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Eradication, Containment, Management and Restoration

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OBJECTIVE

To minimise the damage caused by established IAS to species, habitats, ecosystem function and services, economic activities, together with human and animal health. To be achieved, where possible, by the eradication of IAS and, where impractical, the limitation of their impact, further spread and management of the consequences.

SCOPE

This paper considers the management of those IAS already present in Europe and/or where rapid response has failed to prevent establishment. It will consider both the management of those IAS identified as high priority species for management (Invasive Alien Species of EU Concern), based on the outputs of WG1, and more generally, IAS established within Europe. It will consider the objectives for restoration following the removal of IAS.

DEFINITIONS

A range of management approaches apply to established IAS which require definition, and which can be considered as forming a sequence of response should earlier approaches be unsuccessful. The definitions of rapid response and eradication are widely accepted; containment, mitigation, co-existence and acceptance are defined for the purpose of this exercise.

Rapid Response – The removal of an IAS before it becomes established. This topic is the focus of working group 2. That Task paper offers a working definition of rapid response.

Eradication – The complete and permanent removal of all wild populations of an alien plant or animal species from a specific area by means of a time-limited campaign (Genovesi 2011)

Containment – Methods to reduce the risk of a population spreading. This can include control at the boundaries of its distribution to maintain a zero-density zone where incursions occur but the species is not allowed to establish, or active management of pathways. For example, efforts to

control the spread of Raccoon Dogs into Scandinavia. Containment and exclusion may carry ongoing costs for one MS to protect the interests of its neighbours.

Mitigation – To actively manage the impact of a population on other interests, for example by controlling its numbers to reduce impacts but without attempting to eradicate. This is likely to require ongoing costs and effort within areas where the IAS has become established. For example, the continuing investment in the removal of *Rhododendron* to protect native habitats in Scotland. The appropriate response for mitigation is best determined through a traditional cost-benefit approach.

Coexistence – To find ways of living with the consequences of an established IAS, for example to redefine the fencing requirements needed to exclude new large mammals from motorways or public education to reduce contact rates with toxic plants such as *Heracleum mantegazzianum*. Also referred to as adaptation

Acceptance – To no longer view or manage the IAS as different from native species in that ecosystem.

Restoration – To restore an invaded ecosystem to a pre-invaded state following IAS management (restoration / conservation), or to improve the stability of a degraded or restored ecosystem to enhance resilience against future invasion (improvement).

ERADICATION

- Once prevention has failed, the most effective tool to reduce damage from IAS is rapid response, removing the species during its early establishment phase.
- If an IAS has become established, then eradication prevents further impacts and allows MS to avoid the costs of repeated control.
- Eradication is a key component of a global response to invasions and there is an urgent need for the wide application and acceptance of this method as a conservation tool.
- Allowing a damaging species to become established or widespread can have long-term and wide geographic consequences. A cost benefit analysis needed before eradication is viewed as uneconomic.
- Eradication is often not possible; eradications of some species become impractical or uneconomic once the initial rapid response stage has passed.
- Eradication should be seen as the response to a particular set of criteria rather than the universal response to the presence of an established non-native.
- Eradications are particularly difficult for species with a dormant life stage (eg soil seed bank) or for species with high dispersal capacity and reproductive rates. Plants and marine species provide particular difficulties, and when established are in general not possible to eradicate. For widespread plants, management to zero density is often more practicable than eradication.
- It is rarely the case that eradication can be achieved for the whole territory of Europe permanently. Further incursions may occur and may need ongoing management.
- A species may be established and accepted in some part of Europe but remain a threat in others, for example on islands which are particularly vulnerable to IAS.
- The priorities for action need to be based on a robust risk assessment process.

