IUCN Policy Brief

Biological invasions: a growing threat to biodiversity, human health and food security.

Policy recommendations for the Rio+20 process drafted by IUCN SSC Invasive Species Specialist Group and Invasive Species Initiative

Our planet is undergoing biological homogenisation due to the intentional and unintentional movement of species. Growing rates of human travel and trade are leading to an unprecedented movement of organisms across the globe, ranging from micro-organisms and pathogens to plants, and from invertebrates to vertebrates. Many introduced species establish, spread and subsequently invade in areas where they are not native. Those that are harmful, the invasive alien species[1] (IAS), affect all environments, freshwater and marine, aboveground and in the soil, all ecosystem services, and human physical and cultural health.

IAS are one of the leading and most rapidly growing threats to food security, human and animal health, and biodiversity and, together with climate change, one of the most difficult to reverse[2]. IAS are a main cause of animal extinctions at the global scale[3] and also threaten numerous species[4]. In an IUCN analysis of Red list data, IAS were highlighted to be the 5th most severe threat to amphibians, and 3rd most severe threat to birds and mammals[5]. Many IAS are pathogens, pests or weeds, costing the global economy of the order of many hundreds of billions of dollars each year[6]. In Europe, for example, more than 10% of alien species are inflicting ecological or economic impacts, and threatening all types of ecosystem services[7]. Vast segments of the world's population, especially in developing nations, suffer from vector-borne diseases, such as malaria, dengue, West Nile virus and others, many of which have been transported widely, and which in many areas are spread by invasive vectors such as mosquitos. IAS also affect world food security, as they can severely affect activities such as fishery[8], and have the potential[9] to (and currently[10]) inflict huge pre-harvest yield losses. This concern is heightened by emergence of a new wheat stem rust (*Puccinia graminis*) strain Ug99 epidemic that started in Uganda and that has overcome resistance and may prove catastrophic[11]. Slowing

[1] Invasive alien species defined following CBD decision VI/23 http://www.cbd.int/doc/decisions/cop-06-dec-23-en.pdf
[2] Millennium Ecosystem Assessment, 2005
[3] Clavero M, García-Berthou E (2005) Invasive species are a leading cause of animal extinctions. *Trends Ecol Evol* 20:110
[4] GBO GISP
[5] Vié, J.-C., Hilton-Taylor, C. and Stuart, S.N. (eds.) (2009) Wildlife in a Changing World – An Analysis of the 2008 IUCN Red List of Threatened Species Gland, Switzerland: IUCN. 180 pp
[6] Pimentel D *et al*. 2001. Economic and environmental threats of alien plant, animal, and microbe invasions. Agric. Ecos. Env, 84:1-20
[7] Vilà M *et al.* 2010. How well do we understand the impacts of alien species on ecosystem services? A pan-European, cross-taxa assessment. *Front. Ecol. Environ.* 8, 135–144
[8] Shiganova TA et al., 2001. Invader in the Caspian Sea ctenophore *Mnemiopsis* and initial results of its impact on the pelagic ecosystem. Oceanology 41(4):542–549
[9] Oerke EC 2006. Crop losses to pests. Journal of Agricultural Science 144: 31–43.
[10] Pennisi E 2010. Armed and dangerous. Science 327: 804–805
[11] Stokstad E 2007. Deadly wheat fungus threatens world's breadbaskets. Science 315: 1786–1787

the global spread of this pathogen could cut global production losses by at least US$4.5 billion per annum[12]. IAS account for a large proportion of the total losses (>$5B p.a.) in agriculture production in Australia due to weeds, and increasing levels of herbicide resistance is rapidly reducing control options[13].

The Convention on Biological Diversity (CBD) was the first major international governance instrument to acknowledge IAS as a major cross-cutting theme. Article 8(h) of the Convention calls for parties "as far as possible and as appropriate, (to) prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species". In 2002, the CBD Conference of the Parties adopted Decision VI/23 and Guiding Principles setting out a "Three-stage hierarchical approach" as the basis for all action on IAS: 1) prevention of IAS introductions between and within states as the first line of defence, 2) early detection and rapid action when prevention fails, 3) eradication as the preferred option to manage established IAS, and containment and long-term control measures as the last option. The COP10 of the CBD (held in Nagoya in 2010) adopted, within the Strategic Plan 2011-2020, the Aichi target 9: *By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.* The CBD Programme of Work on island biodiversity[14] acknowledges IAS a as a key area for work, and Decision X/31 calls to improve management of IAS in protected areas.

Key areas of work 2012-2020

Awareness raising

Limited awareness of the issue of biological invasions is a major constraint to effective action. It is important to inform and educate the public as well as decision makers on the magnitude of the problems, the effects of invasions, and the possible solutions. Only with an increased understanding and support from the society will it be possible to enforce more stringent policies on IAS. Key needs are:

- To promote information campaigns to describe the impacts of invasions and the possible responses, designed to target the general public, as well as specific societal sectors (agriculture, transport, fishery, forestry, etc.).
- To compile and circulate examples of best practises, effective solutions, and innovative technical options to address IAS . Support systems and tools to make these information available to the public and to decision makers.
- To compile and circulate best practices and solutions focusing on IAS.
- To provide particular focus to the issues and management of IAS on islands and in protected areas.

