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European Strategy
on
Invasive Alien Species

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INTRODUCTION

Why does Europe need a Strategy on invasive alien species?

European States are required to address invasive alien species (IAS) issues under a range of international instruments. In the biodiversity sector, these include the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and the Convention on Biological Diversity (CBD). Member States of the European Union are also bound by specific IAS measures in the Birds and Habitats Directives and CITES Regulations.

In 2002, the CBD's Conference of the Parties drew up recommendations and Guiding Principles to assist in the implementation of Article 8(h) (Decision VI/23). It **called on Parties**, other governments and relevant bodies to prioritise the development and implementation of IAS strategies and action plans at national and regional level.

Europe has long recognised the need for a regional approach to IAS prevention and began to develop technical references well ahead of many other regions. Its size, number of countries and borders and free trade arrangements make it essential to promote consistency and avoid unilateral national efforts being undermined by their neighbours' inaction. Moreover, IAS can themselves act as barriers to free trade e.g. where governments and industries are unable to sell some types of food products or 'living' commodities or to use certain kinds of containers.

Since 1989, the Bern Convention has initiated a range of relevant actions. These include the adoption of recommendations on general IAS issues and specific problems, production of technical reports, organisation of workshops and establishment of an IAS experts' group in collaboration with the European Section of the IUCN Invasive Species Specialist Group.

In 2000, this group began work on developing elements for a draft European Strategy on Invasive Alien Species to promote implementation of Art.8(h) of the CBD. In 2002, this regional approach was endorsed at the Second Intergovernmental Conference on Biodiversity in Europe in Budapest and welcomed by the CBD at COP6.

The draft Strategy provides a tool to help States to implement **international commitments and best practice and to develop practical policies, measures and priorities for action.**

IAS status and trends in Europe

Biotic invasions represent a major challenge for conservation in Europe in the new millennium. Increased volumes of trade, transport and tourism and the unprecedented accessibility of goods caused by the globalisation of economies are driving an enormous growth in species movements (both intentional and unintentional). This presents a significant risk of the wholesale homogenisation of ecosystems.

Several endangered species in Europe are threatened by introduced alien species (e.g. European mink by the American mink[1]; White-headed duck by the Ruddy duck[2]). The ongoing expansion of the American grey squirrel in north-west Italy is causing the progressive disappearance of the native red squirrel in all overlap areas and is considered a potential threat to forest ecosystems at a continental scale[3]. European forests were also profoundly altered by Dutch elm disease, caused by fungi introduced from Asia, that devastated elm tree populations in much of central Europe and Great Britain[4].

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[1] Sidorovich V, Kruuk H & Macdonald DW (1999) Body size, and interactions between European and American mink (*Mustela lutreola* and *M. vison*) in Eastern Europe. Journal of Zoology 248: 521-527

[2] Hughes B, Criado J, Dalany S, Gallo-Orsi U, Green A, Grussu M, Perennou C & Torres JA (1999) The status of the ruddy duck (*Oxyura jamaicensis*) in the western Palearctic: towards an action plan for eradication. Report by the Wildlfowl & Wetlands Trust to the Council of Europe

[3] Bertolino S., P. Genovesi, 2002. Spread and attempted eradication of the grey squirrel (*Sciurus carolinensis*) in Italy, and consequences for the red squirrel (*Sciurus vulgaris*) in Eurasia. Conservation Biology, in press.

[4] Schrader G., J.G. Unger (2000). Plant pests as alien invasive species: success and failure of European phytosanitary measures – a German view. CBD Technical Series n°1: 81-83.

IAS have also imposed huge losses on the European economy. Leaving aside introduced pests and diseases affecting agriculture, alien parasites such as *Gyrodactylus salary* and *Anguillicola crassus* have led to dramatic decreases in fisheries sector incomes in several Nordic countries[5]. The muskrat and coypu, both introduced in the last century by the European fur industry, damage river banks through digging and have increased the risk and severity of floods in many central and southern European countries.

Despite the Bern Convention efforts, Europe's practical programmes and coordination on IAS lag behind many other regions of the world. Whilst Europe's characteristics arguably make it harder to develop and implement common trade and movement policies, this should not be used as an excuse for failing to take decisive action.

Some impacts of past invasions could have been reduced if European countries had uniformly applied relevant rules and codes of practice and had taken rapid action to eradicate introduced species following their detection. Several biological invasions now threatening Europe might have been prevented by a higher level of awareness of IAS issues and a stronger commitment to address it. Current inaction, in many though not all countries, is becoming increasingly disastrous for the region's biodiversity, health and economy,

Constraints to address

For the countries of Europe to make progress on IAS issues, they need to overcome a range of scientific and technical, policy and ethical obstacles.

The Strategy seeks to address seven fundamental constraints to effective prevention and management of invasive alien species that affect native biodiversity. These are:

- public indifference, lack of knowledge and opposition to government interference
- shortage and inaccessibility of scientific information for assessment and reduction of IAS risks
- ease of introduction and movement (e.g. through the post)
- uncertainty concerning the 'grey area' between justified sanitary measures and disguised trade barriers
- inadequate inspection, quarantine and monitoring capacity
- lack of effective emergency response measures
- inadequate coordination and cooperation between government agencies, between countries and with industry and other stakeholders.

Who is the Strategy for?

The Strategy is primarily targeted at governments of Contracting Parties to the Bern Convention. It aims to engage not only nature conservation agencies but also all sectoral agencies with responsibility for activities relevant to IAS prevention or management.

The Strategy is also addressed to the Bern Convention Secretariat and makes concrete proposals for regional leadership and synergy on IAS issues.

Thirdly, the Strategy recognises the range of stakeholders involved in the movement and use of alien species (industry and trade, transporters, retailers, resource managers, the public) and the contribution that competent non-governmental organisations (NGOs) can make to prevention, detection and mitigation. Many of the recommended actions support joint or complementary initiatives by professional and government stakeholders.

[5] Weidema I (ed) (2000) Introduced Species in the Nordic Countries. Nord 2000:13. Nordic Council of Ministers, Copenhagen

STRATEGY (DRAFT)

Objectives

The Strategy promotes the development and implementation of coordinated measures and cooperative efforts throughout the region to minimise adverse impacts of invasive alien species (IAS) on Europe's biodiversity, economy and human health and wellbeing.

