate, record and prevent the illegal entries of live organisms that are not in the CITES Appendices I-III, countries would need to develop additional regulation for trade in wildlife. To date, Australia, Mexico, Japan, New Zealand, Samoa and South Africa, among others, provide import regulations on live species that are non-native to the country (biosecurity measures) or list known high-risk invasive alien species of concern to those countries and regulate their entry (invasive alien species measures).

11. In addition to the CITES Trade Database, other trade information systems that contain information on animals, plants, food, feed or products of animals and plants in trade (such as WTO Trade Statistics,⁹ the Trade Control and Expert System (TRACES) of the European Union¹⁰) should also be considered as sources of information and when developing measures for reducing risks of invasive alien species spread through trade.

World Trade Organization Agreement on Application of Sanitary and Phytosanitary Measures

12. Regarding live alien organisms that are regulated by national law, either under an invasive alien species act or biosecurity legislation, member Governments are expected to inform the World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures on their import regulations, which should be in conformity with standards, guidelines or recommendations set by standard setting organizations, as appropriate. Cross-border traders are required to obtain permits for the import of regulated live species from the authority of the country where the relevant national legislation is in place.

13. The International Standard for Phytosanitary Measures (ISPM) covers the following commodities with live species and packaging with risk of contamination of live organisms: (a) biological control agents targeting pests of plant (ISPM 03); (b) plants for planting (ISPM 36); and (c) wood packaging materials (ISPM 15). As further detailed below, the World Organization for Animal Health (OIE) Animal Health Codes cover listed diseases in live animals and vectors. Among the standards recognized through the SPS Agreement, a gap exists for live species that are not pests of plants and disease causative agents in, and attached to, live animals and live species with risk of biological invasions, and remain without appropriate risk reduction measures unless countries set national import regulations. In this context, the voluntary CBD guidance (see para. 21 below) contains some relevant technical guidance.

United Nations Centre for Trade Facilitation and Electronic Business

14. The United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) has established a Single Window to enhance the efficient exchange of information between trade and government (Recommendation No. 33, 2004).

15. The Single Window has been implemented at the national level in Brazil, Canada, Guatemala, Japan, Malaysia, Mexico, Singapore and the United States of America, among others. The Single

⁹ <http://stat.wto.org/Home/WSDBHome.aspx>

¹⁰ http://ec.europa.eu/food/animals/traces/index_en.htm

Window could be an effective and appropriate approach to improve monitoring of cross-boundary movements of regulated species beyond species listed in the CITES Appendices I-III, and to prevent the import of problem species if the national legislation sets import requirements. The Single Window approach allows the lodging of standardized information and documents with a single entry point to fulfil all import, export and transit-related regulatory requirements. Its implementation at the national level may facilitate reporting on regulated articles (including live alien organisms with phytosanitary and sanitary risks, and risks to biological diversity).

IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units

16. At its 93th meeting, in 2014, the Maritime Safety Committee of the International Maritime Organization (IMO) approved the revised IMO/International Labour Organization/United Nations Economic Commission for Europe Code of Practice for Packing of Cargo Transport Units (CTU Code).¹¹ The CTU Code was finalized with support from the International Plant Protection Convention's (IPPC) Expert Working Group on Sea Containers to incorporate elements of phytosanitary importance. The CTU Code is voluntary guidance on the safe packing of cargo transport units for those responsible for packing and securing cargo and for those whose task it is to train people to pack or unpack such units. Among other things, the code contains provisions to ensure that containers are free from plants, plant products, visible pests, animals and other invasive alien species.

17. The part of the CTU Code relevant to pests and the information on pest movement via sea containers are also important practices and information in invasive alien species management. Therefore, the actions described in the recommendation above may contribute to reducing the risk of biological invasions caused by contaminants on sea containers used for international trade.

18. In 2015 the Commission on Phytosanitary Measures (CPM), at its tenth session, adopted a recommendation with regard to the elements related to pests in the revised CTU Code, as follows:

“CPM encourages National Plant Protection Organizations to:

- (a) *Recognize* the risk of pests and regulated articles that can be moved with sea containers;
- (b) *Communicate* to those involved in packing of sea containers or in the movement of sea containers in and out of their country information about the risk of pest movement with sea containers;
- (c) *Support* the implementation of the relevant parts of the Code of Practice for Packaging of Cargo Transport Unit;
- (d) *Gather* information on pest movement via the sea containers themselves, rather than with the cargo moved within sea containers and to share such information, when and if, serious trends arise; and
- (e) *Analyse* the possible pest risk and, where justified and practical, take proportionate actions to mitigate risk.”

