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GUIDELINES FOR ASSESSING THE RISK OF NON-NATIVE ANIMALS BECOMING INVASIVE

I. Definitions for the purpose of this document

Animal: means any species, subspecies or lower taxon of the kingdom animalia with the exception of pathogens.

Non-native (or alien) animal: means an animal that is not a native to the country or ecosystem to which it could be intentionally or unintentionally introduced.

Invasive non-native (or invasive alien) animal: means an animal that has been introduced and subsequently become established and spread outside its native distribution area and caused harm to the environment, animal or human health, or the economy.

Hazard: means a non-native animal.

Hazard identification: means the process of identifying whether an animal is native or not in the importing country or region.

Hitchhiker organism: means an organism that has an opportunistic association with a commodity or vehicle/vessel or container and which may be transported unintentionally to a new environment.

II. Scope

In the framework of the international movement of animals, it is important to analyse both the risk of a non-native animal becoming invasive and the risk of pathogens being introduced with the animal. These different risks should be assessed as separate, sequential and complementary processes.

The OIE standard for import risk analysis covers the potential movement of pathogens. The guidelines developed in this document are intended to address the complementary process of assessing the risk of non-native animals becoming invasive.

III. Introduction

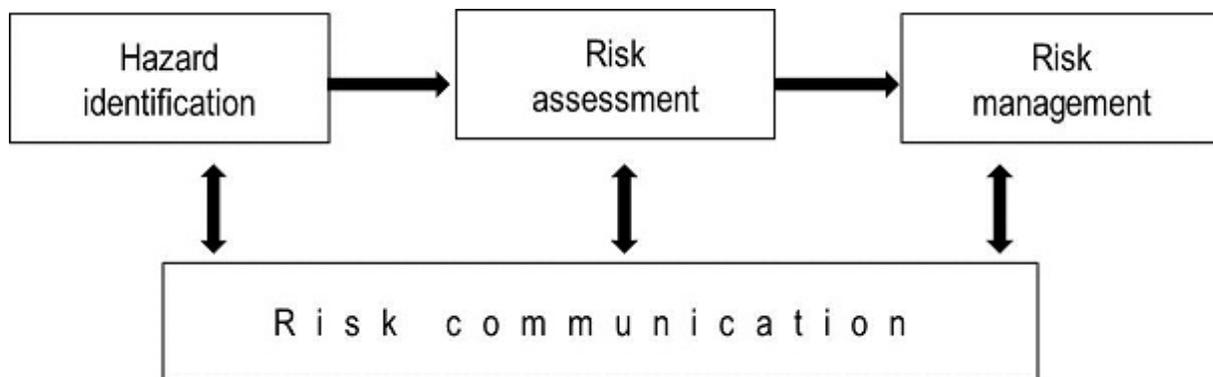
Organisms that have been introduced outside their native distribution and which subsequently become established and harmful to the environment, animal or human health, or the economy are considered “invasive non-native species.” Invasive non-native species are one of the major drivers of biodiversity loss world-wide and are particularly a threat to geographically and evolutionarily isolated ecosystems (e.g., islands).

Trade is responsible for the movement of large numbers of live animals, comprising a wide diversity of species, around the world. Although the majority of these animals are not intended for release into the natural environment, some are, and others either escape or are subsequently released when their owners no longer wish to care for them. Trade in live animals thus plays a major role in facilitating invasions by non-native species world-wide. Because of the potential for non-native animals to become invasive, science-based risk analysis should be conducted before decisions are made with respect to the proposed importation of non-native animal species into a country or area. Risk analysis is also an important tool when considering the risks posed by so-called ‘hitchhiker’ organisms which may be associated with imported commodities or the vehicle/vessel or container in which they are imported.

The principal aim of assessing the risk of non-native animals becoming invasive is to provide importing countries with an objective and defensible method of determining whether such imported animal species are likely to become harmful to the environment, animal or human health, or the economy. The risk analysis should be transparent and participatory, providing stakeholders with the opportunity to contribute to the process and understand the reasons for decisions made. Transparency is also essential because data are often uncertain or incomplete and, without full documentation, the distinction between facts and the analyst's value judgements may blur.

These guidelines provide recommendations and principles for conducting transparent, objective and defensible analyses of the risks posed by the importation of non-native animal species. The guidelines are also useful in assessing the risks posed by hitchhiker organisms. The components of risk analysis described in these guidelines are hazard identification, risk assessment, risk management and risk communication (Figure 1).