Specific objectives are to:

- rapidly increase awareness and information about IAS issues and ways to tackle them
- prevent the introduction of new invasive alien species in Europe
- reduce the impact of existing invasive alien species
- where feasible, restore species, natural habitats and ecosystems that have been affected by biological invasions.

Scope

The Strategy applies to:

- terrestrial, freshwater and marine environments under the jurisdiction of Bern Convention Parties. It also provides guidance for activities carried out in areas beyond national jurisdiction (e.g. inter-continental trade and transportation)
- alien species and lower taxonomic categories, subspecies and varieties in all taxonomic groups, except for genetically modified organisms; viruses and prions; and feral animals of domestic species (cats, dogs, goats, etc.).

Terminology

To promote consistency and clarity in the use of terms and concepts, this Strategy uses the definitions used in the Guiding Principles annexed to CBD Decision VI/23. Other terms are used in accordance with the IUCN Guidelines for the Prevention of Biodiversity Loss caused by Alien Invasive Species.

1 Building awareness and support

In Europe, the public, decision-makers and many academics have limited understanding of the different threats posed by IAS. This makes it hard to mobilise relevant agencies and other stakeholders, particularly for introductions that do not affect human health or major economic interests. Raising awareness and commitment is also essential to develop shared responsibility and to encourage private efforts and voluntary compliance.

Recommended actions

1.1 Plan and implement vigorous information and communication campaigns on IAS issues for different target audiences (general public, schools, local authorities, government agencies).

1.2 Where appropriate, incorporate IAS into education and public awareness programmes on environmental issues (native species and habitat conservation, protected areas, wildlife trade).

1.3 Develop partnerships with key stakeholders (e.g. professional associations for tourism/travel, hunting, fishing, forestry, horticulture, pet trade; NGOs) to produce and disseminate information and guidance to those using or affected by IAS.

1.4 Support the holding of workshops and conferences on IAS.

2 Collecting, managing and sharing information

Improving information can build regional capacity to identify and manage IAS threats. Stakeholders with relevant expertise should cooperate to generate precise updated information that is rapidly and openly accessible. Sharing of information is important because answers to a problem may be available elsewhere in the region or in another part of the world.

Many web sites carry information on introduced species. However, there is no pan-European mechanism to link sites across jurisdictional lines or to ensure that the information is accurate for a potentially problematic species. Existing information resources are also limited taxonomically and geographically. These factors make it harder to find and use information in a timely way (e.g. for early warning and rapid response).

Species listing

A starting point for a regional knowledge base is to identify alien species recorded and established on national territory and to prioritise them for research, prevention and management purposes.

Recommended actions

2.1 Develop and regularly update (at least every 3 years) comprehensive national lists of alien species in all taxonomic groups recorded in their territory. Lists include information on date of introduction, means of arrival, range, population size, impacts recorded and, based on risk analysis, classification of species as harmful, low risk or beneficial.

2.2 Establish a review procedure that allows for rapid inclusion of newly-detected alien species.

2.3 Mobilise existing expertise for species listing and review, based on a partnership approach (NGOs; research institutes; specialist working groups established under the Bern Convention and/or the IUCN Species Survival Commission; other stakeholders).

2.4 Create alien species page in national biodiversity Clearing House Mechanism (CHM) or equivalent, that includes species lists and links to relevant IAS sites and resources.

Research and Monitoring

Prevention and mitigation of IAS impacts require a deep understanding of the species ecology, distribution, patterns of spread, and response to management. Existing knowledge levels and capacity to predict the consequences of introducing a given alien species are recognised as inadequate. This should not delay action, but further monitoring and research should be urgently carried out to support management programmes and provide a stronger scientific basis for decision-making and allocation of resources.

Given the transboundary nature of IAS issues, regional networks of research groups should be encouraged and mechanisms for effective information sharing should be established.

Recommended actions

2.5 Inventory existing research and monitoring procedures to identify gaps, overlaps and ways to improve coordination and practical outputs (between different national research institutes and within Europe).

2.6 Prioritise research that directly supports prevention and minimisation of impacts (see Box).

Indicators for priority research topics

- risk analysis of different pathways, categories of goods and/or imported species
- methods to predict and prevent invasiveness of alien species before they are introduced (e.g. invasiveness in other regions with similar conditions)
- detection of newly arrived alien species
- patterns of spread of established species
- assessment of the impacts of alien species on biodiversity, including genetic diversity
- evaluation of economic and public health implications of biological invasions
- evaluation of effectiveness of mitigation measures.

2.7 Support basic research on ecology and biology and epidemiology of alien species.

2.8 Establish or expand monitoring systems for pathways, vectors, vulnerable points (entry and exit) and ecologically important or isolated areas, making best use of available expertise.

2.9 Support the integration of national data into a European list of alien species that is regularly updated and circulated.

Exchange of information: towards a regional information system

A regional system for information sharing with neighbouring countries, trading partners and regions with similar ecosystems can be used to facilitate identification, early warning and coordination of prevention and control measures, consistent with State responsibility (§4).

An information system should locate, systematically document and provide electronic access to sources of information; provide quality control and ensure controlled vocabularies; and establish data protocols or standards where necessary.

Recommended actions

2.10 Identify lead organisations to develop a coordinated internet-based European data network, building on existing regional information resources. Encourage the European Environment Agency (Topic Centre for Nature Conservation) to designate IAS as a thematic area if resources permit.

2.11 Identify national focal points, to work with the lead organisation and regional counterparts to establish regional information objectives and procedures.

2.12 Link national databases to subregional and regional information mechanisms where these exist (e.g. Nordic-Baltic Invasive Species Informational Network). As necessary, create new information tools (e.g. for taxonomic groups, subregions such as the Mediterranean).

2.13 As soon as practicable, link regional information mechanisms to the global network of IAS databases currently under development.