Animal health codes of the World Organisation for Animal Health

19. The World Organisation for Animal Health (OIE) is the WTO reference organization for standards relating to animal health and zoonoses. OIE has published two codes: the *Terrestrial Animal Health Code*,¹² which aims to assure the sanitary safety of international trade in terrestrial animals; and the *Aquatic Animal Health Code*,¹³ which sets out standards for the improvement of aquatic animal health and welfare of farmed fish worldwide, and for safe international trade in aquatic animals and their products.

¹¹ https://www.unece.org/fileadmin/DAM/trans/doc/2014/wp24/CTU_Code_January_2014.pdf

¹² <http://www.oie.int/international-standard-setting/terrestrial-manual/access-online/>

¹³ <http://www.oie.int/international-standard-setting/aquatic-code/>

20. A chytrid fungus, *Batrachochytrium salamandrivorans*, and a cockle parasite, *Marteilia cochillia*, are recently described pathogens causing high mortality in salamanders and cockles, respectively. The Aquatic Animals Commission discussed the situation regarding these new diseases with regard to consideration of their inclusion in the OIE list and, in the light of recent publications, agreed to undertake assessments against the criteria for listing (Chapter 1.2.) for *B. salamandrivorans* and *M. cochillia*. The Commission will review these assessments at its meeting in February 2016. Once the disease-causing agents are listed in the Health Codes and its *Manual of Diagnostic Tests for Aquatic Animals*, members of OIE issue notifications of occurrences of the related diseases and provide the epidemiological information to a global disease information system on the OIE website (World Animal Health Information Database Interface – WAHID Interface). WAHID provides official surveillance on the listed diseases under the Terrestrial and Aquatic Animal Health Codes, which contributes prevention of invasive alien species that threaten aquatic species, globally.

Guidance under the Convention on Biological Diversity

21. The risk of biological invasions of alien species introduced as pets, aquarium and terrarium species, and as live bait and live food have been addressed by the Conference of the Parties to the Convention on Biological Diversity in the “Guidance on Devising and Implementing Measures to Address the Risks Associated with the Introduction of Alien Species as Pets, Aquarium and Terrarium Species, and as Live Bait and Live Food” (decision XII/16, annex), which provides voluntary measures to be taken by Parties, other Governments, relevant organizations and stakeholders. The guidance seeks to address the risks associated with trade in wildlife at various levels, including the risk of escape of live species, noting that escape of live species from confined conditions was identified as the most frequent pathway to spread invasive alien species (see [UNEP/CBD/SBSTTA/18/9/Add.1](#)).

22. The voluntary guidance contains useful risk reduction measures for safe trade of live species *per se*. Therefore this guidance could be applied, *mutatis mutandis*, to live species beyond pets, aquarium and terrarium species, and live bait and live food. However, risks posed by the associated materials (packaging, media, food etc.) and so called “hitchhikers” (live organisms unintentionally attached to or contaminating the imported live species or its container) may not be sufficiently covered by this guidance. Thus, SBSTTA may wish to consider recommending that the application of the guidance be extended to all live species and that a supplement to the guidance be developed for the purpose of covering such risks.

Possible additional ways and means to address the risks associated with trade in wildlife

23. The expert meeting suggested that, to minimize the risks associated with live species trade, the following measures could be taken at various levels:

(a) Commodity-specific international standards for live organisms, including those transported as pets, aquarium and terrarium species, and as live bait and live food, could potentially be developed under the standard-setting process of IPPC;

(b) For the purpose of minimizing the potential risk of invasions, countries could ensure that they have a regulatory framework in place to control the import and spread of wildlife species and associated materials (packaging material, food, etc.) that can be pathways of introduction for invasive species. National sanitary and phytosanitary measures developed in compliance with the provisions of the WTO-SPS Agreement would contribute to reducing the risk of invasive alien species. The CBD “Guidance on Devising and Implementing Measures to Address the Risks Associated with the Introduction of Alien Species as Pets, Aquarium and Terrarium Species, and as Live Bait and Live Food” (decision XII/16, annex) also provides relevant information;

(c) Cooperation could be enhanced among national authorities responsible for the control of wildlife trade, including national authorities for CITES, and national authorities responsible for the control of invasive alien species;

(d) Application by actors in trade and industry of the voluntary measures indicated in the “Guidance on Devising and Implementing Measures to Address the Risks Associated with the Introduction of Alien Species as Pets, Aquarium and Terrarium Species, and as Live Bait and Live Food”

when trade in wildlife takes place, in particular, labelling on the consignment of live organisms as a potential hazard for biodiversity and proper identification of species with the scientific names/taxonomic numbers,¹⁴ are appropriate measures as indicated in the guidance;

(e) Governments and relevant organizations should explore ways and means to promote changes in the behaviour of individuals so as to reduce the risks to biodiversity associated with both legal and illegal trade in wildlife, including through engagement with social sciences and social media in targeted awareness campaigns, and through cooperation with wildlife trade organizations.

