



# STOP

the  
**I**nvasion of  
**A**lien  
**S**pecies







# **Stop the Invasion of Alien Species**

CABI Caribbean and Latin America

Mitigating the Threats of Invasive Alien Species in the Insular Caribbean (MTIASIC)

St. Augustine, Trinidad and Tobago

August 2012

© 2012 CABI Caribbean and Latin America

under The Project: Mitigating the Threats of Invasive Alien Species in the Insular Caribbean (MTIASIC)

CABI encourages the fair use of this document. Proper citation is requested.

This publication is also available in hard copy from the contacts listed at the back of the publication.

Editorial coordination: Diana Francis, Naitram Ramnanan

Publication concept: Diana Francis

Cover design and layout: Kathryn Duncan

Printing: SCRIP-J, Trinidad and Tobago

The views and opinions expressed in this publication and all errors and omissions are those of the authors, contributors and editors and do not necessarily reflect those of CABI.

ISBN: 978-976-8242-22-8

Trinidad and Tobago

2012

*Dedicated to the many men, women and children around  
the Caribbean who take steps, no matter how simple, to  
help protect the region's biodiversity and promote sustainable  
development by helping to prevent introductions and manage  
the spread of invasive alien species which threaten ecosystems,  
habitats and local species.*

| IAS

destroys local biodiversity!



Mongoose



Wild Cat



Black Rat

| STOP

the destruction!

SoS save our species!

SoB safeguard our biodiversity!



Saint Lucia Racer



Dominican Republic  
Ricord Iguana



Trinidad's Blue  
and Gold Macaw

# FOREWORD

*Invasive Alien Species (IAS) are a major threat to the unique and vulnerable biodiversity (the variety of species and their natural habitats) found in Caribbean seas, freshwater and land resources. They also threaten livelihoods of people who depend on this biodiversity.*

*IAS threats and the need to alleviate their potentially devastating impacts have prompted Caribbean states to take actions to combat IAS. Such actions are guided by the principles of Article 8 (h) of the Convention on Biological Diversity (CBD), which is one of several other international instruments addressing IAS threats.*

*At present, the IAS threat in the Caribbean is being partially addressed through a regional project "Mitigating the Threats of Invasive Alien Species in the Insular Caribbean (MTIASIC)". It is being implemented in five (5) Caribbean states –The Bahamas, The Dominican Republic, Jamaica, Saint Lucia and Trinidad and Tobago. The project is promoting a broader approach to dealing with IAS, supporting strengthening of existing national measures and fostering regional cooperation frameworks for Caribbean-wide actions.*

*Within this regional cooperative approach, each project country must take steps to address its own most problematic IAS problem. Such steps are represented in a total of twelve (12) pilot projects that range from prevention, early detection and rapid response, eradication and control, and management. These national pilot projects place strong emphasis on capacity building among Government staff and other practitioners and on raising awareness of IAS issues among a wider stakeholder group including the general public.*

*These pilot national projects will carefully document their methodologies, processes, actions, findings and lessons learned. These will developed into best practices and tools that will be shared with the rest of the Caribbean to enhance their capacity to address existing and future biological invasions.*

*Public awareness and understanding is pivotal in the fight against IAS. Participation of communities and the general is essential to stop the introduction and spread of IAS in Caribbean states. It is hoped that this publication will help to sensitize and enhance understanding of the IAS threat among a wider audience.*

*The MTIASIC project is indebted to the national coordinators for their collaboration and efforts in writing the technical papers which provided the content for this publication, and for their coordinating role with obtaining articles from other authors. The willingness of all authors for repackaging of their information and reviewing accuracy of the final information is acknowledged.*

*The MTIASIC project is also extremely grateful to Ms. Diana Francis of the Inter-American Institute for Cooperation on Agriculture (IICA) and the Caribbean Regional Agriculture Policy Network (CaRAPN) for the yeoman services and their in-kind contribution in extracting and repacking the technical information into this publication.*