2.14 Draw up registers of experts, particularly for taxonomy, that can advise on technical IAS issues.

2.15 Create regional/subregional listservers to facilitate rapid communication.

3 *Strengthening policy, legal and institutional frameworks*

Leadership and coordination

IAS are a cross-cutting issue that involve a wide range of social, economic and environmental interests, including trade, health, agriculture, forestry, aquaculture, tourism and recreation. However, European countries often have fragmented and complex arrangements for IAS prevention and management. Sectoral departments and agencies have separate policies and mandates. It can be difficult, even within government, to identify those with responsibility for IAS issues. This can hamper efficient communication between neighbouring States and within the region.

As part of an integrated approach to biosecurity, States need to determine leadership on IAS issues and support closer coordination between sectors and different levels of government. The objective should be to minimise policy conflicts and inefficient use of information and resources and to make best use of existing capacity and expertise (e.g. national plant protection offices, customs, CITES authorities).

Recommended actions

3.1 Establish a national biosecurity authority (or equivalent interministerial mechanism) to lead, coordinate and oversee the efforts of other agencies and subnational governments dealing with alien species. It should have powers to:

- lead the policy and legal review process (§3.4-3.8)
- lead the development of a national strategy/action plan on alien species (§3.9)
- designate competent scientific authorities to provide technical advice on applications for introductions (§5), contingency plans for rapid response and mitigation measures (§6-7) and applications for reintroductions (§8)
- coordinate input from different agencies to regional and international policy-making and programmes.

3.2 In relevant departments and agencies, designate a lead official to oversee IAS-related implementation, to be represented on the authority and liaise with other branches of government.

3.3 Communicate the contact details of the biosecurity authority/IAS focal point to the Bern Convention Secretariat and other Parties.

Legal review and development

To support implementation of international commitments, legal frameworks need to provide a basis for prevention, detection and management across different taxonomic groups, ecosystems and pathways.

States often have many different laws for this purpose (plant and animal health and quarantine; hunting and fishing; nature conservation etc.). Laws may use different terminology and apply different rules or criteria to introductions, taxonomic groups, post-introduction monitoring and enforcement. There may be gaps in the regulatory framework (e.g. movements of alien species between ecologically distinct units such as different drainage basins or islands). This tends to reduce legal certainty about what is actually regulated and hamper compliance and enforcement efforts.

Recommended actions

3.4 Initiate a national review of existing measures and non-statutory procedures to manage the movement, trade, possession and establisment of alien organisms. The review should produce practical and proportionate recommendations, set priorities and identify appropriate organisations to take forward any measures.

3.5 Promote use of terminology consistent with the definitions used in the CBD Guiding Principles and, for other terms, with those used in the IUCN Guidelines for the Prevention of Biodiversity

Loss caused by Alien Invasive Species. As a priority, ensure that national legislation defines ""alien"/"native" with reference to ecological parameters rather than political boundaries and that "into the wild/environment" is not interpreted in a restrictive sense.

3.6 At the European level, develop a common interpretation of key terms and concepts as a basis for regionally consistent approaches. This should include the time scale of introductions, for which different countries and academic institutes have used many classifications and terms (neophita, paleointroductions, etc.). Assess the possible need to develop specific lists for alien species introduced in ancient times (millennia) (§3.15-16).

3.7 Ensure that roles and responsibilites are clearly assigned to named agencies, including for enforcement, and identify areas where management capacity and training need to be improved.

3.8 In States with a decentralised or federated system of government, assess whether national measures are needed to ensure consistency of species listing, trade and other controls.

National strategies

Most European States have some kind of national biodiversity strategy, but few cover IAS issues in detail. Consistent with CBD Decision VI/23, each State should now develop a specific strategy or action plan to address all aspects of IAS prevention and mitigation.

The actual process of strategy development can contribute to awareness-building in different government agencies. Wider consultation with sectoral stakeholders, NGOs and the general public can also lead to improved voluntary compliance in the longer term.

A comprehensive biosecurity strategy may be designed to cover policies and measures applicable to genetically modified organisms, which have many synergies with IAS measures (risk assessment, contained use, field trials, control of release, monitoring etc.).

Recommended actions

3.9 Launch consultative process to develop a national biosecurity strategy (see Box), drawing on the national biodiversity strategy and other relevant policies.

Possible components of a national biosecurity strategy

- Status and trends of IAS in the country: identification of specific problems (§2)
- Outline of main pathways and particular risks
- Designation of national biosecurity authority or coordinating mechanism (§3.1)
- Roles and responsibilities of other agencies and partners (§3.2)
- Relevant legislation and non-statutory measures: options for improvement (§3.4)
- Criteria for defining management and control actions
- Needs related to monitoring, training, capacity building and funding
- Mechanisms to circulate information to neighbouring countries (§2, §4)
- Preference for native rather than alien species (§8)
- Recovery of species/ecosystems affected by IAS (§8)
- Proposals for improved prevention and management((§5, §6, §7)
- Priority list of actions, timelines and lead responsibilities.

3.10 Develop specific measures, or linked sub-national policies, for isolated and biodiversity-rich ecosystems (e.g. isands and archipelagos, protected areas).

3.11 Initiate discussion between countries in the same subregion to harmonise strategic direction and to promote common approaches to shared IAS problems.

Principles and tools

Precaution and risk analysis

Predicting the invasiveness and possible impacts of an alien species is notoriously difficult. It requires an assessment of the likelihood of arrival, ability of the species to survive, lag time before the species becomes invasive, speed and extent of invasion, ease and cost of control and its effect on a wide range of resources and values. Although the epidemiology of biological invasions in some taxonomic groups is now better understood, this has not led to the identification of general rules applicable across all groups or even within the groups studied in detail. Species frequently change their behaviour when they invade a new habitat, so that studies of their ecology in their home country may not provide fully reliable indications of their behaviour in a new location.

Because of this uncertainty and because delayed intervention can result in greatly increased impacts and reduced ability to correct problems, several instruments support the application of the precautionary approach to alien species decision-making. This approach requires prevention and mitigation measures to be based on the best available evidence and knowledge, including within a risk analysis framework, but provides that lack of scientific certainty should not be used as a reason for postponing or failing to take appropriate measures.

Risk analysis is a two-step management tool. An assessment is made, using science-based information, of the actual risks related to introductions. Using this assessment, management decisions to reduce or manage these risks can be made in a thorough, consistent, logical and transparent way.