Fig. 1. The four components of risk analysis



A risk analysis is initiated either by a request to import a new species or a species for a new purpose. However, even non-native species that are already within a country's borders may be considered for risk analysis, especially if there is a high likelihood of them being introduced, or escaping, into the natural environment. All pathways showing a potential for the introduction of non-native animals should receive some degree of risk assessment, with those pathways that show a high potential for introducing non-native animals being subject to in-depth risk assessment.

IV. Hazard identification

In the case of trade in non-native animals, the animal under consideration is the hazard. This hazard should usually be identified to the level of species although in some instances identification to the level of genus may suffice while in others, identification to the level of breed, subspecies, hybrid or biotype may be required.

In the case of so-called hitchhiker organisms, the hazard identification involves identifying species which could potentially produce adverse consequences if introduced in association with an imported commodity (animals or animal products) or the vehicle/vessel or container in which it is imported.

It is necessary to identify whether each potential hazard is already present in the importing country or area into which the animals are imported. This is not always easy for animals traded widely for a diversity of commercial and private purposes and which may already be present in private collections.

Identifying whether a species is present in a country or region requires historical information on the abundance and distribution of animals and therefore typically requires consultation with a variety of stakeholders. Ecological boundaries, as opposed to political boundaries, should be considered. Consultation and coordination with appropriate authorities in neighbouring countries may help to determine species distribution and abundance. The presence of a particular species in the importing country or area does not necessarily eliminate the need for risk assessment, since the likelihood of non-native animals becoming invasive is also dependent on a number of additional importation factors such as size and frequency of importations, transport methods, intended use, containment etc.

Hazard identification is a categorisation step, identifying animals dichotomously as hazards or not. For the purpose of these guidelines all non-native animals are considered a hazard.

V. Principles of risk assessment

The risk assessment is the component of the risk analysis which estimates the risks associated with a hazard. Risk assessments may be qualitative or quantitative. Qualitative risk assessment does not require mathematical modelling skills to carry out and so is often the type of assessment used for routine decision making.

Risk assessment should be flexible to deal with the complexity of real life situations. No single method is applicable in all cases and different methods may be appropriate in different circumstances. Risk assessment should be able to accommodate the variety of non-native animal species that may be considered for importation, entry and spread scenarios, and types and amounts of data and information.

The aim of a risk assessment is to assist in decision making in the face of uncertainty.

Both qualitative risk assessment and quantitative risk assessment methods are valid.

The risk assessment should be based on the best available information that is in accord with current scientific thinking. The assessment should be well-documented and supported with references to the scientific literature and other sources, including expert opinion and that of participating stakeholders.

Consistency in risk assessment methods should be encouraged and transparency is essential in order to ensure fairness and rationality, consistency in decision making and ease of understanding by all the interested parties.

Risk assessments should document the uncertainties, the assumptions made, and the effect of these on the final risk estimate.

The risk assessment should be amenable to updating when additional information becomes available.

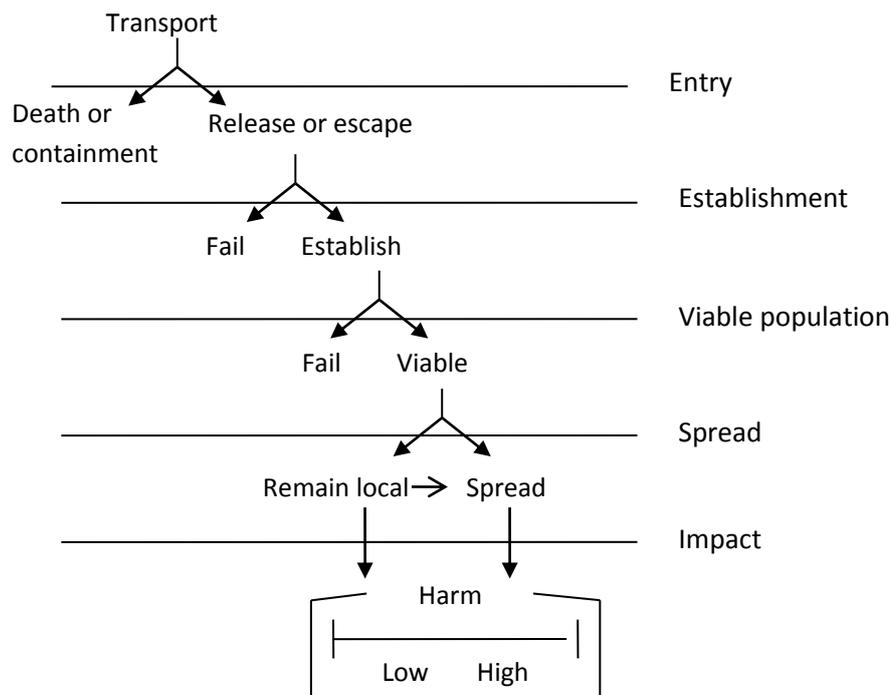
In addition to the general principles of risk assessment, assessment of the risk of non-native animals becoming invasive needs to consider certain unique aspects such as:

- The risk assessment need not be at a country level, but at an ecosystem level that may be sub-national.
- The risks may be borne by multiple subjects such as people, other animals or landscapes, thus requiring a systems-based approach to risk assessment.
- An invasive animal species may cause harm through a variety of mechanisms, both direct and indirect.
- The effects of an invasive animal species are often dependent on environmental conditions and may thus change over time in response to factors such as climate change.

VI. Risk assessment steps

The risk assessment examines the entire process by which a non-native animal species could enter a country, be introduced (escape or release) into the environment, become established, spread and cause harm. The steps in this process of invasion are illustrated in Figure 2.

Fig.2. *The stages in the process of invasion by non-native animal species*



1. Entry assessment

Entry assessment consists of describing the pathway(s), biological or non-biological, necessary for an importation activity to introduce non-native animal species into a particular environment, and estimating the probability of that complete process occurring, either qualitatively (in words) or quantitatively (as a numerical estimate). The entry assessment describes the probability of the entry of each of the hazards (the non-native animals) under each specified set of conditions with respect to amounts and timing, and how these might change as a result of various actions, events or measures.

- a) Circumstances of entry and containment. Do the circumstances of transportation and containment on arrival prevent escape or release? Examples of the kind of inputs that may be required are:
 - whether entry is intentional or unintentional;
 - whether different commodities, vehicles/vessels or containers are capable of harbouring the animal under consideration;
 - security of containment, if any;
 - planned movement, use and holding conditions upon and after arrival.
- b) Biological factors. What are the features of the animal that may affect its survival during transport and in its initial holding? Examples of the kind of inputs that may be required are
 - species, subspecies or lower taxon, sex, age and breed of animals;
 - the ability of the organism to survive the conditions and duration of transport;
 - the number of individual animals per importation;
 - ease of escape or release from containment;
 - ability to survive in the environment of the importing country.

If the entry assessment demonstrates no significant risk, the risk assessment does not need to continue.

2. Establishment and spread assessment

Establishment and spread assessment consists of describing the biological conditions necessary for the hazards (in this case the non-native animals) to survive escape or release and estimating the probability of establishment and spread occurring, either qualitatively or quantitatively.

The probability of establishment and spread of the non-native animals is estimated for the local environment with respect to the number, size, frequency and season of escapes or releases.

- a) Biological factors: What are the features of the animals that may affect the probability of establishment and spread of the animals? Examples of the kind of inputs that may be required are:
- history of invasiveness elsewhere;
 - number and size of releases or escapes (propagule pressure);
 - reproductive biology and capacity (fecundity, age of sexual maturity, breeding frequency, gestation length, etc.);
 - diet;
 - whether the animals under consideration are wild or domesticated;
 - whether the animals under consideration are generalist or specialised species;
 - range of tolerance and adaptability to environment and climate;
 - dispersal mode and capacity;
 - longevity;
 - density dependence.
- b) Receiving environment: What are the features of the receiving environment that may affect the probability of establishment and spread of the animals? Examples of the kind of inputs that may be required are:
- climate match with the species native environment;
 - presence of suitable food source;
 - presence of suitable breeding sites;
 - geographical and environmental characteristics;
 - presence of predators, competitors, parasites and pathogens.
- c) Containment factors: What are the management factors that may affect the probability of establishment and spread? Examples of the kind of inputs that may be required are:
- security capacity for housing, handling and transportation;
 - intended use of the imported animals (e.g. pets, zoological collections, live food or bait, research etc.);
 - the nature and frequency of human-assisted animal movements;
 - live animal disposal practices (euthanasia, release, rehoming, etc.).