*You, the reader, are encouraged to pass this on the information and understanding gained and become a champion in protecting our environment; agriculture, trade and livelihoods from the ravages of IAS.*

**Naitram Ramnanan**  
**Regional Representative and IAS Coordinator**  
**CABI Caribbean and Central America**

August 2012

# CONTENTS

|  |           |
|--|-----------|
| <b>Introduction</b>  | <b>9</b>  |
| in brief - Invasive alien species                            | 10        |
| <b>1. Alien Invaders</b>                                     | <b>15</b> |
| Alien bird invaders  | 16        |
| • Tweet this! (the Bare-eyed Thrush and Red-Ringed Parakeet) | 17        |
| • Petite, pretty predator (the House Sparrow)                | 18        |
| Alien plant invaders   | 20        |
| • A problem to a solution (the Hawaiian Sea Grape)           | 21        |
| • The big bamboo (Bamboo)                                    | 22        |
| • “Punked” (the Paperbark Tree)                              | 24        |
| Alien aquatic invaders                                       | 26        |
| • Aliens in our waters (Trinidad's invasive alien aquatics)  | 27        |
| • Aquarim seaweeds can invade our seas                       | 28        |
| • The ‘taliban’ fish (The Suckermouth)                       | 29        |
| • Beauty is the beast (the Lionfish)                         | 30        |
| The tale of two snails                                       | 31        |
| • Quilted Melania and Giant African Snails                   | 31        |
| Four legged Aliens   | 32        |
| • This green is not in (the Alien green Iguana)              | 33        |
| • Voracious and wild (Wild pigs)                             | 34        |
| • Small pets, big pests (The Red Slider Turtle)              | 35        |
| • Stealthy stowaways (the Black or Ship Rats)                | 36        |
| <b>SoS - Save our Species</b>                                | <b>37</b> |

a section dedicated to some of the species under threat in the Caribbean, from IAS and other destructive elements.



## **2. Combating the IAS threat!** **47**

Prevention - always better than the cure **48**

- Green Customs Initiative **48**
- Voluntary Codes of Conduct and the Wildlife trade **49**
- Protect the Cocoa Industry **50**

Eradication – not always possible **51**

- Success Story & Best Practice – Rat-proofing Antigua's Islands **53**

Managing IAS – Lessons Learnt **54**

- Understanding the opponent! **55**
  - Building Knowledge and Learning Networks - An experience from Jamaica **56**
  - An experience from Saint Lucia **58**
- Choosing the right tools and strategies – the hunt is on! **59**
  - Wild pigs are not welcomed in Saint Lucia's forests **60**
  - Using Conservation Canines to Locate Invasive Iguanas in Saint Lucia **61**
- Enhancing cost-effectiveness of eradication and control operations **62**
- Staying vigilant and building early warning systems! **63**
  - Possibilities: using local species for biological IAS control **63**
- Community participation - key to sustainability **64**
  - Small seed – Big solution, Dominican Republic **64**
- Keeping the public educated, aware and engaged! **65**
  - Creating awareness and changing public perception, Jamaica **65**
  - Engaging the public media participation, Dominican Republic **66**