An important element of risk assessment is environmental impact assessment, which should be designed to predict potential threats to native biodiversity and ecosystem goods and services. Potential adverse effects of an introduction to the environment, and the probability of the occurrence of these effects, can be assessed by analysing the intrinsic characteristics of the species, ecological relationships in its current range, the similarities between its existing range and the potential area for introduction, and any past history of the species (or a similar relative) as an invasive alien species.

Recommended actions

3.12 Ensure that legal frameworks support the application of the precautionary approach to alien-species decision-making, within a risk analysis framework that takes account of possible impacts on native biodiversity and ecosystem function.

3.13 Prohibit intentional introductions without prior authorisation (§5.11) and apply risk analysis to pathway management and mitigation decisions to minimise impacts.

3.14 In cooperation with relevant organisations, support the development of common decision-making criteria and risk standards regarding the movement of alien species through trade pathways.

Approach to ancient introductions

The very ancient history of introductions in Europe makes this region unique, both because alien species play an important role in our culture, landscapes and present ecosystems and because Europeans are more used to coexisting with introduced animals and plants than inhabitants of most other regions of the world. These specific European characteristics explain several inconsistencies in existing biodiversity instruments and policies: in some cases, alien species are listed for protection under regional/national red lists and resources are allocated to their conservation.

European conservation strategies should be revised to ensure that they give priority to conservation of endemic and native species. No conservation efforts should be devoted to the protection of alien species. In the case of species introduced several millennia ago, conservation for historic and cultural reasons can be acceptable if 1) recovery of the original ecosystems is no longer feasible; 2) their conservation does not conflict with the primary aim of conserving the native biological diversity (impact assessment before protection). For these species, an expansion of the range can be allowed or promoted only in contiguous areas after an impact assessment; no translocation to isolated areas outside their present range should be allowed.

Recommended actions

3.15 Review species lists (national/Bern Convention/Red Lists) to ensure that no alien species are listed for legal protection.

3.16 Review national and subnational conservation strategies to ensure consistency with these principles.

Compliance and enforcement

Conventional approaches to liability are often not applicable to biological invasions, because of difficulties in proving fault and causation (time lag, scientific uncertainty, multiple responsibilities, low priority within judicial system). National frameworks therefore need to support a mix of voluntary and regulatory measures for compliance and to promote innovative measures for greater accountability. There should be a reasonable level of consistency between neighbouring countries to support uniform improvement in compliance levels.

Recommended actions

3.17 Identify existing voluntary codes of conduct: in consultation with relevant stakeholders, review their effectiveness and consider whether binding measures are needed.

3.18 Promote the development of new codes to address specific risks and foster technical innovation.

3.19 Establish offences for unauthorised introductions, movement or holding of alien species, whether intentional or resulting from negligence, and establish meaningful penalties.

3.20 Establish administrative sanctions for establishments that breach conditions for the keeping or breeding of alien organisms (e.g. withdrawal of permits, temporary or permanent closure, confiscation of the organisms).

3.21 Consistent with the polluter-pays principle, develop measures to allocate the costs of recapture, eradication or control to the person responsible for an unlawful introduction or escape as well as a system for compensation for environmental damage.

3.22 Collaborate to develop economic instruments for more effective prevention and management and to generate sustainable funding for monitoring and management (e.g. guarantee systems, insurance or levies involving professional species breeders or traders, main transport bodies etc.).

4 Regional cooperation and responsibility

Cooperation between States

States should recognise the risk that activities within their jurisdiction or control may pose to other States as a potential source of IAS and take appropriate individual and cooperative actions to minimise that risk. This is particularly important within Europe, with its shared coastline, transboundary mountain ranges and protected areas and international watercourses, as species introduced into the territory of one State can easily spread to neighbouring States, subregions or the entire region. It is also critical with regard to Europe's trading partners .

Recommended actions

4.1 Establish general mechanisms for inter-State information exchange, notification and consultation. Contact may be bilateral (between biosecurity agencies/national plant protection organisations etc.) or be made through designated subregional bodies or the Secretariat.

4.2 Develop procedures to supply available information on a species' invasive behaviour or invasive potential to neighbouring States and trading partners.

4.3 Provide for prior notification/consultation with other States concerning:

- intentional transfer to such States of an alien species with known invasive potential.
- intentional introductions to national territory where the alien species concerned may subsequently spread (with or without a human vector) into another State and become invasive.

4.4 As a priority, adopt harmonised measures to prohibit the introduction into the environment of IAS identified as problematic at the regional level.

4.5 Implement standards and recommended best practices for regional pathway management to minimise risks of unintentional introductions.

4.6 In development assistance programmes, give preference to use of native species unless these are unavailable, unsuited to the programme purpose and/or risk analysis indicates that alien species are unlikely to have adverse impacts.

Possible role of the Bern Convention

The Convention provides the regional framework for implementation of the CBD in Europe. It has a long history of engagement with IAS issues and is supported by specialist working groups.

Recommended actions

4.7 Establish a core advisory group to assist the Secretariat in developing proposals, reviewing effectiveness of existing measures and identifying opportunities for synergies and partnership.

4.8 Compile a regional resource directory (lead agencies and focal points, scientific authorities for different taxonomic groups and ecosystems, technical authorities for different management practices, research institutes, competent NGOs) and make available on the Internet or through the Parties' server.

4.9 Facilitate information exchange and early warning through the notification system (proposed introductions and information about management outcomes can be transmitted via the Secretariat) and encourage NGOs to make use of the case file system for this purpose.

4.10 Monitor compliance (through annual reporting requirements and the case file system). Assess the effectiveness of existing recommendations and the possible need for binding measures in the future (whether species-specific or general).

4.11 Work with other competent institutions to address the issue of possible liability for intentional introductions that damage the environment of other States.

4.12 Engage relevant European institutions – in particular the European Commission, European Environment Agency and the European and Mediterranean Plant Protection Organisation – to promote coordination on IAS issues and compatible approaches to IAS legislation and programmes.

4.13 Organise a major European workshop or forum on IAS that brings together key organisations, sectoral bodies and other stakeholders and raises awareness throughout the region.

Subregional cooperation

Although continental Europe is characterised by territorial continuity, there are marked biogeographical differences in terms of species, subspecies, populations and ecosystems. A biogeographic approach can be particularly useful when developing species lists as well as methods and measures to control or eradicate IAS.