- Selection of eradication methods should consider several criteria (e.g. effectiveness, target specificity, humaneness, cost, practicality, regulation, acceptability to public, occupational health/safety, environmental impact).
- The practicality of eradication needs to be determined on a case by case basis. Resources are best used when eradication plans are based on accurate surveillance to reduce uncertainties, detailed scientific trials and adaptive management plans with clear goals and an evaluation mechanism.
- To commit to an eradication campaign without detailed understanding (e.g. risk assessment and management plan) is likely to lead to inefficient use of resources and higher risk of failure to achieve the objectives.
- Continuation of eradication actions once the objective is no longer practical or achievable can lead to a major waste of resources and loss of credibility.
- Criteria are needed to support decisions of when eradication is no longer practical in a defined area. These are needed to help avoid local interests deciding that eradication is too difficult when the costs of more widespread establishment lie elsewhere, and avoiding the inefficient use of resources when eradication is not a practical alternative.
- If eradication is impractical or limited, a policy needs to consider a broader series of potential outcomes and manage each effectively.

CONTAINMENT

- If eradication is impractical then management to limit the spread of the species should be considered.
- The total costs of damage caused by IAS are likely to be proportional to the area over which the species occurs, increasing exponentially as a population spreads.
- Containment will typically require action by one area for the benefit of distant areas that do not incur the costs.
- Methods of cost sharing and lines of responsibility to take action need to be put in place to ensure that the rate of spread of damaging species is managed appropriately.
- Consideration should be given to the concept of 'infected' or 'free' zones. Animal Health legislation deals with infected areas, with particular actions and responsibilities required within their perimeters and free trade and movement outside these areas. Plant Health uses the concept of pest-free areas with particular actions required to maintain that status.

MITIGATION

- Within areas where an IAS has become established, the mitigation of damage becomes a traditional resource management/conflict issue. For example, the ongoing control of grey squirrels in UK forestry to reduce bark-stripping.
- The cost of damage to the valued resource needs to be balanced against the costs and effectiveness of the mitigation measure through a traditional cost-benefit approach.
- Responsibilities for mitigation will be shared between MS, individual and economic interests.
- This may be superseded by commitments to species or site conservation that require efforts to effectively minimise the damage.

COEXISTENCE AND ACCEPTANCE

- If mitigation fails to effectively manage the damage, methods for coexistence need to be supported and developed.
- Many IAS are already widespread and have been present in our ecosystems for hundreds if not thousands of years. At what point do we accept them as a naturalised element of our fauna and flora or do we accept an ongoing need for management based on economic criteria? This is an issue under consideration by WG1.

RESTORATION

- To restore the habitat to a condition in which the invasive species does not exist, by actively removing the invasive species, preventing its reinvasion and passively allowing the habitat to achieve balance without invasion pressure.
- To restore the habitat to a condition which limits the potential for future invasion by active removal of the invasive species and active replanting, habitat alteration or other such activities that can prevent reinvasion? This may include other activities such as limiting supply of the invasive species by bans on sale, or by restriction of keeping in the case of invasive fish species (see WG1).

THE ROLE OF EU AND MS

A series of options are available, each with strengths and weaknesses

Option	Strengths	Weaknesses
1. That the EU determines through regulation that eradication of the IAS of EU species of concern should be the expected outcome for MS, only allowing lesser objectives of containment, management etc under derogation where certain conditions apply.	Legislatively robust, existing models in place, for example Animal Health. Clear responsibilities for MS Ability to compel MS to take action Ensures level of common action so one MS cannot undermine efforts of another	This is a blanket default requirement, not case by case determination on a species or MS basis. Focused on eradication rather than broader management objectives. Presumption of eradication risks MS undertaking actions with low chance of success and potentially not wise use of resources Derogations need to include alternative actions to achieve containment, mitigation etc.
2 That the EU determines, through the advice of an expert and representative panel, the eradication or management objectives for the IAS of EU species of concern to be adopted by individual MS on a case by case	Clear responsibilities for MS Focused on broader management objectives than just blanket eradication Ability to take long-term, wider geographic view of EU wide management.	Requires detailed actions to be determined at EU rather than MS level. Likely to impose financial burdens on one MS to the benefit of another Complex to administer