### **A call to Action!**

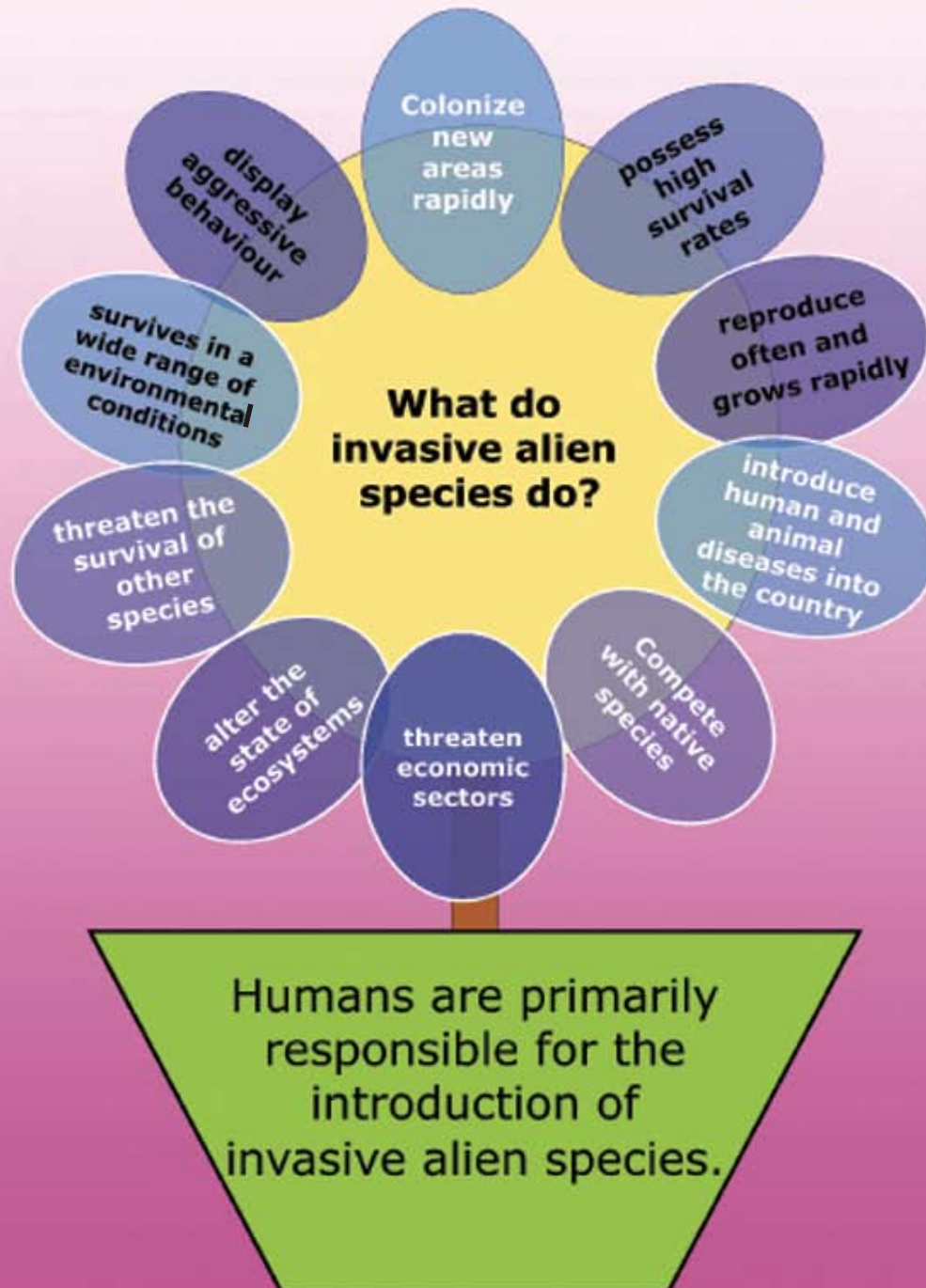
**About the MTIASIC Regional Project, National Pilot Projects and the CIAS Strategy**

**67**

# **INVASIVE ALIEN SPECIES - HOW MUCH DO YOU KNOW?**

## **What are Invasive Alien Species?**

Invasive Alien Species are plants, animals, or microorganisms which are introduced deliberately or unintentionally into an area where they do not naturally occur. The introduction and or spread of these species threatens other living things.