Prevention

Risk mitigation of IAS should be built into the assessment of activities under the green economy. Green must also mean biosafe. IAS prevention is far better than cure or lifelong

[12] Cook DC *et al*. 2011. PLoS ONE 6(10): e26084
[13] Sinden J et al. 2004. The economic impact of weeds in Australia. CRCAWM Tech Series #8
[14] http://www.cbd.int/decision/cop/?id=11013

treatment. Internationally recognised and increasingly adopted risk assessment protocols should be utilized to prevent intentional introductions of IAS, for example as biofuels and crop biofactories[15]. Such protocols should be science-based, and should carefully consider environmental, economic, social and cultural costs and benefits. The costs of the assessment should be borne by the proponent, and they should incorporate the precautionary approach where data relating to biosafety are lacking. Key needs are:

- To strengthen cooperation between CBD, IUCN and international standard setting organisations such as IPPC, OIE, CITES and with the WTO SPS agreement to improve international, national and regional trade regulatory processes for minimising the spread of IAS.
- Based on available information, to identify key global-scale drivers and facilitators of biological invasions, and promote voluntary (codes of conduct, best practice, incentives, etc.) as well as regulatory (IMO Ballast Water Management Convention, national and regional biosecurity legislation and regulation such as EU Aquaculture Regulation, etc.) approaches to address key pathways along which invasions occur.
- To ensure that policies and measures in other fields - such as ecosystem restoration and climate change – take account of the risk of causing further IAS invasions (e.g. biofuel, assisted colonization, use of potential IAS in habitat restoration programs, etc.), balancing the short-term benefits with the long-term costs of invasions.

Early warning and rapid response

Prevention of IAS establishment and spread largely depends on the promptness of response. It is therefore crucial to improve techniques for detection and channels of information flow that lead to early warning of invasion (such as alarm lists of priority IAS), effective surveillance for incursions, and the frameworks needed to promptly and effectively guide decisions on eradication or management of new IAS. Key needs are:

- To make best use of available information services, e.g. the Global Invasive Species Database (http://www.issg.org/database/), and of innovative techniques (e.g. DNA barcoding of known IAS[16], applications of search theory) to develop global early warning systems for better identification of threatening species prior to importation and to facilitate rapid response to new incursions. The systems could also incorporate the need for early international reporting of new invasion events.
- To build global, regional and national alarm lists of species, that are, or have the potential to become, invasive.
- To promote capacity-building, involvement of local communities, and the establishment of appropriate frameworks to enable early detection and management of new incursions.
- To remove legal and financial constraints to rapid response, especially in developing countries.

Eradication

[15] Sheppard A. et al. (2011) Current Opinion in Environmental Sustainability 3: 105-111
[16] www.qbol.org

The ability to remove IAS has greatly advanced in recent years, and eradication campaigns have proven effective in improving the conservation status of threatened species, as well as mitigating the impacts of IAS on food safety and human wellbeing. Key needs are:

- To support early detection of new incursions as part of facilitating successful eradication efforts.
- To support eradications of established IAS. Prioritize species for eradications, based on impact on biodiversity as well as on food safety and human wellbeing. Promote eradication campaigns in key areas such as on islands, protected areas, and key points of entry, such as ports.
- To develop tools to prioritise IAS for eradication, based on impacts on biodiversity as well as on human livelihood, as well as to identify key localities for response.

Containment/Control

For IAS that are widely established and causing harm, management aimed at containment and mitigation of impacts is warranted. Effective management of IAS (control/containment) of some IAS groups, like weeds, has had an impressive track record, providing major technical advances. Promising new management technologies deserve increased support. Key needs are:

- To support and encourage science-based management of IAS, e.g. biological control, chemical control, mechanical methods, restoration indicators, risk assessment, bio-economics.
- To improve the resources on hand for rapid response by facilitating the dissemination of proven technologies and methods for control as well as eradication.
- To incorporate IAS and biosecurity policy imperatives in water and land-use planning at all scales from local to global, including islands, protected areas, river and lake basins, production landscapes and seascapes.

Preventing and mitigating biological invasions is crucial to protect global biodiversity, as well as world food security, human health and the global economy. The general principles of how to prevent and mitigate the impacts of invasions have been agreed at the international scale, and the recent advances in invasion science could allow us effectively to address this growing threat. However, as clearly shown by recent assessments[17,18], the global response to invasions has so far been very limited. It is imperative that the recommendations so far agreed upon be taken beyond 'good advice' and 'guiding principles' and turned into enforced policies[19]. It is in particular urgent to immediately start working to meet the relevant aims of the CBD Strategic Plan 2011-2020, prioritizing and managing key pathways of invasions, and identifying and targeting the most harmful IAS. Furthermore, it is also crucial to enforce the relevant IAS aspects of the CBD program of work on islands as it concerns IAS, as well as to improve the management of IAS in protected areas as required by the CBD program of work on protected areas.

[17] 3rd Global Biodiversity Assessment http://www.cbd.int/gbo3/
[18] Butchart et al., 2010. Global Biodiversity: Indicators of Recent Declines. *Science (New York, N.Y.)*, 1164. Available at: http://www.ncbi.nlm.nih.gov/pubmed/20430971.
[19] Lambertini, M. et al., 2011. Invasives: A Major Conservation Threat. *Science*, 333(6041), p.404.