basis. This advice to be under regular review and update and underpinned by risk assessment	Ability to compel MS to take action.	
3- That MS contribute to working groups for each of the IAS of EU concern that agree the coordinated actions to be taken by each MS for each of those species, with approval of the action plans by the EU.	Focused on broader management objectives than just eradication. Detailed decisions taken at MS level. Readily accommodates different MS objectives where a species may be well established in one but absent in another. Relatively simple to administer.	Reluctance to accept financial burdens on one MS to the benefit of another. Risk of coordination by consensus and negotiation rather than by long-term, wider geographic view of EU wide objectives. More limited ability to compel MS to take action
4- That MS adopt a set of principles and then produce state level responses to IAS with supporting financial instruments from the EU for approved actions, international coordination and collaboration.	Detailed decisions taken at MS level. Low cost option.	Less clear responsibilities for individual MS Weak coordination of actions Weak ability to compel MS to take action Weak ability to address IAS from broader EU perspective

PRACTICAL CONSIDERATIONS

Legislation

- There are many examples where regional, MS and EU legislation places constraints on the management of species, the methods available for use, access to land, the timing of control or even protects the IAS. Any European policy should encourage, not discourage eradication
- To achieve coordinated and effective management of IAS, there should be overarching legislation to require effective, coordinated and responsible management actions to be undertaken.
- Current responsibilities for IAS management sit within many different European Institutions. Appropriate governance, consolidation, rationalisation and institutional coordination is needed within the EU and across MS to more effectively tackle the problems of IAS.
- Eradication and containment actions will often require costs to borne in one area for the benefit of others. Financial mechanisms are needed to share the costs of such actions.

Methods

- Eradications and other species management are complex operations, both from a policy, logistic, ecological and communications viewpoint. Managing the implications or impacts of the eradication programme or other management on other areas of policy and the impacts on stakeholder interests needs effective management and planning.

- Derogations are needed to allow effective methods to be used quickly and pragmatically. For example the need to use traps approved for use on similar species to react to the escape of an exotic species for which no specific approved trap exists.
- There are existing derogation mechanisms, for example under the Birds Directive, that may provide suitable models.
- Off-label approval is needed for the use of chemical control, such as herbicides to control invasive plants or anticoagulant rodenticides to control invasive rodents.
- Cages or traps, approved for use on other similar species, should be available to be used on new IAS to avoid delays in rapid response or eradication. Criteria to define the circumstances under which this derogation would be appropriate are needed. Testing for that specific IAS should follow if the method becomes widely used.
- Research must be supported to expand the range, effectiveness and humaneness of available methods and to improve the methods by which effectiveness and humaneness can be assessed.
- Investment is needed to assist the development and registration of new methods that may have wide applicability to the control of IAS, for example fertility control agents, but where markets are unlikely to justify the costs of registration.
- Methods such as biological control agents offer considerable potential to control invasive species, but also carry wider risks to the environment. Clear processes are needed to test, approve and coordinate the use of biological control agents across member states.

Training and Best Practice

- Existing advice on the characteristics of successful eradications and restorations, and the considerations that need to be taken into account, including risk assessment, should provide the basis for planning and best practice.
- The pool of expert knowledge need be identified and made available to support and advise on best practice.
- This should draw on best practice in other regions, for example the Australian Codes of Practice and Standard Operating Procedures for the humane control of pest animals. These SOPs describe control techniques, applications and animal welfare impacts for target and non-target species. COPs provide info on best practice management, control strategies, species biology and impact, summary of humaneness, efficacy, cost-effectiveness and targets specificity of control method. <http://www.dpi.nsw.gov.au/agriculture/pests-weeds/vertebrate-pests/codes/humane-pest-animal-control>
- Training courses and demonstration projects are needed to raise awareness and spread best practice.
- Mechanisms are needed to exchange information and experience between practitioners.