States not party to the Bern Convention should be encouraged to participate in relevant subregional programmes.

Recommended actions

4.14 Develop and implement subregional action plans to address priority issues in a coordinated way (e.g. Mediterranean action plan to deal with biological invasions on islands, an Alpine action plan on the grey squirrel, a Baltic policy on the treatment of ballast water).

4.15 Maximise use of subregional expertise and networks (e.g. the Pan-European Biodiversity and Landscape Strategy, International Commission for Scientific Exploration of the Mediterranean Sea, Nordic-Baltic Invasive Species Informational Network) and build links to ongoing work under the Bern Convention.

4.16 Promote development of common approaches and standards for pathway management through relevant subregional institutions (e.g. for marine pathways, regional seas treaty mechanisms such as Helcom and the RAC/SPA centre).

5 *Preventing unwanted introductions*

Prevention is the most effective and generally the least costly management strategy to reduce threats posed by biological invasions: it should always be the first line of defence. All prevention measures should be based on the precautionary approach.

Prevention measures should apply to trade- and transport activities that generate intentional and unintentional introductions of potentially invasive species. In Europe, common approaches are needed because of the number of contiguous countries, the high volume of inter- and intra-continental trade and transport and the extent of free trade arrangements which can facilitate the movement of potentially invasive organisms.

- Within the European Union, the Single Market provides for the free movement of people and goods: in the absence of special rules (mainly for plant, animal and human health), Member States may not adopt border or area-specific controls on movement or keeping. References to 'border control' in this Strategy should therefore be interpreted as meaning the external border of the Community.
- The proposed enlargement of the Community will expand the Single Market and facilitate translocation of organisms to new biogeographical regions.
- Free trade arrangements are also in place in the European Free Trade Area (EFTA) and are being developed for the EuroMediterranean free trade area which is intended to link the EU Member States and 12 Mediterranean Partners by 2010.

The Strategy recommends actions at different levels to prevent or minimise the risk of export, import, introduction and natural spread of IAS and to facilitate the efficient movement of low-risk biological material into, within and out of the region.

Prevention at source: managing exports and pathways

Concerted efforts to prevent unwanted movements should begin at the place of origin or export (before a living organism crosses the biogeographical barrier). Prevention at source is particularly important where there are known disease incursions and in cases where interception may be difficult (e.g. consignments that are packed into containers within a source country and transported to dispersed destinations, often remote from traditional inspection sites at entry points).

Measures to reduce risk should be applied to the vector (means) and pathway (route) of movement, including surveillance of exit and entry points.

Recommended actions

5.1 Promote compliance with available international standards and certification procedures for exported biological material and packaging (as developed by IPPC/EPPO, OIE, FSC etc.)

5.2 Communicate regularly with trading partners, particularly those with similar biogeographical and climatic conditions, to identify and address risks, provide feedback and, as appropriate, support capacity-building for prevention and risk assessment.

5.3 Enact national measures consistent with the IMO voluntary guidelines and support the conclusion of the draft IMO International Convention for the Control and Management of Ship's Ballast Water and Sediments.

5.4 Promote development of new standards and codes, in cooperation with international standard-setting organisations and/or professional trade and transport bodies, to reduce the risk of exporting living organisms as hitchhikers (contaminants). In particular:

- Support the application of IPPC Guidelines for Regulating Wood Packaging Material in International Trade to other categories of risk goods;
- Support the ongoing work of the International Civil Aviation Organisation to develop common measures to minimise alien species movements through civil air transportation.

5.5 Monitor potential vectors and pathways (including passenger baggage and postal services) and develop programmes to minimise associated risks in partnership with competent agencies, trade/transport bodies and NGOs. Establish subregional or regional pathway working groups as appropriate.

5.6 Cooperate with tourist operators and airport/port authorities to develop a Code of Conduct to minimise movement of biological material by tourists: disseminate information materials as part of awareness-building.

Prevention on arrival: border control and quarantine measures

For international trade and transport, border control is the point at which countries should screen intentional introductions and take steps to minimise unintentional introductions. It requires a framework of rules, trained staff, reference lists of species and risk goods, technical procedures and surveillance protocols.

All European countries have long-established Customs, plant and animal health systems which play a key role in border control. However, the expanding volume of goods and passenger traffic entering and moving within Europe by air, sea and land makes it impossible to inspect all imported material. At national and regional level, there is a need to prioritise available resources and manpower, build capacity in some key areas (taxonomy) and facilitate the application of import standards and protocols.

Recommended actions

5.7 Evaluate existing border regulations and inspection procedures to identify and address gaps (e.g. taxonomic groups, risk goods) and any resource weaknesses (e.g. taxonomy).

5.8 Implement training and capacity-building programmes for quarantine, customs and other border officials and promote increased cooperation between relevant authorities at the national and regional level.

5.9 To minimise unintentional introductions, target inspections at high-risk vectors and risk goods and verify that technical risk reduction measures have been carried out consistent with international standards and codes of practice (e.g. filtration, separation and sterilisation of ballast water; spraying aircraft cabins; heat treatment and fumigation of timber; plant and animal health measures).

Regulating intentional introductions

International policy supports a comprehensive prohibition on all first-time introductions, and on subsequent introductions of alien species that are already invasive within a country, without prior authorisation based on risk analysis (§3.13-15). This requirement (which does not replace existing plant and animal health regulations) should apply:

- irrespective of taxonomic group
- irrespective of the purpose of introduction

- to introductions within countries, between countries and to areas beyond national jurisdiction
- to all activities involving deliberate movement and/or release outside a species' natural range (including import, release into the environment, introduction into containment/captivity and translocation to ecologically different parts of the same country).

Recommended actions

5.10 Develop or strengthen legal rules to prohibit alien species introductions without a permit from the competent authority based on assessment of risk and environmental impact. The permit applicant should normally bear the burden of proof that the proposed introduction is unlikely to threaten biodiversity as well as the cost of the risk assessment.

