

Invasive Species: how can we monitor their invasion and should interventions take place?



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Introduction

- Invasive Species are those species which become established in natural or semi-natural ecosystems or habitats, and threaten the native biological diversity (IUCN 2000)
- They may spread naturally (without the direct assistance of man) and cause a significant change in composition and structure of the ecosystem (Cronk & Fuller, 1985)
- Alien Invasive Species (IAS) are the 'exotic' invasives
- Indigenous species may become invasive, but this is often considered part of the dynamics of the habitat/ecosystem in question
- Occur in all major taxonomic groups, including viruses, fungi, algae, mosses, ferns, higher plants, invertebrates, fish, amphibians, reptiles, birds and mammals

The Problem of IAS

- The spread of IAS is one of the greatest threats to the ecological and economic well-being of the planet
- They cause enormous damage to biodiversity and the valuable natural agricultural systems upon which we depend
- Direct and indirect health effects are increasingly serious and the damage to nature is often irreversible
- The effects are aggravated by global change and chemical and physical disturbance to species and ecosystems

Environmental/Ecosystem Impacts of IAS

- IAS can transform the structure and species composition of ecosystems by repressing or excluding native species
- Affect entire systems through cascading effects e.g. on plants that rely on insects for pollination or seed dispersal
- Lead to increasing global domination by a relatively few invasive species creating a relatively homogeneous habitats
- How much is the minimum damage, spread or size of population needed for an alien species to be considered invasive?
- These questions need to be investigated and demonstrated for the various known IAS to guide management

Economic costs

- Decrease water supply by degrading water catchment areas and freshwater ecosystems; disturb the hydrological cycle, including flood control and water supply, waste assimilation, recycling of nutrients, regeneration of soils, pollination of crops, and seed dispersal
- In PAs, IAS degrade the ecosystems and drive up management costs
- Pests and pathogens of crops, livestock and trees destroy plants, or reduce yields and increase pest control costs
- Spread of disease organisms which kill or disable millions of people with social and economic implications
- These too have to be investigated and demonstrated for the various known IAS to guide management

Human health costs

- The dynamism among invasive pathogens and various aspects of human behaviour and economic development are complex and require investigation e.g. does population and the pattern of human settlements around BINP, for example, signal any potential threats?
- 'Large' development projects e.g. oil exploration: how much will these contribute to the invasion of diseases?
- Clearing of TRFs for agricultural land: What are the new possibilities for wider transmission of viruses previously circulated in wild animal hosts?

Some invasives Species

Senna spectabilis



Matiri and Budongo FRs; Kibale and Semiliki: How much area is covered? What is happening to the pollinators? What are the properties of timber from this species? What is happening to the soils?



Broussonetia papyrifera



Budongo and Mabira Forest Reserves: How much is covered?

How important is *B. papyrifera* to the diet of primates?

Can the local communities use this species to generate income?



Amaranthus sp.



Kasese district (slopes of
The Rwenzori)

Is this species a threat?
Is it likely to find its way
into RMNP?

Lantana camara



Country-wide coverage: What are the impacts? What are the pollinators?



Mimosa pigra

Sango Bay Area



Caesalpinia decapetala



Is it Invasive??? Not in BINP? Is *Mezoneuron* an alternative??

Nile Perch (*Lates niloticus*)

- Introduced to L. Victoria in 1954 to counteract the drastic drop in native fish stocks caused by over-fishing
- Has led the extinction of >200 fish species through predation and competition for food
- Commercial exploitation of the Nile perch has displaced local men and women from their traditional fishing and processing work
- The far-reaching impacts of this introduction have been devastating for the environment as well as for communities that depend on the lake



Photo: <http://www.african-angler.co.uk/>



Water Hyacinth:
Eichornia crassipes

Azolla filicoidea



What is the coverage of this species? What are its impacts on the aquatic organisms??

Opuntia



Queen Elizabeth NP

What's the impact on the movement patterns of the animals in the park?

Cymbopogon nardus L: Lake Mburo NP and Mbarara area



Is it invasive or can it be planted as a way of managing crop raiding?



Acacia hockii

*It is a challenge
to management in L. Mbuoro*

*What's the impact on grazing
patterns of animals in the Park ?*

*Does fire play a major in its
proliferation?*

The House Crow (Corvus splendens (Vieillot, 1816))



- Is an aggressive and often invasive bird that originates from the Indian Sub-Continent and parts of South-East Asia
- Has been introduced to many tropical and sub-tropical countries where it has become an urban and domestic pest
- Steals human food, pollutes human habitation, spreads human diseases, delights in garbage and lives in noisy colonies

Are extremely detrimental to native biodiversity in a range of invertebrate and vertebrate groups – especially in passerine birds

Is this species already in Uganda?

Prosopis



The genus *Prosopis* includes >40spp.

Several species have become invasive in Africa and other parts of the world e.g. *P. juliflora* in Kenya



Was introduced to stop desertification and to provide fodder, charcoal and fuelwood, shade in the dry zones of the country

-also used for sand stabilisation, soil improvement, or for hedges to contain livestock

Has spread and is now eliminating other species and threatening ecosystems, livestock and the livelihoods of thousands of people (c. 30 000 people are affected Baringo District, where it has encroached onto grazing land, blocking roads and watering points, drying up rivers and changing their courses, and causing the loss of teeth – and even death – in goats)

This has led to a high-profile debate in the country, resulting in the Minister of Environment declaring it a national disaster

Uses of some invasives e.g. *Lantana camara*

- Farmers believe that the species fertilises the soil by acting as manure
- Fresh branches are hanged in the house as mosquito repellent
- Used for medicinal purposes to treat cough
- Used as land marks and to demarcate gardens
- Used as building material for granaries, local huts
- The fruits are eaten by children and birds
- The stems are used as tooth brushes
- Used to control soil erosion
- Used for firewood
- Questions to be asked: Is the species useful to the community?
- Is it likely to spread because of this?