If the establishment and spread assessment demonstrates no significant risk, the risk assessment may conclude at this step.

3. Consequence assessment

The consequence assessment describes the potential consequences of a given establishment and spread of the animals and estimates the probability of them occurring. This estimate may be either qualitative or quantitative. The social and biological costs associated with the effects of invasive non-native species

are often very difficult to assess and measuring socio-economic impacts of invasive animal species requires data of sufficient magnitude and quality, which are often not available. Examples of consequences include:

- a) Direct consequences:
 - Harm to ecosystems;
 - harm to native species;
 - economic damage;
 - impacts on human health and well-being.
- b) Indirect consequences:
 - Surveillance, containment, control and eradication costs;
 - compensation costs;
 - potential trade losses;
 - impacts on socio-cultural values.

4. Risk estimation

Risk estimation consists of integrating the results from the entry assessment, establishment and spread assessment, and consequence assessment to produce overall measures of risks associated with the hazards identified at the outset. Thus risk estimation takes into account the whole of the risk pathway from hazard identified to unwanted outcome.

For a qualitative assessment, the final outputs may include:

- estimated costs for surveillance and control in descriptive terms such as ‘high’, ‘medium’ or ‘low’;
- estimated level of impact on animals, ecosystems or habitats, or people in terms such as ‘high’, ‘medium’ or ‘low’;
- lists of potential evidence-based impacts of significance warranting consideration in decision making;
- description of relative risk and range in terms such as ‘high to very high’ etc.

For a quantitative assessment, the final outputs may include:

- estimated costs for surveillance and control;
- estimated numbers of herds, flocks, animals, ecosystems or habitats, or people likely to experience health impacts of various degrees of severity over time;
- probability distributions, confidence intervals, and other means for expressing the uncertainties in these estimates;
- portrayal of the variance of all model inputs;
- a sensitivity analysis to rank the inputs as to their contribution to the variance of the risk estimation output;
- analysis of the dependence and correlation between model inputs.

VII. Principles of risk management

Risk management is the process of deciding upon and implementing measures to achieve the Member's appropriate level of protection in a cost-effective manner, whilst at the same time ensuring that negative effects on trade are minimised. The objective is to manage risk appropriately to ensure that a balance is achieved between a Member's desire to minimise the likelihood of incursions of non-native invasive species and their consequences and its desire to import commodities and fulfil its obligations under international trade agreements.

VIII. Risk management components

1. Risk evaluation -the process of comparing the risk estimated in the risk assessment with the Member's appropriate level of protection.
2. Option evaluation - the process of identifying, evaluating the efficacy and feasibility of, and selecting measures to reduce the risk associated with an importation in order to bring it into line with the Member's appropriate level of protection. The efficacy is the degree to which an option reduces the likelihood or magnitude of adverse consequences for biodiversity, animal and human health, and the economy. Evaluating the efficacy of the options selected is an iterative process that involves their incorporation into the risk assessment and then comparing the resulting level of risk with that considered acceptable. The evaluation for feasibility normally focuses on technical, operational and economic factors affecting the implementation of the risk management options but because the assessment of risk from non-native animals must consider socio-cultural aspects, option evaluation must also consider the cultural, ethical and political acceptability of the various risk management options.
3. Implementation - the process of following through with the risk management decision and ensuring that the risk management measures are in place.
4. Monitoring and review - the ongoing process by which the risk management measures are continuously audited to ensure that they are achieving the results intended.

IX. Principles of risk communication

1. Risk communication is the process by which information and opinions regarding hazards and risks are gathered from potentially affected and interested parties during a risk analysis, and by which the results of the risk assessment and proposed risk management measures are communicated to the decision-makers and stakeholders in the importing and exporting countries. It is a multidimensional and iterative process and should ideally begin at the start of the risk analysis process and continue throughout.
2. A risk communication strategy should be put in place at the start of each risk analysis.
3. The communication of the risk should be an open, interactive, iterative and transparent exchange of information that may continue after the decision on importation.
4. The principal participants in risk communication include the authorities in the exporting country and other stakeholders such as domestic environmental and conservation groups, local communities and indigenous peoples, domestic livestock producers and consumer groups.
5. The assumptions and uncertainty in the model, model inputs and the risk estimates of the risk assessment should be communicated.
6. Peer review is a component of risk communication which is carried out in order to obtain scientific critique and to ensure that the data, information, methods and assumptions are the best available.

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