5.11 To facilitate screening of permit applications, develop a national listing system (see Box).

Components of a listing system for alien species

- **Black list**: species whose introduction is strictly prohibited (no risk assessment to be carried out). This should include species/groups of species known to be problematic for native biodiversity (e.g. certain terrestrial vertebrates, certain aquatic plants, allergenic plants with major health implications).
- **White list**: species classified as beneficial or low risk following a risk assessment. Introduction of specimens of these species may be authorised without restriction or under conditions (see (see § 4.17-4.25).
- **Grey (holding) list:** any species not included in the black or white list must be subject to RA prior to introduction.

The listing system should be dynamic, making it possible to transfer a species to a different list if scientifically justified. For example, where a white-listed species is repeatedly introduced over a long period, the risk should be reassessed periodically since circumstances may have changed and/or new information about the species may become available.

5.12 Provide in permit systems for conditions to minimise risks and ensure continuing oversight, preferably at the introducer's expense (e.g. controlled field trials prior to release; preparation of a mitigation plan in the event of unforeseen or harmful consequences; monitoring; containment).

5.13 Work towards a regional system for listing and authorisation: priority should go to a regional/subregional black list to include species that are already problematic in several European countries.

5.14 Consider greater use of existing national/regional CITES mechanisms for regulating trade and possession of alien species that may impact on regional biodiversity.

Minimising unwanted introductions within the country

In addition to pathway management, specific measures should target sectoral activities that can facilitate the unwanted introduction, establishment and spread of AS within a country.

Recommended actions

5.15 Require a permit for domestic movements of potentially harmful species and risk goods to ecologically different parts of the country.

5.16 Adapt licensing rules for containment facilities to minimise risks arising from escape or release of specimens of alien species. Facilities concerned may include botanic gardens, greenhouses,

arboreta, garden centres, zoos, animal-breeding establishments, fish farms and animal retail establishments.

5.17 In the forestry sector, control and monitor the use of alien species to detect unusual mortality, disease, or insect outbreaks and to avoid adverse ecological impacts. Implement relevant Forest Stewardship Council principles and support the development of European forest stewardship standards on the selection of species for planting and the reduction of threats from alien tree species (§8).

5.18 Cooperate with horticultural trade bodies to identify potentially invasive terrestrial and aquatic alien plants. Promote initiatives to raise awareness amongst gardeners and landscapers of associated risks and ways to minimise them. Monitor the effectiveness of voluntary approaches such as codes of conduct: if necessary, develop legal measures to phase out sale and use in the environment of high-risk plant species, particularly aquatic species.

5.19 Work with the *Fédération des associations de chasseurs de l'UE* (FACE) and national hunting and shooting organisations to identify risks associated with introduction of alien game species for restocking. As appropriate, cooperate in the elaboration, adoption and implementation of a European Code of Conduct on Hunting to prohibit/strictly regulate such introductions.

5.20 Take similar action with sport fishing (angling) associations to identify and minimise risks associated with the introduction of alien fish as game. Strictly regulate trade in and use of live bait for fishing, to prevent unintentional introduction of organisms not present in the drainage basin concerned.

5.21 For aquaculture and mariculture, recognising the difficulty of avoiding escapes from fishfarms, promote implementation of existing best practice (International Council for the Exploration of the Sea Code of Practice on the Introductions and Transfers of Marine Organisms (1994); FAO Code of Conduct for Responsible Fisheries (1995)). Work with relevant stakeholders such as the Federation of European Aquaculture Producers to develop a European code of conduct to:

- phase out farming/trade of alien fish species that are known to have significant negative impacts on natural systems and native species;
- strengthen zoosanitary measures to minimise accidental transport of larvae of alien species or alien parasites and other organisms associated with fish or equipment in fish-farms;
- monitor the spread of alien species from existing aquaculture structures.

5.22 For ornamental fish and aquaria, apply standards and procedures to public aquaria to reduce risks of escape when tanks are emptied and work with relevant stakeholders (Ornamental Fish International, Ornamental Aquatic Trade Association) to promote awareness-building and best practice amongst dealers, retailers and the general public.

5.23 For aviculture, apply strict rules to minimise escape risks (general prohibition on setting them free; wing-clipping or 'pinioning' of birds in roofless enclosures; strict standards of security for roofed aviaries when birds are not rendered flightless; licensing requirement for all establishments keeping captive non-native birds; a registration and marking system so that the birds' origin can be identified in the event of their escape).

5.24 Apply generic operating rules to pet and animal retail establishments. These may include:

- an obligation for retailers to inform their customers of good practice, legal regulations and the penalties for violation;
- a prohibition on trade in and possession of alien species assessed to be capable of surviving in the environment of the country/subregion concerned and potentially harmful to native biodiversity;
- a recovery system for animals their owners wish to get rid of, possibly financed by a tax on sales and/or some kind of refundable deposit system.

Special measures for isolated ecosystems

Strategies and legal frameworks should contain stricter measures for isolated ecosystems (islands, lakes, enclosed and semi-enclosed seas) and centres of endemism.

Recommended actions

5.25 Develop regulations to prevent/minimise introductions and spread in particularly vulnerable areas (e.g. archipelagos, other biogeographically or evolutionarily isolated ecosystems, areas of high endemism and other hot spots of biological diversity, protected areas).

5.26 Prohibit facilities holding alien species in containment/captivity in or near to such areas or apply rigorous operating conditions.

5.27 Establish comprehensive screening procedures for passenger and commodity traffic between mainland and islands, between islands and so on.

5.28 Set up island information exchange networks and connect to the IUCN Islands Initiative.

5.29 Regulate movements of species and water transfers between separate drainage basins and catchments to prevent the introduction of organisms to a water system outside their natural range.

Prevention of natural spread

It is important to distinguish between the initial entry into a country (or region) and a later natural spread. Natural expansion of an alien species established in a neighbouring country is particularly critical because: 1) it means that the ecological conditions are suitable to establishment, 2) it may be more difficult to contain the natural spread of a species than to prevent its introduction.

Predicting the patterns of spread of established IAS can allow timely responses. An important component of regional responsibility (§4) is the circulation of information among countries and periodical surveys of the IAS established in neighbouring countries to increase the efficiency of control before arrival.