Restoration: Use of exotics vs the indigenous

- Is the regeneration of indigenous species under sites previously covered by exotics successful?
- Can the sites that have been degraded by previous land use practices such as agriculture and logging be re-vegetated with desirable species?
- Is enrichment planting the best method to deal with the problem of arrested regeneration, to encourage recovery of the forest?
- Should exotic species be used to rehabilitate degraded sites because of their adaptability to such conditions?
- Are the exotic plantations or woodlots good nurse crops for the establishment of native forest species?
- **What's the best approach? Research on these questions will guide management in making decisions**

Additional Research Issues...

- What's the response of invasive species to: the combined variations in inter-annual rainfall, temperature, human population density, population mobility and pesticide use?
- What are the economic costs of managing the invasives?

The global IAS problem requires solutions tailored to the specific values, needs, and priorities of nations; as well as efforts at the global level

Some global efforts to deal with invasive species:

Global Invasive Species Programme (GISP-

<http://jasper.Stanford.EDU/GISP/>)

Global Invasive Species Database (GISD) www.issg.org/database/

Invasive Species Specialist Group (ISSG-www.issg.org) of the Species Survival Commission of IUCN (www.iucn.org)

How can we manage the invasive species?

- Management of Invasive Alien Species should include the following:
 - Prevention
 - Early Detection
 - Strategies
 - Assessment
 - Control methods
 - Monitoring and following up

These broad areas can guide development of research questions to yield management options

Prevention

- May target **individual species**
- **Exclusion** - methods are based on pathways rather than individual species i.e. identify major pathways that lead to harmful invasions and manage the risks associated with these
- **Preventive mechanisms**- Quarantine laws and regulations; Accessibility of information on invasive organisms; Public education; Inspection
- **Risk assessments** can be done for pathways as well as individual species
- **Invasiveness of a species**: this be predicted by extrapolating from records of the species as an invasive under similar conditions elsewhere.

Species known to be invasive elsewhere must be considered high priority black list species

Early Detection

- Early detection of non-indigenous species should be based on a system of regular surveys to find newly established species
- Steps in the early detection of invasive species:
 1. Surveys: General surveys; Site specific surveys; Species specific surveys; Data collection and storage
 2. Developing a team of experts/trainers: Who to train; Training needs; Where to train; Who will do the training; and Staff retention

Necessary to develop a database of invasive species in BINP or the Albertine Rift. These can form the basis for early detection

This can be included under Ranger Based Monitoring; use also the local communities to report new occurrences

Strategies

- **1. Eradication:** the elimination of the entire population of an alien species, including any resting stages. Methods:
 - Mechanical control e.g. hand-pulling of weeds
 - Chemical control e.g. using toxic baits and spraying insecticides against insect pests
 - Biological control
 - Biopesticides
 - Pathogens for control of vertebrates
 - Biological control e.g. sterile male releases
 - Biological control of plant diseases
 - Habitat management e.g. Prescribed burning and grazing
 - Hunting and other use of non-indigenous species
 - Integrated Pest Management (IPM)
- **2. Containment:** restrict the spread of an alien species and contain the population in a defined geographical range
- **3. Control:** long-term reduction in density and abundance to below a pre-set acceptable threshold
- **4. Mitigation:** Used if eradication, containment, and control options or have failed

Identify the best method in each case

Assessment

- It is necessary to assess the current situation by determining:
 - the management goal relating to IAS
 - the extent and quality of the area being managed: e.g. BINP? AR?
 - the invasive target species affecting the area presently
 - the native species or habitats threatened
 - current and potential extent of the species on or near the site
 - current and potential impacts of the species
 - value of the habitats/areas that the species infests or may infest
 - difficulty of control

Mechanical means using heavy machines





Mechanical means using simple tools



Opuntia



Control of the Indian Crow

- Control of small groups is possible through trapping, hunting and chemical means, but control of large infestations is almost impossible as the crows learn quickly how to avoid human attempts to catch or kill them and they even attack people trying to manage their flocks
- **Is it possible to act fast upon first arrival of these birds before they breed and spread?** – a classic case for the need for rapid response and direct action



Biological Control of invasives



Biological methods: e.g. i) use of weavils (*Neochetina eichhorniae* and *N. bruchi*) to control the water hyacinth; ii) seed-feeding beetles *Algarobius prosopis* and *Neltumius arizonensis* – for prosopis control

Should biological control methods be used to control invasives in the PA?

Monitoring and following up

- to evaluate the success or failure of the management efforts, it is necessary to monitor aspects such as: population of the invasive species; condition of the area under consideration; changes in species composition and importance
- Control activities, whether they involve eradication efforts, control actions taken, or taking no action at all, must be monitored over the period of the programme. The targets set at the beginning will help to evaluate the success or failure of the programme

Summary

Question

- Which invasive Alien Species occur in and around BINP (or the Albertine Rift)
- What is the coverage of invasives occurring in BINP (or AR) at the moment?
- What are the current and/or potential threats of these species? Links between species composition and invasiveness
- What action should be taken on each of these species?

Data needs

- Species data – Used for focusing management efforts
- Mapping the spatial distribution of IAS – for identification of infested/un-infested but susceptible areas
- Ecological data e.g. on pollinating agents
- Examples of successful management measures; Can they be applied? Monitoring needs? **Don't re-invent the wheel**

Thank you very much