B. Risks associated with e-commerce

24. The term “e-commerce” refers to the trade of commodities conducted electronically on the Internet. E-commerce in live specimens obtained from wildlife, as well as plants for planting, seeds and products that contain seeds, and potentially associated living organisms, has become increasingly relevant to biological invasions since the trade volume and traded taxa through e-commerce have significantly expanded in recent years. A wide range of providers and potential buyers are involved in e-commerce in live species. These actors of e-commerce may have little knowledge of the risks or regulations pertaining to the import and use of invasive alien species. With the growth of e-commerce, mail and courier services have become frequent pathways of introduction of invasive alien species. There is an urgent need for measures to reduce the risk of introduction and spread of invasive alien species through this pathway.

25. Sanitary and phytosanitary measures developed in compliance with the provisions of the WTO Agreement on the Application of Sanitary and Phytosanitary Measures contribute to reducing the risk of invasive alien species sold via e-commerce. For example, standards, guidelines or recommendations set by standard-setting organizations, such as IPPC and OIE, and guidance produced by the Food and Agriculture Organization of the United Nations (FAO) consistent with the WTO Agreement on the Application of Sanitary and Phytosanitary Measures.

26. The “Guidance on Devising and Implementing Measures to Address the Risks Associated with the Introduction of Alien Species as Pets, Aquarium and Terrarium Species, and as Live Bait and Live Food” is also relevant to the commodities sold via e-commerce and transported to a new biogeographic region. It is highly important to prevent escape and release of live species from confined conditions when their impacts have not been reported or their risk of invasion has not been assessed.

27. To reduce the risk of invasive alien species sold via e-commerce, the following measures could be implemented at various levels:

(a) Consumers and e-commerce traders should have a greater awareness of the risks of biological invasions and knowledge on relevant national regulations and international standards related to invasive alien species in exporting and importing countries. E-commerce market places and related social media are recognized as effective platforms for disseminating information and have the potential to educate consumers on responsible trade in live species. The national authorities for international trade, border control and invasive alien species management should communicate national import regulations related to live species that are alien to the country and facilitate access to this information, through the companies represented in e-commerce market places, in order to reduce the risk of non-compliance with existing regulations, and to promote awareness of the issue of invasive alien species among the stakeholders in the value chain of e-commerce;

(b) Parties and other Governments may need to review the risk of biological invasion, as well as sanitary and phytosanitary risks, posed by all forms of distance selling, and, if necessary, appropriate national legislation should be considered to minimize the risk of biological invasions;

(c) Implementation of the Single Window approach (see paras. 14-15 above) at the national level could facilitate reporting on the trade of regulated live species via e-commerce.

¹⁴ The list of standard nomenclatural references (Checklist of CITES species <http://checklist.cites.org/#/en/>) in Resolution Conf. 12.11 (Rev. CoP16) is a static nomenclature for the species listed in appendices to the CITES. This nomenclature would need to be consistent with up-to-date taxonomy for the purposes of effective border controls.

III. USE OF BIOLOGICAL CONTROL AGENTS TO MANAGE INVASIVE ALIEN SPECIES

28. This section provides a synthesis of information on experiences in the use of biological control agents against invasive alien species based on the information submitted by Parties, other Governments, relevant organizations and experts. Detailed discussions made by the expert meeting on experiences in the use of biological control agents against invasive alien species can be found in the report of the expert meeting (UNEP/CBD/SBSTTA/20/INF/31).¹⁵

A. Lessons learned from biological control programmes

29. Classical biological control¹⁶ has over 100 years of practice based on scientific principles with many useful and well documented case studies of both successes and failures. Some early successful biological control programmes have generated sustained control of target species now for up to 80 years. There is a great deal of understanding, experience and expertise in the application of classical biological control. Successful cases largely relate to success at suppressing target invasive alien species populations, while lack of success or failure might include one or several of the following: lack of target suppression; assessed direct harmful non-target impacts on native species; direct unanticipated harmful non-target impacts on native species; indirect harmful impacts on native species and ecosystems.

30. Although successful cases draw positive expectations of biological controls, it is important to acknowledge that classical biological control may reduce, but not completely eliminate the impacts of the targeted invasive alien species. Suppression of the target species may also not be sufficient to restore the negatively impacted biodiversity, ecosystem service or other environmental benefits.

31. Furthermore, there are negative cases with significant non-target impacts on the native ecosystems from activities that were historically considered biological control attempts. Most of these cases were related to the uncontrolled release of vertebrates into islands or continents without appropriate risk assessment. There are also a few more recent examples of non-target impacts of biological control programmes which were caused by either a lack of consultation between neighbouring countries, unsupervised releases, or the accidental movement of biological control agents between countries.