Recommended actions

5.30 Produce, update and circulate maps of distribution for the main IAS.

5.31 Develop predictions of patterns of spread.

5.32 Ensure that information is rapidly and effectively circulated to neighbouring states.

5.33 Give priority to the eradication and/or containment of established alien species that could potentially spread outside the state's territory.

6 *Early detection and rapid response*

The counterpart to prevention at source (before a species crosses a biogeographical barrier) is prompt detection and intervention post-barrier. Early detection is essential because of the need for rapid action before significant populations are established. Procedures need to target the arrival of unintentionally or unlawfully introduced species which slip through the formal regulatory system.

Monitoring and surveillance

Surveillance (activities aimed at identifying alien species new to the country) is a critical element of prevention: without effective surveillance, early detection will mostly cover larger species and remain anecdotal. Surveillance should be coordinated by the biosecurity authority and be adequately resourced.

Surveillance efforts should focus on high-risk sites such as:

- main entry points for commercial/tourist arrivals (airports, ports, harbours and open moorings, train stations, etc.);
- entry points of natural dispersal pathways (coasts, border crossings of water systems shared with neighbouring countries, etc.);
- areas adjacent to facilities where alien species are kept in captivity or containment (nurseries, botanical gardens, fish farms, zoological gardens, game parks etc.);
- areas where severe disturbance has occurred (land clearance, storm damage etc.).

Surveys should also target different taxonomic groups (plants, mammals, insects, pathogens, etc.).

A network of professionals and volunteers should be established to rapidly report observations of potential incursions to the biosecurity authority or competent agency. The authority should have access to taxonomic experts to support rapid identification of species (§2.15).

Recommended actions

6.1 Mandate the national authority to collect, analyse and circulate information on IAS, including taxonomy, and methods to monitor their presence.

6.2 Support the development of a database for the rapid identification of alien species, at the European or subregional level (§2.13).

6.3 Set up an Early Warning System for surveillance in-country and communication with neighbouring states and, where appropriate, trading partners. Maximise use of existing capacity (e.g. in plant and animal health sectors) and train field officers (e.g. protected area staff) to conduct site- and species-specific surveys.

6.4 Organise regular surveillance of areas vulnerable to invasion and important and/or isolated ecosystems (protected areas, islands etc.). In transboundary sites and ecosystems, surveys should preferably be conducted jointly by neighbouring management bodies.

6.5 Develop information materials to assist farmers, gardeners, birdwatchers, foresters, fishermen, hunters, divers, hikers and photographers to participate in detecting new arrivals. As appropriate, provide landowners and occupiers with a list of the highest-risk species and introduce reporting requirements.

Rapid response and contingency planning

There is only a limited period of time in which eradication is a practicable option, before the invasive species reaches a certain population level and/or range expansion. Islands have a much higher proportion of successful eradications than the mainland, for which it is difficult to predict with any certainty the length of the critical period during which eradication is feasible. On the mainland, rapid implementation of an eradication programme is therefore crucial.

To reduce the time between documenting an introduction and implementing a response, contingency plans should be developed for eradicating specific taxa (e.g.: plants, invertebrates, marine organisms, fresh-water organisms, fresh-water fishes, reptiles, amphibians, birds, small mammals, large mammals).

Recommended actions

6.6 Ensure that all competent authorities (including local authorities and protected area authorities) have clear powers and duties to remove alien species that have been unintentionally or unlawfully introduced or have become invasive following a lawful introduction.

6.7 Streamline the authorisation process for rapid response and provide for the issue of biosecurity emergency orders where urgent eradication action is needed.

6.8 Establish contingency plans to ensure adequate funds, material and equipment for rapid response to new invasions. Ensure that staff at the appropriate level/sector are trained to use the control methods selected.

6.9 Cooperate at the regional level on research and development of emergency response materials.

7 Mitigation of impacts

Prevention can reduce new introductions, but not halt them. When an alien species is unintentionally or unlawfully introduced or an introduced species becomes invasive, precaution dictates that:

- eradication programmes should be considered first. Eradication is the most coherent solution in terms of biodiversity conservation and can be more effective, cost effective and ethical than other management alternatives (control, containment, do-nothing);
- where a science-based assessment shows that eradication is no longer feasible, containment should be considered, particularly for species that could spread to neighbouring countries;
- where eradication and containment are not feasible or appropriate, permanent control should be considered on the basis of a long-term cost/benefit analysis.

Legal and institutional aspects

Legal authority is needed to halt and reverse the increase in population and range of known IAS so as to prevent spread to other countries and regions. At the regional level, procedures are well-established for pests and diseases that affect plant, animal and human health, less so for IAS that pose a threat to native biodiversity and ecosystem function.

Effective mitigation requires a suite of legal measures and administrative powers. To minimise delay, existing tools and procedures (e.g. on hunting or weed control) should be used in a more targeted way to reinforce mitigation efforts. Action plans for protected sites and species should identify any IAS-related threats and propose appropriate control measures as a conservation tool.

Because of the sensitivity surrounding species control programmes, legal frameworks should support consultation with affected stakeholders and communities.

Recommended actions

7.1 Provide competent authorities (national/subnational) with a clear mandate to take appropriate mitigation action for introduced plant and animal species in different taxonomic groups (see §6.6).

7.2 Remove legal protection from unlawfully/unintentionally introduced species and ensure that all alien species have a legal status compatible with necessary management measures (§3.15-16).

7.3 Review protected species lists to ensure that introduced species are not automatically protected under legal measures applicable to higher taxa and to restrict lists to indigenous/native species.

7.4 Prohibit further releases of species already introduced without authorisation: regulate their possession and transport to minimise the risk of escape.

7.5 Maximise the contribution of hunting, shooting and angling associations to monitoring, training and management, but avoid any incentives to continue introduction of alien species for game purposes.

7.6 Extend responsibility of landowners, occupiers and relevant stakeholders to prevent or control further spread of IAS (notification of listed alien species on their land; implementation of management measures to eradicate or limit numbers, possibly backed by incentives).

7.7 Equip competent authorities with powers of compulsory access to sites where voluntary approaches are unsuccessful: provide for recovery of expenses where the authority takes control measures in place of the landowner/occupier.

7.8 Establish transparent procedures to consult community and other stakeholders about proposed control programmes and to take account of comment and criticism when reaching a decision.