# Introduction

Most people..., don't realize when they see a plant or an animal, if it's native or non-native. Unfortunately, quite a few of them don't belong here and can cause harm.

adapted from Dr. Kenneth L. Krysko,  
Herpetology Collection Manager,  
Florida Museum of Natural History

in brief

# Invasive Alien Species

The concept of invasive alien species (IAS) is relatively new in the Caribbean and IAS impacts on biodiversity, environment, livelihoods and economies are becoming more obvious. IAS damage infrastructure, food crops, aquaculture and timber stocks, block waterways and increasingly affect human health.<sup>(1)</sup>

IAS are one of the principal causes of species extinctions and the biodiversity crisis. IAS can affect native species by eating them, competing with them for resources, such as food, inter-breeding and hybridising, disrupting or destroying their habitat, and/or introducing pathogens, parasites or diseases that weaken or kill them.

Once an alien species has been introduced to a new country, there will be a brief period when its chances of establishment hang in the balance. In the Caribbean, the importance of dealing with the IAS problem is gaining widespread acceptance. Fortunately, IAS management methods tend to be similar for any type of organism and site, and does not necessarily depend on the pathway by which the IAS was introduced.<sup>(2)</sup>

(1) Bird Life International

(2) U.Krauss

All IAS are hitchhikers, 'hitching rides' on anything that moves – packaging material, ships, even you!

They use various forms of 'transports' to move them from one place to another, including imported used vehicles, used tyres, ships' ballast water, ports in cargo holds, aircraft cabins, or shipping containers, wood pallets and packaging material, bamboo and construction material, among others.

Some IAS are capable of long-distance migration, using prevailing winds currents, such as from Africa to the Caribbean. Such natural spread are of great concern, especially with projections of more extreme weather variability and other climate change impacts.

Human movements are by far, the main pathways for IAS introductions. Pathways are the means by which an invasive species may be brought into a foreign environment (intentionally or otherwise).

Arrival by air, sea or land, all carry risks of IAS introduction. Humans can unknowingly carry 'hitchhiker' pests on themselves, clothing, shoes, and/or on objects brought to or taken from an area (e.g., handicrafts). Humans also intentionally 'sneak some in' as pets or planting material.

Free trade and globalisation have enabled greater and wider movement of people who are often intentional or accidental carriers of all kinds of organisms, including IAS. The explosion in internet trade has also made purchasing of IAS, as pets, easier.

| STOP  
being an  
accidental  
carrier of the  
dreaded IAS!

| STOP  
sneaking in  
foreign plants  
and animals!

| STOP  
the habit!

Once an IAS establishes itself in a new area, it is difficult to determine the pathway of introduction.



## The Construction industry

*Construction is a grossly underestimated pathway for the spread of IAS with no existing international standard that deals with this issue.*

- removal of natural dispersal barriers during construction of Marine Canals, such as the Suez and Panama canals, allows aquatic species to cross between water bodies, hybridizing with related native species.
- importation of building materials harbours IAS and also allows some invertebrates and small reptiles to 'hitch-hike' on dirty heavy duty equipment.
  - sand can carry weed seeds, arthropods, as well as parasites and pathogens of plant, animals and man;
  - soil harbours even more organisms than sand and its import into most countries is prohibited or at least strictly regulated;
  - used heavy duty equipment previously involved in earthwork may have soil remnants and plant debris which hosts seeds, insects, nematodes and plant pathogens;
  - imported lumber is also a potential pathway for the introduction of pests;
  - imported used garbage trucks are also a potential pathway for IAS introductions.