32. With the long history and experiences gained by using biological control, recent cases have shown a significant reduction in the occurrence of non-target impacts. Classical biological control has provided in-depth understandings of: (a) costs versus benefits; (b) risks to biodiversity and human well-being; (c) applicability and feasibility; (d) likelihood of success; (e) likely timelines and sustained effectiveness of the biological control agents. Classical biological control is recognized as an effective measure to address the problems of already established invasive alien species in the environment. The classical biological control agent that controls the population of a targeted invasive alien species in one ecosystem would be expected to also effectively control the same species in a similar ecosystem elsewhere. Therefore, using classical biological control agents against invasive alien species has potential benefits beyond the specific project area. The information on applications of classical biological control measures should therefore be shared.

B. Technical considerations for the use of biological control agents to manage invasive alien species

Comprehensive risk assessment

33. The spread and impacts of biological control agents are largely uncontrollable once released into the environment. Classical biological control programmes therefore require rigorous risk analysis and independent review under government regulatory processes and decision-making processes prior to

¹⁵ <https://www.cbd.int/doc/meetings/ais/iasem-2015-01/official/iasem-2015-01-06-en.doc>

¹⁶ Host-specific natural enemies from the country of origin of the invasive alien species are identified, and one or more are imported and released to control the invasive alien species. It is expected that the biological control agent will establish itself permanently from the relatively small founder populations released, and that they will reproduce and spread (UNEP/CBD/SBSTTA/20/INF/32).

release being permitted by relevant government departments. The precautionary principle should be the basis for all decisions on the release of biological control agents.

34. A comprehensive risk assessment is a prerequisite for all biological control programmes so that there is clear understanding of the risks before and after programmes are implemented, and to allow improvements to be understood and adopted. The International Plant Protection Convention provides the International Standard for Phytosanitary Measures. ISPM3:2005 “Guidelines for the export, shipment, import and release of biological control agents and other beneficial organisms” relates specifically to the use of classical biological control. ISPM 2:2007, “Framework for pest risk analysis” and ISPM 11:2013, “Pest risk analysis for quarantine pests” are also relevant. These standards provide guidance on preventing impacts not only on the agricultural sector but also on the environment more generally. Such risk assessment protocols relate mostly to understanding potential direct non-target impacts by evaluating the host range of potential agents prior to their release.

35. OIE has published the “Guidelines for Assessing the Risk of Non-native Animals becoming Invasive”¹⁷ and the *Scientific and Technical Review* Vol. 29 (1) (2)¹⁸ on Invasive Species, to provide a basis for addressing invasion risks posed by organisms under the kingdom Animalia and animal disease causative agents.

36. Risk assessments should include the following elements:

(a) The potential for direct non-target impacts, including the degree to which the action of the biocontrol agent is specific only to the invasive alien species to be controlled and does not impact native species, habitats or ecosystems, including those that are important for the economy and distinct culture in the area where the biological control agents are planned to be released;

(b) The potential for indirect non-target impacts on the ecosystems, habitats, native species, or human health and safety, in the area where the biological control agents are planned to be released;

(c) The potential influence of climate and its current and future variability and other sources of environmental variation in the proposed region of release on the establishment, spread and impact of the biological control agent.

37. When considering the risks, as well as costs and benefits of a proposed release of a biological control agent, the risks and costs of inaction or comparative risks from other approaches, such as the use of chemicals or toxins to reduce an invasive alien species population, should also be considered and assessed.

38. Risk analysis traditionally includes hazard identification, risk assessment, risk management and risk communication. In biological control practice, the risk analysis typically focuses on the biological control agents to be introduced. However, risks can also arise from social or environmental factors. A comprehensive risk management approach including human response and broader facts in the environment is also needed. For example, the Unified Process Practices Guide on risk analysis published by the United States Centers for Disease Control and Prevention (CDC) would be useful for identifying potential management risks and possible solutions.

Classical biological control as part of an integrated ecosystem management package

39. Biological control, where applicable, should be carried out in the context of clear environmental restoration goals and as part of an integrated management approach. Biological control should be a component of a recognized active adaptive management approach for invasive alien species, and used together with short-term options such as cultural,¹⁹ mechanical or chemical control, whereby such options

¹⁷ <http://www.oie.int/doc/ged/D13931.PDF>

¹⁸ <http://www.oie.int/publications-and-documentation/scientific-and-technical-review-free-access/list-of-issues/>

¹⁹ Examples of cultural control: appropriate land preparation, use of clean seeds, equipment, and water for crop production to reduce the risk of invasions by pest species.

are safe and effective. Measures to promote habitat recovery, re-vegetation or full restoration should also be included in the control programme, as appropriate.

Cost-effectiveness and cost-benefit analysis

40. Biological control programmes require relatively high initial investments for risk analysis and testing, as well as a sustainable long-term resource commitment. Cost-effectiveness and cost-benefit analyses should therefore inform any decision-making in the process of biological control.

