PEMPHIS .48

Environmental Newsletter
Ministry of Environment and Energy

INVASIVE ALIEN SPECIES

Editor's Note

In this edition, Pemphis undertakes to highlight the obscure but important issue of Invasive Alien Species (IAS). We have always been concerned about our heritage, tradition and culture by our ancestors; but have we pondered about the identities and traits of our ecosystem?

The set of species inhabited in Maldives living in harmony and equilibrium over the generations are now challenged with **Invasive Alien Species**, since some species introduced to the Maldives have the ability to survive, reproduce and compete with native species.

The impacts does not confine to detriments to the ecosystem alone but is associated with illegal issues of trafficking of wildlife, drugs, and business fraud as well.

Pemphis greatly acknowledges the time and contribution provided by Maldives Customs Service for this edition. Senior Superintendent of Customs, Hussein Hameed shared some valuable insights and concerns regarding the issue of Invasive Alien Species and its associated problems.

Hope you all would find out more on " Invasive Alien Species" and its associated concerns from this month's issue.

Wish you all a safe and blessed days ahead.

Feedbacks, comments, articles, photos, etc .
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"Invasive species are a major threat to biodiversity. Given the way they quickly become established and spread, measures taken by one Member State can have no eff ect if neighbouring countries fail to take action or respond in an uncoordinated manner. The ecological, economic and social consequences of the spread of invasive species for the EU countries are serious and need a harmonised response." EU Environment Commissioner Stavros Dimas

Ministry of Environment and Energy organized a stakeholder consultation meeting on invasive alien species on the 8th of this month. Participants which include government ministries and enforcement agencies expressed their concern over the issue. To conclude the meeting Director General of Environment Ministry Mr. Mohamed Zahir remarked upon the importance of putting a cooperative effort in addressing the issue.

Invasive Alien Species

"Invasive alien species (IAS) are species whose introduction and/or spread outside their natural past or present distribution threatens biological diversity." Convention on Biological Diversity

Basic Rule: Arrive, Survive & Thrive

For an alien species to become invasive, its introduced habitat should complement its survivability and reproducibility. However, it must also out-compete the native organisms and spread through and increase its population in its new environment. The local ecosystem can be subjected to negative impacts since this causes disruptions and alterations in the food chain and other associated biological features.

Common Characteristics of IAS

Rapid reproduction and growth
High dispersal ability
Phenotypic Plasticity *(Phenotypic Plasticity: ability to adapt physiologically to new conditions)*
Ability to survive on various food types and environmental conditions.

The Giant African snail, *Achatina fulica*, or locally referred to as "Finihaka" is said to make its mark in the Maldives in the 1960s. Upon the introduction, its population is known to increase dramatically. It is considered as a garden pest but with it can reproduce to such numbers to cause public nuisance. The Giant African snail can alter the habitat properties by feeding on the native plants. Furthermore it is known to out-compete the native snail population as well. It can also act as a vector of human pathogens and parasites.

Coconut Hispid Beetle, *(Brontispa longissima)* distresses seedlings, mature coconut trees and other palms, specifically palms up to five years old are at the greatest risk of infestation.

The beetle is known to attack the closed young fronds of the palm. As the spear unfurls the beetle moves on to other palms or the next emerging spear. Coconut hispid beetle invasion can kill the underlying tissue and reduce the leaf photosynthesis of the leaflets. Infestations may result in the complete defoliation of the palm and in worst cases palms can die.

The beetle was introduced to the Maldives in the late 1990s from ornamental palms imported from Malaysia and Indonesia. It is believed that these originated from adult or immature stages of the pest that were concealed in these palms. Even with the fragmented and isolated geography of the nation the beetle had spread to several islands in a year's period. A severely affected resort of Maldives has reported to have incurred direct economic loss of over US$ 200,000 within a period of 3 years.

Impacts of Invasive Alien Species

Predicting the progress and consequences of a biological invasion is a difficult endeavour packed with complex variables and uncertainties.

IUCN describes the impacts of alien invasive species as **"immense, insidious and usually irreversible".**

American botanist Warren Wagner of Michigan University explains the difficulty of predicting the effects of invasive alien species before it's arrival and invasion
"Nothing is more difficult than to predict what will happen to an exotic"

Impacts: Ecological and Environmental

Alien Invasive Species can impact the environment at all levels of organization including gene, species, habitat and ecosystem.