Islands

- Islands are particularly valuable for biodiversity, containing high concentrations of endemic species together with unique and valuable species assemblages.
- IAS are a particular threat to island biodiversity and have been responsible for many species extinctions in the past.
- Islands are particularly vulnerable to IAS, and also to the spread of native species from neighboring mainland areas which can behave as IAS in an island context.

- Given their often small size and isolation, eradication and restoration can be particularly effective on islands.
- Restoration on islands may be possible depending on the level of damage caused by the invasive species using active removal and passive recovery techniques, with careful monitoring for re-introduction or recovery of the invasive species.
- To better protect islands and make best use of resources, there is a need for to identify, prioritise and coordinate IAS actions for islands across the EU together with education and networking to raise awareness and capacity.
- Islands often have limited resources to deal with IAS, specific support mechanisms are needed to support actions on islands

Consumptive Use of IAS

- The consumptive use of IAS is unlikely to assist in eradications and may hinder the achievement of eradication or containment strategies.
- Experience suggests that promoting the consumptive use of IAS places a value on the species, which can encourage its maintenance or spread.
- Bounty schemes have led to further introductions or ‘farming’ of the species to maintain income. Hunting of IAS can encourage further introductions and promote spread.
- When researching eradication plans it is often necessary to understand the population response per unit of control effort, having uncontrolled consumptive use at this stage can complicate planning for eradication.
- The skills and knowledge of hunters can be valuable for the practical elements of eradication. Their involvement should be based on an agreed code of conduct. Government supervision during eradication or containment operations should be ensured.
- However, if a species has progressed to become widespread and eradication or containment is no longer feasible (the mitigation, coexistence or acceptance phases), then consumptive use can play an important part in the management of the species. However, care is needed to ensure the prospect of consumptive use does not become a motive to assist establishment or spread.
- The uncontrolled cultivation of invasive species, for instance for biomass production, should be discouraged.

Humaneness

- The EU and MS are committed to the humane treatment of animals through a range of legislation, commitments and initiatives. IAS should be considered in the same way, and their welfare during any control should form an integral part of planning.
- Humane vertebrate pest control has been defined as “the development and selection of feasible control programs and techniques that avoid or minimise pain, suffering and distress to target and non-target animals”. (Humane Vertebrate Pest Control Working Group 2004)
- A series of implementation principles have been identified in Australia (Annex 1) to guide design and execution to maximise the humaneness of vertebrate pest control programs. These provide a good basis for producing management plans for ongoing control, discussion is needed on the specific needs of eradication programmes.

- Public support for IAS management is likely to be contingent on the adoption of a humane and sympathetic approach to control, both in terms of its justification and the humaneness of the methods used.
- During the rapid response or early eradication phase it is important to achieve effective control rapidly. It is therefore crucial that especially in this phase methods are chosen primarily on the basis of their efficacy, also considering that early action may prevent large scale control in the future. Taking this principle into account, a balance may need to be struck between the need for speed and effectiveness of response, the humaneness of the method, its target specificity, cost, public acceptability, occupational health and safety and environmental impact.
- Decisions for the selection of methods to achieve eradication should assess lethal and non-lethal controls for the best option based on the accepted criteria, recognising in some cases it may be more humane to utilise a rapid lethal method than longer term controls impacting larger number of animals.
- When deciding on the relative humaneness of different methods, use should be made of existing models, for example the Australian model for assessing the relative humaneness of pest animal control methods which considers both the intensity and duration of suffering (Daff)