41. A cost-benefit or cost-effectiveness analysis should be undertaken through a collaborative process involving all relevant stakeholder groups. Recognized processes exist for each of these in invasive alien species management and systematic conservation planning. There is a need for standardized approaches or guidelines for cost-benefit or cost-effectiveness analysis on the use of classical biological control agents. Such analyses must be based on valid science, including spatially explicit information, with regard to any assumptions on: (a) establishment; (b) spread; and (c) likely impact. Such information should be included in standard economic benefit-cost models. Rigorous analysis of the potential for classical biological control to sustainably bring benefits to the recipient environment is very important for ensuring long-term financial support for classical biological control programmes.

Public consultation and collaboration (risk communication)

42. The legitimacy of classical biological control should be built upon wide public acceptance. Public participation should be sought actively, at least before releases of biological control agents begin. Information shared should be based on science and evidence. Public consultation also builds trust and hence acceptance of and support for biological control programmes.

43. Public understanding about biodiversity conservation is changing as more people become largely urban-based and city focused. Effective public consultation requires reaching the right audience but can also lead to broader community understanding of the need for and acceptance of long-term public investment in classical biological control and more general facts and principles around invasive alien species. Public consultation is particularly important for classical biological control because the approach is for public good rather than commercial gain.

44. Consultation and collaboration across sectors, such as the agricultural, environmental, health sectors and border protection services, and between the private and public sectors is critically important for successful use of biological control agents. It is particularly important that the agricultural and environmental (conservation) sectors share information, cost and technical capacities. There may also be opportunities for collaboration across these two sectors in the management of the aquatic environment and aquaculture to address the issue of invasive alien species, including aquatic weeds, pests and diseases.

45. Collaboration among stakeholders is particularly important when beneficiaries and risk bearers are in different stakeholder groups. These stakeholders may include sectoral authorities, practitioners, regulators, land managers, regional councils, etc., at the national and community levels. Collaborative activities among them can build trust and understanding. Stakeholder engagement also improves governance within the community for collective decision-making and continued engagement.

International collaboration

46. Classical biological control is very frequently conducted as an international collaborative activity with the participation of, and support from, multiple countries. At the international level, collaboration is important not only for sharing the benefits but also for sharing the costs and for increasing awareness of any risks from biological control agents. To improve international collaboration, open access and shared technical reports and relevant scientific publications (past and current) on classical biological controls need to be promoted.

47. Decisions on biological control programmes should be made in consultation with neighbouring countries that may be affected. Information exchange and consultations with neighbouring countries should be made at an early stage when planning programmes.

48. By its very nature, classical biological control often requires the sharing of organisms isolated from some distant country of origin. Parties should be encouraged to develop procedures that allow facilitated access to such biological control agents when implementing the Convention and the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity.

Systematic monitoring and evaluation in post-release phase

49. There is vital importance in monitoring and evaluating classical biological control programmes after releases have been made. Assessing the programme in relation to its invasive alien species and biodiversity conservation goals, and assessing whether the biological control agents released are causing any direct or indirect non-target impacts, are important to prevent any damage to the environment.

50. Monitoring is also important for demonstrating benefits to help build acceptance and support. Monitoring is vital in all adaptive and integrated management approaches against invasive alien species. Monitoring will also aid in understanding the resilience of classical biological control based approaches adopted in the face of climate variability, fluctuations and change as invasive alien species management in the future will increasingly require resilient classical biological control in the environment. Post-release monitoring should therefore be considered mandatory.

51. The ISPM 6:1997 “Guidance for Surveillance” may be usefully adapted to monitoring of classical biological control programme. Novel tools and automated technologies are also increasingly available to assist with effective monitoring. Encouraging citizen science observations with online portals for public data capture is another way of engaging public interest and involvement, and keeping costs down over the period of monitoring.

52. Understanding the success and failure of classical biological control programmes is vitally important to improve the approach and to more effectively apply classical biological control against invasive alien species. Such analyses need to be published in the scientific or grey literature (particularly the failures, which generally attract less interest). Such assessments can also aid in understanding if the decision to release a classical biological control agent was justified or correct and led to improvements in future classical biological control risk analyses, in particular with regard to risk management.

Capacity development

53. Capacity development is needed in many countries, in particular in developing countries, to enable the conduct of comprehensive risk analysis (risk assessment, risk management and risk communication). Technical and scientific cooperation should be further facilitated to develop capacities in safe use of classical biological control agents. Such capacity development requires training of skilled staff in the process beginning in scientific understanding, development of regulatory mechanism and long-term monitoring to be in place.

54. The secretariats of the international agreements, such as CBD, WTO SPS-Agreement, IPPC, OIE, FAO, and experts from the International Union for Conservation of Nature (IUCN), CABI and the International Organization for Biological Control (IOBC) could collaborate to promote, support and contribute to technical and scientific cooperation related to the use of biological control agents against invasive alien species.