7.9 For species identified as a regional or sub-regional threat, promote the adoption of harmonised national control programmes in affected countries in line with regional objectives and review implementation on a regular basis.

Eradication

Eradication should not be attempted unless:

- it has a legal basis, public and political support and adequate funding; and
- it is ecologically feasible. This should be assessed on the basis of relevant biological characteristics of the target species, its ecological relationship with the invaded area and socio-economic considerations. A trial eradication can be a useful tool to collect information for the assessment (e.g. bait preference and acceptance to target species, risk of destruction of non-target species, ways to minimise this risk, etc.), which should determine the chances of success and address worst case scenarios.

Eradication programmes should be subject to risk assessment covering impacts, reversibility of effects and risk of re-invasion. They should provide for the use of different techniques to ensure that individual organisms surviving the primary campaign are destroyed, and monitor effort, costs and results to allow for corrections. To be successful, the immigration rate of the alien species being eradicated needs to be zero (i.e. a new invasion of the management area must be prevented). The means to prevent future re-invasions should therefore be carefully addressed. Programmes should also support monitoring of recovery of native plant and animal populations and, where necessary, conservation measures.

Eradications should be targeted at vulnerable and relatively undisturbed ecosystems and at areas where measures are most likely to be successful. Islands should be considered priority areas for eradications.

Species-based priorities for eradication should be (1) newly formed propagules, especially when non-reversible effects are predicted (2) species representing a major threat to native biodiversity (3) species already established in the wild, causing reversible effects on native ecosystems, and (4) species for which eradication is most feasible. Removal of feral animals of domestic species and commensal non-native species that damage the natural environment should be considered as a management option, particularly on islands.

Eradication methods should be selected primarily on the basis of their efficiency, since it is essential that all individuals of the population be vulnerable to the removal methods. Consistent with this objective, they should be as selective, ethical and humane as possible.

Recommended actions

7.10 Establish priority lists of IAS to eradicate, including species known to be harmful to biodiversity and/or ecosystem function.

7.11 Prioritise areas for eradication, based on a classification of natural value, degree of disturbance and feasibility of success.

7.12 Implement and fund eradication programmes, subject to prior risk assessment and public consultation.

7.13 Notify and consult with neighbouring countries and the Bern Convention Secretariat about proposed eradication of transboundary populations: seek to develop joint programmes with other States affected, including for follow-up monitoring.

Containment

Containment may have one or more specific aims, namely to:

- contain the species' presence within defined geographical boundaries;
- prevent its spread to neighbouring countries;
- prevent its expansion to isolated and/or ecologically important areas e.g. islands, protected areas, areas critical for the survival of native or endemic species; hotspots of biodiversity); or
- postpone its population growth in order to develop more effective eradication techniques.

Containment methods should be selected with regard to their efficiency, selectivity and the undesired effects they may cause.

Recommended actions

7.14 Establish priority lists of IAS for containment, as appropriate in collaboration with neighbouring States for which the same species are problematic.

7.15 Implement containment programmes for priority IAS.

Control

The aim of control is to reduce density and abundance of an IAS in order to keep its impact to an acceptable level in the long term.

Before starting a control programme a cost/benefit analysis should be realised, desired outcomes should be clearly defined and appropriate monitoring of the results should be planned. Control methods should be selected with regard to their efficiency, selectivity and the undesired effects they may cause.

Recommended actions

7.16 Assess costs, benefits and outcomes of IAS control programmes already in place.

7.17 Initiate new IAS control programmes after a long-term cost/benefit analysis, with defined aims and adequate monitoring arrangements.

7.18 Identify IAS problems that could be addressed through coordinated control by neighbouring countries/subregions (e.g. aquatic plants in shared water system, marine algae along a shared coastline) and develop appropriate programmes.

8 Restoration

Biosecurity policies and measures should not be purely defensive. They also need to support restoration measures for species, natural habitats and ecosystems that have been affected by biological invasions. Increased resilience of native biodiversity can in turn provide greater protection against reinvasion or new incursions.

A holistic approach should include practical steps to support the use of native species in preference to alien ones. Depending on the species and the sector, however, there may be problems on the supply side, at least in the short term. Ways to source, label and expand the supply of genuine" native" material will need to be explored at the regional level, partly in view of the trade implications.

Re-introduction of native species may be a desirable management option, but should only be carried out in accordance with best practice guidelines (e.g. IUCN/SSC Guidelines for Re-introductions, IUCN Position Statement on Translocation of Living Organisms). Particular care should be taken to avoid introduction of a different subspecies of the native species concerned, due to the risk of genetic

contamination. Priority should go, for example, to preventing the 're-introduction' of non-native plant genotypes where the introduced stock is in fact foreign to the phytogeographical area concerned.

Disturbance of soil and canopy can lead to conditions that facilitate the establishment and spread of introduced alien species. Land and resource use policies need to take account of invasion risks and promote ecologically sound practices to minimise such disturbance and to remedy damage where disturbance has already occurred.

Recommended actions

8.1 Include restoration policies in IAS strategies and specific measures in eradication and control programmes.

8.2 Identify and cooperate with appropriate partners for restoration in shared ecosystems and transboundary protected areas.

8.3 Explore scope for reintroduction of native species after eradication programmes, subject to consultation with neighbouring States and the Bern Convention Secretariat. All reintroductions should comply with the IUCN/SSC Guidelines for Re-introductions and/or other international best practice.

8.4 Implement measures to phase out the use of alien species in landscaping, revegetation, tourist and leisure development, urban environmental management, erosion control and wildlife habitat enhancement, particularly where such species are likely to spread into natural areas.

8.5 Develop policies/incentives to increase the supply of local native species to meet landscaping and environmental management needs

8.6 Adopt measures (statutory or non-statutory) for the use of native plant material in habitat creation or restoration. The material should be of known local provenance, derived from seed or stock originating from the region.

8.7 Review and, where appropriate, adjust conservation payment schemes and agri-environment measures to link incentive payments to use of reliably-sourced native material.

8.8 In forestry, support the use of native species over alien species in the establishment of plantations and the restoration of degraded ecosystems, in accordance with the Forest Stewardship Council's Principles. Alien species should only be used when they are low or no risk and their performance is greater than that of native species.