Gene Pool

Same as humans, it is important to recognize that each organism is genetically unique with respect to the habitat and nature of the ecosystem.

"If introduced or spread into habitats with closely related species, alien invasive species could interbreed with native species resulting in changes to the genetic makeup of either species (Secretariat of the Convention on Biological Diversity, 2003)."

Possible negative consequences of alterations in gene pool:

- Reduction in the survival of either species
- Creation of a more successful invader
- Creation of hybrids that could be more susceptible to certain pests and pathogens
- Loss of gene pools

Ecosystems

The impacts of alien invasive species at the ecosystem level include changes to trophic structures, changes in the availability of resources such as water and nutrients, and changes in the disturbance regimes (McNeely et al., 2001; Secretariat of the Convention on Biological Diversity, 2003a).

Species

Invasive alien species can influence species diversity, richness, composition and abundance. At the species level, direct effects of alien invasive species occur through processes such as the predation of, competition with, and pathogen and parasite transmission to individual organisms, eventually leading to population declines and species extinctions (Loehle, 2003; Secretariat of the Convention on Biological Diversity).

Habitats

Through their impacts on species and ecosystem processes, alien invasive species can result in the fragmentation, destruction, alteration or complete replacement of habitats which in turn, has cascading effects on even more species and ecosystem processes (McNeely et al., 2001; Secretariat of the Convention on Biological Diversity, 2003a).

Ecosystems

Changes subjected to the ecosystem can include changes to trophic structures, changes in the availability of resources, etc.

Economy

Economic impacts can be either direct or indirect. Direct costs are of those related to mechanisms adopted in controlling the spread of invasive species, while the degradation of ecosystem services can be accounted as the indirect.

Social & Health

These species often triggers skin complications, while they act as vectors for dangerous pathogens and diseases. Loss of food sources and decrease of land value are often associated with the introduction of invasive species.

Asian Tiger Mosquito, *(Ades albopictus)* native to South East known to carry over 20 highly dangerous human pathogens such as dengue, yellow fever and chikunguya was introduced to Europe in the form of eggs on used tyres or heavy duty equipment. Regular mosquito outbreaks have been reported across western and southern Europe, where it poses a major health risk.

Since the 17th Century invasive alien species is accountable to nearly 40% of all animal extinctions for which the cause is known

-UNEP-

Through direct impacts on species or through alterations of habitats, invasive alien species are responsible for placing 762 forest species at risk (IUCN, 2005). The loss of such species is leading to a more homogenous world which is perhaps the biggest threat to global biological diversity, behind habitat loss

(Perrings, Williamson and Dalmazzone, 2000; McNeely et al., 2001; Richardson and Rejmánek, 2004).

Miconia

Miconia calvescens

-Shades out native plants and completely takes over forests

-Shallow root systems encourage erosion
-Decreases the amount of rainwater into the watershed

-The seeds spread easily through animals and even through dirt/mud stuck in vehicles, shoes, clothing, etc.

Has overtaken two-thirds of Tahiti's Forests, since its introduction in 1937 and is directly responsible for threatening 25% of their native forest species with extinction.

Invasive alien species are often associated with many emerging infectious diseases such as **Lyme disease, Ebola, Marburg hemorrhagic fevers, malaria, yellow fever, leishmaniasis, trypanosomiasis** and **Kyasanur forest disease**

(Morse, 1995; Sanchez et al., 1995; Wilson, 1995; Daszak, Cunningham and Hyatt, 2000; Chivian, 2001; Chivian, 2002; Cinco et al., 2004).

Giant Hogweed Plant

Heracleum mantegazzianum

Has been introduced to countries as an ornament. The plant has the potential to readily disperse and can grow along roadsides, ditches and streams. It contains high toxins which can cause severe dermatitis and burns when exposed to sunlight. If in contact with the eyes it can cause blindness to the eyes. Each year in Germany alone, 6 to 21 million Euros are spent for eradication and medical treatment. With its dense impenetrable strands, it can also reduce the biological diversity of the native plant species.