IV. DECISION-SUPPORT TOOLS

55. The Executive Secretary, in collaboration with partner organizations, will compile or develop and maintain decision-support tools and make them available through the Convention’s clearing-house mechanism. A preliminary list of tools was made available for the expert workshop.²⁰ Users of the tools may include (a) national and subnational Governments; (b) stakeholders who participate decision-making process; and (c) experts who provide information and technical support to the decision-making process. The following is a summary of the findings of the expert meeting.

²⁰ See UNEP/CBD/SBSTTA/20/INF/33.

Importance of decision-support tools

56. Decision support tools are important in order to:

- (a) Increase the transparency of decision-making and provide a systematic framework for decisions;
- (b) Help systematically prioritize measures that are to be taken, such as determining which alien species have the highest potential to become invasive or which invasive species are feasibly the most manageable;
- (c) Assist decision makers in the screening for the best use of limited resources and ensuring cost-effectiveness of measures that will be taken based on the previous findings and information on economic analyses;
- (d) Enable timely and efficient cooperation and participatory decision-making among authorities, organizations and stakeholders who will be influenced by the decision.

Basis for decision-support tools

57. To implement the Strategic Plan for Biodiversity and achieve Aichi Biodiversity Target 9 on invasive alien species, existing voluntary guidance adopted by the Conference of the Parties to the Convention on Biological Diversity, and other international standards and guidance for application of sanitary and phytosanitary measures, provide an important basis for the development of tools.

58. Decision-making should be a participatory process. Stakeholders, including risk bearers and risk makers, should be identified and should be engaged from the beginning of the decision-making process. Participatory decision support tools would help to increase transparency in decision-making, reduce bias and support objective decisions, and enhance the effectiveness of measures taken to manage invasive alien species.

Decisions prior to the introduction of alien species

59. Biological invasion risk analyses with evidence-based assessments are key support tools for initiating the decision-making process prior to the introduction of alien species. ISPMs related to pest risk analysis for quarantine pests, the risk analysis framework for animal diseases and the OIE “Guidelines to assess risks of non-native animals becoming invasive” provide global guidance. The Generic Impact Scoring System (GISS) to assess impacts of alien species on environmental, economic, and social well-being²¹ and the Environmental Impact Classification for Alien Taxa (EICAT)²² are also important to produce information on risks with respect to the environment/conservation.

Decisions on management of invasive alien species

60. Decision-making on the introduction, eradication, containment, mitigation or control of invasive alien species should consider the balance between the environmental, social and economic benefits and costs related to biological invasion and remedial actions. The existing tools shown in the information document listing the decision-support tools, including the tools assessing the impact of climate should be made accessible through the CBD website in a manner that users of the tools can easily find them.

61. To reduce any future risks, it is necessary to consider drivers of trade, future trade patterns and invasive alien species that may come into trade. Further development of tools is needed in order to assess and evaluate the social, economic and ecological consequences of invasive alien species.

²¹ Kumschick S, Bacher S, Evans T, Marková Z, Pergl J, Pyšek P, Vaes-Petignat S, van der Veer G, Vilà M, Nentwig W. 2015. Comparing impacts of alien plants and animals in Europe using a standard scoring system. *Journal of Applied Ecology* 52: 552-561.

²² Hawkins CL, S Bacher, F Essl, PE Hulme, JM Jeschke, I Kuhn, S Kumschick, W Nentwig, J Pergl, P Pyšek, W Rabitsch, DM Richardson, M Vilà, JRU Wilson, P Genovesi & TM. Blackburn 2015. Framework and Guidelines for Implementing the Proposed IUCN Environmental Impact Classification for Alien Taxa (EICAT). Diversity & Distribution. DOI: 10.1111/ddi.12379.

62. Access to correct and up-to-date information is crucial in all occasions of decision-making. It is therefore important that information sources and databases on invasive alien species at national, regional and international scales are continually updated, maintained and further developed to enable users to find the information that can support sound decisions.

V. SUGGESTED RECOMMENDATIONS

64. The Subsidiary Body on Scientific, Technical and Technological Advice may wish to adopt a recommendation along the following lines:

The Subsidiary Body on Scientific, Technical and Technological Advice

Takes note of the report of the Expert Meeting on Alien species in wildlife trade, experiences in the use of biological control agents and development of decision support tools for management of invasive alien species.²³

65. The Subsidiary Body may also wish to recommend that the Conference of the Parties adopt a decision along the following lines:

The Conference of the Parties,

Recalling its provisions related to Article 8(h) of the Convention and existing standards, guidelines and recommendations under the international regulatory framework relevant to invasive alien species,