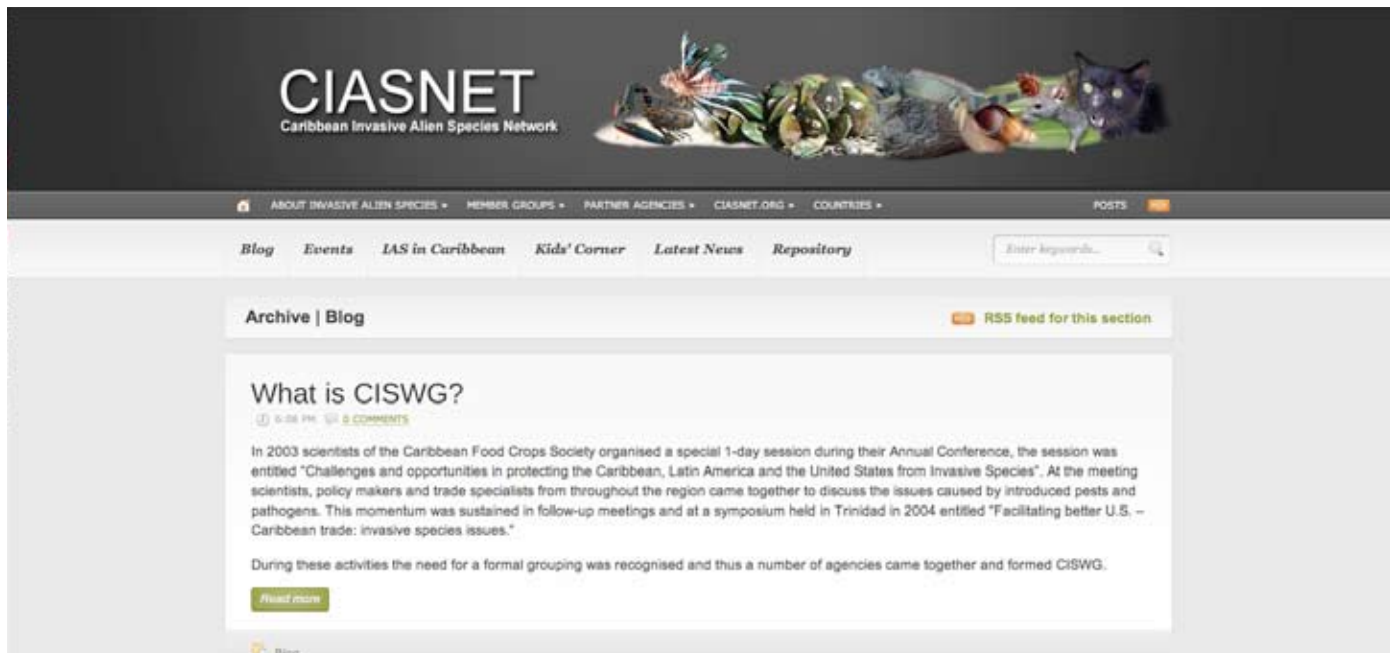


*Sand Fly Injectors are used to rid infested beaches in Belize. The effect is ephemeral and unlikely to be cost-effective for the construction industry*

Contributor: U. Krauss

Looking for information on  
invasive alien species?

Then go to  
[www.ciasnet.org](http://www.ciasnet.org)



The screenshot displays the CIASNET website. The header features the CIASNET logo (Caribbean Invasive Alien Species Network) and a collage of various invasive species. Below the header is a navigation menu with links for 'ABOUT INVASIVE ALIEN SPECIES', 'MEMBER GROUPS', 'PARTNER AGENCIES', 'CIASNET.ORG', and 'COUNTRIES'. A search bar is located on the right side of the navigation menu. The main content area shows a blog post titled 'What is CISWG?' with a date of '0:08 PM' and '0 COMMENTS'. The post text describes the formation of CISWG in 2003 by scientists from the Caribbean Food Crops Society. A 'Read more' button is visible at the bottom of the post. The footer includes a 'Blog' link.



# 1. The Alien Invaders (IAS)

Biological invasion is a serious threat to global biodiversity. It is important to understand the process of biological invasion and the invaders themselves.

*E. Arnoux and B. Faivre*

## Alien Bird Invaders

Invasive birds have negative impacts on agriculture and the environment. They are responsible for spreading major weed species.

In Hawaii, 37% of major weed species were spread by introduced birds. Parrots may fly up to 30 miles in the course of a day, spreading invasive plants high into the rain forest(1)

Invasive birds may cause serious economic damage to grain and cereal crops. The House Sparrow recently introduced into Trinidad and Tobago, is notorious for destroying eggs and hatchlings of native species.