80% of the threatened species in the Fynbos biome of South Africa are endangered due to invasions by alien species

North American Red Swamp Crayfish,

Procambarus clarkii

The North American red swamp crayfish, *(Procambarus clarkii)*, was originally introduced into Europe for use in aquaculture. Having escaped into freshwater streams, this aggressive species has since spread across several EU countries, actively colonizing new territories at the expense of rarer native crayfish, such as *Austropotamobius pallipes* which is listed in the Habitats Directive. Apart from causing local extinctions, the red swamp crayfish is also a carrier of a fungus-like organism that is wiping out entire populations of European crayfish. The disease alone is estimated to have an economic cost of over €53 million/year.

Annual environmental losses caused by introduced pests in the US, UK, Australia, South Africa, India, Brazil have been calculated at over **US$100 billion**

-CBD-

It is estimated that US spends around 80 Billion to combat biological invaders.

Islands & Invasive Alien Species

As an island nation with dispersed and isolated geographical characters, Maldives limits immigration of new species, allowing established species to evolve with few strong competitors and predators. However, through human activity invasive alien species can be introduced causing dramatic changes to the island ecosystems. Island ecosystems are more prone to invasion by alien species with the lack of natural competitors and predators.

Being a small island developing state the issue threatens the fragile ecosystem, livelihood, economy and the wellbeing of its citizens.

Common pathways for the arrival of IAS

Ship ballast water, hull fouling, cargo containers and packaging materials, unprocessed commodities such as timber/agricultural goods, imported food species such as fish, horticultural/plant imports, waste material, military activities, and biological agents to combat pests.

Island Birds & IAS

Invasive alien species are stated among the most common threat to the avifauna of islands. Introduced rats, cats and diseases are accounted for half of the global bird extinctions over the past 500 years.

Invasive alien plants and trees have decreased water supplies for nearby communities and increased fire hazards in South Africa (McNeely et al., 2001; van Wilgen et al., 2001; Petit et al., 2004)

Australian Acacia species, such as *A. cyclops* and *A. saligna*, have radically altered nutrient cycling regimes in nutrient poor ecosystems due to their ability to fix atmospheric nitrogen (van Wilgen et al., 2001).

Island birds & IAS

Invasive species are among the most common threat to global avifauna and islands in particular. Invasive alien species, mostly from introduced rats, cats and diseases are responsible for half of the global bird extinctions over the 500 years.

Bird Life International

ScrewPine. *Pandanas*

Screwpine or locally referred to as Kashikeyo have been one of the core ingredients in many delicacies in Maldives. With the absence of common staple foods in the World War II, it is known that Maldivian communities relied on Screwpine to fill the void.

The native species of the screwpine are now threatened with the introduction of alien specimens. It is believed that these specimens were first introduced from a Caribbean country and distributed throughout the Maldives. Since the introduced screwpines had preferable features over the natives, farmers tend to promote the introduced foreign species of screwpine. At present the local vegetable and fruit market is occupied by these alien specimens, side-lining the natives.

Countering the issue of Invasive Alien Species

Each invasive alien present deserves individual management plans with respect to the habitat and environmental conditions.

Counter actions can be categorized into prevention, mechanical, chemical, biological, indirect and integrated.

Prevention

As a rule of thumb, prevention is the most cost-effective method against the issue of alien invasive species. Throughout the world, governments have imposed stringent laws and regulations to minimize the entry of invasive species. Common practices under prevention can be custom checks, shipment inspections and quarantine. Awareness of the general public is important for successful implementation of preventive measures.

Mechanical

These methods include use of machines, hand picking, soil tillage, trapping, shooting, etc.

Biological Methods

Biological control includes various methods which is associated around the use of a living organism as a predator with the aim of controlling a particular target alien invasive species.

Control strategies of biological means include:

Introduction (classical biological control) of a herbivore or parasite from the 'pest's' area of origin;
Inoculation - repeated releases (of sterile males, for example) so as to prevent pest build-up;
Inundation - where large numbers of natural enemies are cultured and released during critical periods in the life cycle of the crop or other alien species;
Conservation - where measures are taken to conserve and enhance the numbers of natural enemies already present in an area thus decreasing the mortality of the affected species; and
Augmentation - where natural enemies of a pest are at too low a level and the numbers are augmented by artificial rearing and release.

Chemical Methods

Herbicides/Pesticides: The most widely used method in eradicating unwanted animals and plants.

Anti-Coagulant poisons: Used to eradicate rodents by effectively blocking the vitamin K cycle, inhibiting the ability to produce essential blood-clotting factors.