Additional ways and means to address the risks associated with trade in wildlife

Recalling decisions XII/16 and XII/17,

1. *Encourages* Parties, other Governments and relevant organizations, consumers and traders to make use of the Guidance on Devising and Implementing Measures to Address the Risks Associated with the Introduction of Alien Species as Pets, Aquarium and Terrarium Species, and as Live Bait and Live Food, in addressing risks associated with the introduction of all live alien species, beyond pets, aquarium and terrarium species, and live bait and live food, applying the guidance *mutatis mutandis*;

2. *Invites* the International Plant Protection Convention, in collaboration with the inter-agency liaison group on invasive alien species, to consider developing commodity-specific international standards for live species including risks posed by the associated materials (such as packaging, media, food) and live organisms unintentionally attached to or contaminating the imported live species or its container, taking into account the existing domestic regulations and approaches;

3. *Encourages* Parties and other Governments to review their regulatory framework with a view to ensuring the control of the import and spread of wildlife species and associated materials (such as packaging material and food) that can be pathways of introduction for invasive species, making use of appropriate risk analysis processes;

4. *Urges* actors in trade and industry to apply the voluntary measures indicated in the Guidance on Devising and Implementing Measures to Address the Risks Associated with the Introduction of Alien Species as Pets, Aquarium and Terrarium Species, and as Live Bait and Live Food when trade in wildlife takes place, for example the use of labelling on the consignment of live organisms as a potential hazard for biodiversity and the proper identification of species with the scientific names/taxonomic numbers;

5. *Encourages* Parties, other Governments and relevant organizations, including research organizations, to explore ways and means to promote changes in behaviour of individuals so as to reduce the risks to biodiversity associated with both legal and illegal trade in

²³ UNEP/CBD/SBSTTA/20/INF/31.

wildlife, including through the engagement with social sciences and social media in targeted awareness campaigns, and through cooperation with wildlife trade organizations;

Reducing the risk associated with trade in invasive alien species sold via e-commerce

6. With a view to reducing the risk associated with trade in invasive alien species sold via e-commerce, *urges* Parties, other Governments, relevant international organizations, consumers and e-commerce traders:

(a) To promote greater awareness among consumers, e-commerce traders and other stakeholders about the risks of biological invasions on the one hand, and the relevant international standards and national regulations on the other through, inter alia, e-commerce market places and related social media;

(b) To review the risk of biological invasions, and associated sanitary and phytosanitary risks, posed by all forms of distance selling and, as necessary, develop appropriate measures to minimize the risks;

(c) To consider using, or promoting the use of, the Single Window approach of the United Nations Centre for Trade Facilitation and Electronic Business to facilitate reporting on the trade in regulated live species via e-commerce.

Reducing the risk of invasive alien species moving with sea containers

7. *Welcomes* the revised IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units and recommendations of the Commission on Phytosanitary Measures at its tenth session that are related to prevention and minimizing the risk of invasive alien species spreading with sea containers;

8. *Invites* Parties and other Governments:

(a) To communicate about the risk of invasive alien species of the country's concern that move and spread via sea containers with those stakeholders involved in the packing of sea containers or the movement of sea containers in and out of their country

(b) To support the implementation of the relevant parts of the Code of Practice for Packing of Cargo Transport Units;

(c) To gather information on the movement of invasive alien species via sea containers themselves, rather than with the cargo moved within sea containers and to share such information should serious trends arise;

(d) To analyse the possible biological invasion risk and, where justified and practical, take proportionate actions to mitigate the risk.

Biological control of invasive alien species

Recognizing that classical biological control can be an effective measure to manage already established and widespread invasive alien species, that use of biological control agents can also present direct and indirect risks to non-target organisms and ecosystems and that these risks can be addressed through appropriate procedures including comprehensive risk assessment;

9. *Encourages* Parties, other Governments and relevant organizations, to make use of classical biological control, through appropriate procedures, including comprehensive risk assessment, to manage already established and widespread invasive alien species, making use, as appropriate, of the summary of technical considerations annexed to the present draft decision;

10. *Requests* the Executive Secretary to further collaborate with the International Plant Protection Convention, the World Organization for Animal Health, the Food and Agriculture Organization of the United Nations and other members of the inter-agency liaison

group on invasive alien species to identify options to address gaps in risk assessment and risk management standards for the use of biological control agents against invasive animal species;

Decision support tools

11. Further to decisions IX/4 A, X/38, XI/28 and XII/17, *requests* the Executive Secretary, in collaboration with partner organizations:

(a) To compile or develop and maintain decision support tools and make them available through the clearing-house mechanism of the Convention;

(b) To develop technical guidance for conducting cost-benefit and cost-effectiveness analysis for management of invasive alien species.