Restoration

- The overall aim of restoration should be to achieve stable habitats that may better resist invasion in future, particularly after the removal of an IAS.
- Restoration techniques may be either passive or active. Passive restoration relies on effective eradication of the invasive species and careful monitoring for re-occurrence of the invasive species, while allowing natural processes of recolonisation by native plants or animals to take place.
- Where passive restoration is not possible, for example where eradication of native species has already occurred due to the presence of the invasive species, consideration should be given to active restoration which may be beneficial to native communities by improving resilience to future invasions. Active restoration should have a defined outcome, for a specific purpose or ecosystem function and the IUCN Reintroduction guidelines are relevant to this issue. All restoration activities assume that the habitat / ecosystem has retained the capacity to recover to pre-invasion status. Where this is not the case, decisions should be made either not to undertake restoration, or to implement active restoration to achieve a more stable, but altered habitat.
- Restoration costs in most cases are likely to be high.
- Restoration will most likely occur on a local basis and rarely even at MS level as the priorities for reinstatement of the habitat will vary. Restoration is most likely in situations where ecosystem supplies and services are threatened by the presence of the invasive species, for example protection of water resources, for prevention of flooding, threats to agriculture or other activities that can be assigned ecological or commercial value (Defra, 2011).

REFERENCES

Daff - http://www.daff.gov.au/animal-plant-health/welfare/aaws/humaneness_of_pest_animal_control_methods

Defra (2011) The UK National Ecosystem Assessment. <http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx>

Genovesi, P. (2007) Limits and potentialities of eradication as a tool for addressing biological invasions. *Ecological Studies* 193:385-402

Genovesi, P. (2011) Eradication. In: *Encyclopaedia of Biological Invasions*. Eds Simberloff, D. and Rejmanek, M. University of California Press.

Genovesi, P. (in press) Are we turning the tide? Eradications in times of crisis: how the global community is responding to biological invasions.

Humane Vertebrate Pest Control Working Group (2004). 'A national approach towards humane vertebrate pest control. Discussion Paper arising from the proceedings of an RSPCA Australia/AWC/VPC joint workshop, August 4-5 2003, Melbourne.' Canberra, ACT. http://www.feral.org.au/wp-content/uploads/2011/02/HVPC_Discussion_Paper_Dec2004.pdf

Sharp, T and G Saunders (2008) *A Model for Assessing the Relative Humaneness of Pest Animal Control Methods*. Australian Government Department of Agriculture, Fisheries and Forestry, Canberra, ACT. http://www.daff.gov.au/animal-plant-health/welfare/aaws/humaneness_of_pest_animal_control_methods

Annex 1

- *The aims or benefits and the harms of each control program must be clear. Control should only be undertaken if the benefits outweigh the harms.* Control must definitely be necessary, and the benefits must be clearly identified so that they can be maximised and any anticipated harms minimised. This requires a sound understanding of the impacts of the pest in each case. It must be decided whether the aim is to reduce or avoid impacts or eradicate the pests, as the control method may be different or conflicting in each case.
- *Control should only be undertaken if there is a likelihood that the aims can be achieved.* If the proposed benefits are not achievable the control program cannot be justified. The probability of benefit needs to be assessed and even if the harms are low, control should not be undertaken if the likelihood of benefit is low.
- *The most humane methods that will achieve the control program's aims must be used.* This relies upon an active research and development program to improve the humaneness of existing methods and develop more humane alternative methods.
- *The methods that most effectively and feasibly achieve the aims of the control program must be used.* The method must have the most effective impact on target pests with the least harm to non-target animals, people and the environment. This means that the methods must be appropriate for the species and the situation. The choice will therefore depend on knowledge of which methods can best achieve the aims with the target-species in their particular locations.
- *The methods must be applied in the best possible way.* This is achieved by good quality control applied to, for example, the manufacture, selection, operation, placement, maintenance and effective use of devices, poisons and other components of each control method.
- *Whether or not each control program actually achieved its aim must be assessed.* In reality, control programs do not always achieve their aims. Whether or not this is the case must be determined, so that if necessary, methods can be changed to those that are more likely to achieve the desired aims. The real measure of success is whether a pest control program reduces the negative impacts of pests, not merely whether the number of pests is reduced following control.
- *Once the desired aims or benefits have been achieved, steps must be taken to maintain the beneficial state.* If that were not done, the control program and any suffering it causes would be purposeless.
- *Where there is a choice of methods, there needs to be a balance between humaneness, community perception, feasibility, emergency needs and efficacy.*