Immunization: Animals are given immunization doses to combat from potential invasive species. In Ontario, raccoons and skunks are immunized to prevent the rabies virus.

Impeding reproductive ability: The method utilizes hormones to lower the reproductive potential of the species.

Pheromones: uses traps based on chemicals produced by the target species to attract members of the same species.

Pimentel, Zuniga and Morrison (2005) estimates that the 50 000 alien species in the United States cost almost US$120 billion in environmental damages and losses yearly. Pimentel et al. (2000) gave an estimate of US$137 billion per year.

Pimentel et al. (2001) looked at over 120 000 alien species of plants, animal and microbes that have invaded Australia, Brazil, India, South Africa, the United Kingdom and the United States causing significant economic losses in the agriculture and forest sectors and negatively affecting ecosystems. They estimated that the total cost in the six countries was US$314 billion in damages per year - Australia ($13 billion), Brazil ($50 billion), India ($116 billion), South Africa ($7 billion), the United Kingdom ($12 billion) and the United States ($116 billion).

OTA (1993) concluded that about 4 500 exotic species occur in the United States and that about 20 percent of them have caused serious economic and environmental harm. The cumulative loss caused by 79 of these species was estimated at almost US$97 billion for the period 1906 to 1991.

Pemphis Talk

Pemphis meets Senior Superintendent of Maldives Customs Service.

Hussain Hameed

Procedure followed by Customs when dealing with imported species

Since Customs is an enforcement agency, we follow laws and regulations set by policy making institutes. As per norm, Customs will ensure the species to be imported have been granted permissions from the relevant institutes.

If the species is found to be illegal, Customs will confiscate the species and handover to the relevant authorities; in required cases, extermination of the species will be carried out in presence of the relevant authorities.

Experience sharing of Customs with other countries:

Illegal doings along the border are shared with Regional Intelligence Liaison Office, World Customs Organization and countries of interests as well.

Trend in the imports of Alien Species:

A study is required to derive the actual statistics but with regard to the cases we can assume that the **trend is definitely not decreasing.**

Most Common Cases:

Snakes and Birds

Highest priority of Customs:

Narcotics comes first, followed by others

Advice to the general public on this matter:

The importers should know legal status of the subject to be imported. People should find out information about legal and illegal species before trying to import it. **Individuals should bare their responsibility towards the wellbeing of the nation before their own personal amusements**. Don't get involved in any illegal activity even if it's related to a friend of a family member. The general public is not aware. **People should share the information with customs or police about alien species; (if it's being smuggled into the country or if anyone is in possession of such a species)**. There is a mechanism in which information could be shared without disclosing who you are.

Health and Safety concerns of Customs officers when dealing with these species

Since Customs is an authority working at the frontlines the threat of such an event is there. As per health and safety Customs may always not be prepared in terms of work health and safety since such events would be isolated and dispersed.

Mechanism in identifying alien species:

At present there is no such mechanism formulated, but we are in need of one. Customs do have some difficulties therefore we need more training to be informed of the species.

Emergency plan, such as a virus infected shipment:

At the moment we lack a plan; but we are formulating such a plan which covers the required procedures.

Customs perspective on the relation between illegal imports of species and narcotics:

These species have been confiscated from Police operations regarding narcotics, so therefore it is known that there is a link between these two. With respect to the available information, drug dealers have these exotics as their pets.

Challenges faced by Customs in dealing with Alien Species:

Customs are required to check a lot of areas; it is fairly easy to check the airport passenger terminal area while Customs face difficulties in the air-cargo area. With the dispersion of sea vessels and the marine routes poses the greatest challenge for customs.

Another challenge is that the lack of coordination between the institutes working at the border. **To have a dedicated law and regulation to tackle the issue would be one of the solutions while implementing a documented rigid coordinating system to manage the ports among the relevant authorities and stakeholders.**

Public awareness and awareness campaigns regarding the issue is inadequate. **It is important to step up these campaigns as it is not just Customs officers who should be aware of this.**

Reason for the demand in smuggling Alien Species:

As per Customs perspective the demand is dependent upon two factors; import duty and legality of the subject. If the import duty is high or if the subject is banned or illegal; smuggling and demand does increase along with the associated profit of the sale.

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