*Annex***SUMMARY OF TECHNICAL CONSIDERATIONS FOR THE USE OF BIOLOGICAL CONTROL AGENTS TO MANAGE INVASIVE ALIEN SPECIES****Classical biological control**

1. Classical biological control is the control of invasive species by host-specific natural enemies – biocontrol agents. Such natural enemies from the country of origin of the invasive alien species targeted for control are identified, and subjected to risk assessment against direct and indirect non-target impacts, in line with national law and international standards. If the results of the risk assessment permit, the biological control agents are imported, further tested and released to control the invasive alien species. The biological control agents are expected to establish permanently from the founder population released, and to reproduce and spread, causing suppression of the target organism. Classical biological control assists mitigation of the negative impacts of invasive alien species and expedites the restoration of biodiversity but rarely leads to the complete eradication of a target species. Biological control is usually carried out as part of an integrated management approach in the context of clear goals for conservation and restoration.

Precautionary approach and risk assessment and management

2. Comprehensive risk assessment of candidate biological control agents against direct and indirect non-target impacts, prior to any release decision, is key for the success of classical biological control programmes.

3. Comprehensive risk assessment affords a clear understanding of the risks before and after programmes are implemented and allows improvements to be understood and adopted. Internationally harmonized guidance, such as that provided in the International Standards for Phytosanitary Measures (ISPMs) pertaining to the pest risk analysis process (including ISPM 2, 3, 11), provides readily available guidance for this purpose.

4. Risk assessments should include the following elements:

(a) The potential for direct non-target impacts, including the degree to which the action of the biocontrol agent is specific only to the invasive alien species to be controlled, and does not impact native species, habitats or ecosystems, including those that are important for the economy and the distinct culture in the area where the biological control agents are planned to be released;

(b) The potential for indirect non-target impacts on the ecosystems, habitats, native species, or human health and safety, in the area where the biological control agents are planned to be released;

(c) The potential influence of climate and its current and future variability and other sources of environmental variation in the proposed region of release on the establishment, spread and impact of the biological control agent.

5. The following procedures should be respected:

(a) Quarantine infrastructure of sufficient standard and appropriate standard operating procedures should be available to ensure that the agents can be safely imported, tested and cleaned of any diseases and parasites before any releases are made;

(b) Host selection and host specificity testing and efficacy studies of biological control agents should take place either in the country of origin or in an appropriately registered quarantine facility within the country of introduction;

(c) Qualified taxonomists, including experts in phylogenetic analysis, should be involved in the selection and testing to correctly identify all potential biocontrol agents and the species undergoing the testing;

(d) Shipments of live biological control agents conform to applicable national (origin, destination and transit countries) and international regulations, and permits for the import of live

organisms include appropriate labelling. This is generally a requirement of all shipping and courier companies.

6. Social factors should be addressed, including any conflicts of interest surrounding the control of the target as well as the potential for cognitive bias in the community regarding management of invasive alien species.

Planning and implementation of biological control programmes

7. The following planning and implementation measures are recommended:

(a) Carrying out biological control programmes in the context of clear environmental conservation and restoration goals and as part of an integrated management approach, consistent with the Ecosystem Approach and its 12 principles;

(b) Availability of substantial initial investments for exploration, risk analysis and quarantine facilities, as well as sustainable long-term funding to support mass rearing and redistribution of biological control agents and post-release monitoring and surveillance;

(c) Full engagement by the State authority for the management of pests and pathogens and of appropriate State regulators responsible for release decisions;

(d) Engagement of all relevant stakeholders, at the cross-jurisdictional, cross-sector, and cross-stakeholder levels, to take account of varying and complementary goals, knowledge, experience, and capacity development, and to allow a fair distribution of benefits and costs.

Post-release monitoring, emergency plan and rapid response

8. Post-release monitoring allows for rapid detection and measurement of any predicted, unpredicted direct or indirect negative impacts of the agents on biodiversity or agriculture and can assist emergency planning and rapid response. In this context, long-term monitoring and evaluation of impacts (positive or negative) using standardized and cost-effective methodologies is important.

Decisions on release of biological control agents

9. For decisions regarding biological control programmes, participatory decision-making is encouraged. This includes the communication of information on risks and options for their management. This process is most usefully initiated at the early stage of the development of a biological control programme to ensure that the interests of all relevant stakeholders are considered in view of the conservation goals set for the specific programme.

10. The provision of relevant scientific information for neighbouring countries prior to the approval of the release of biological control agents supports regional consultation and the sharing of relevant knowledge, and allows neighbouring countries to offer feedback and prepare for any potential negative impacts.

11. Sharing post-release monitoring information widely, including with neighbouring countries and other experts, can support the improvement of biological control programmes elsewhere, and the approaches adopted in the face of climate variability, fluctuations and changes.

Capacity development

12. Technical and scientific cooperation to develop capacities in classical biological control, from scientific understanding through the regulatory process to the training of skilled staff, is crucial for the success of biological control programmes.