IAS are associated with extinction of(2):

- 134 bird species worldwide since the 1500s. Other contributing factors include over-exploitation by humans and habitat destruction due to logging and expanding agriculture.
- at least 71 species, due to predation of introduced animals, especially rats and cats, the most deadly, dogs, pigs and mongooses, and sheep, rabbits and goats, which destroyed habitats. Diseases caused by introduced pathogens also played a role in species extinction.

*Contributors: (1) U. Krauss; (2) Bird Life International (2008)*



## Tweet this!

**The Bare-Eyed Thrush**, native to South America and South of the Lesser Antilles, is invading the **Caribbean Islands!**

The Bare-eyed thrush is considered native to the Lesser Antilles, as far north as Antigua. However, its recent range of expansion appears to be facilitated by the absence of its natural enemies. This theory is supported by the fact that this invasive species have fewer parasites compared with indigenous species in the same area.

If allowed to successfully colonize the islands, the Bare-Eyed Thrush can have a negative impact on endemic birds in the Lesser Antilles. It is hoped that current research into the bird's immune defences against native and newly encountered parasites will improve understanding of the dynamics of the competition between native and invasive species and thus help in the fight against invasive birds.

Contributors: E. Arnoux and B. Faivre

**The Rose-ringed Parakeet is thriving in urban Jamaica** after establishing both wild and naturalized populations in Australian, British and American cities.

In March 2008, a flock of strange parakeets were seen flying over the suburbs of St. Andrew, Jamaica; strange because they are native to Africa and Asia. The Rose-ringed Parakeet's beauty, large size and ability to mimic speech make it a popular pet. It has proven to be one of the most successful species to thrive in urban settings and become an invasive species.

The Rose-ringed Parakeet could have negative impacts on Jamaica's native bird life, posing a real threat to native species of the same family - the Yellow-billed Parrot (*Amazona collaria*), olive-throated Parakeet (*Aratinga nana*). The Olive-throated Parakeet may be most affected as it is more likely to overlap with the present range of these new invaders. Here they may be out-competed for resources. A wild population of Yellow-billed Parrots that reside in the nearby Hope Gardens and its environs may also be impacted by this invasion.

Contributor: R. Miller

Bare-eyed thrush (*Turdus nudigenis*)



on Pigeon Island, Saint Lucia  
(Photo: Emile Arnoux)

The Rose-ringed Parakeet  
(*Psittacula krameri*)



A new invader to the  
Jamaican Avifaunal landscape  
(Photo: <http://images115.fotki.com/v690/photos/6/869496/9634780/IMG5145b-vi.jpg>)

## Petite, pretty predator!

With a reputation as the most widely distributed wild bird on the planet, the House Sparrow is very aggressive for its small size!

Native to the Middle East, it has successfully expanded its range and is now widely distributed throughout Europe, Asia, North, South and Central America, Africa, Australia and New Zealand.

The House Sparrow was identified in Trinidad in May 2012, believed to have first inhabited the Point Lisas area in early 2011. Initial surveys showed that the bird was only found in and around buildings at the Point Lisas Industrial Estate on the west coast of Trinidad. So far, the colony is about 100 birds.

The sparrow has been classified as an invasive species. They have been known to destroy agricultural crops, including grains and fruit trees and displace native birds by out-competing them for nesting sites and foraging grounds. These birds are also known to carry a range of diseases and parasites harmful to humans, other bird species, livestock and domestic animals. These include West Nile virus, avian pox, avian malaria, Salmonella and E. coli. Since these birds generally establish themselves close to human populations, this makes them very dangerous to human health!

The Trinidad and Tobago Rare Bird Committee (TTRBC), which alerted national authorities to its presence, is part of a multi stakeholder committee established to determine the extent of the invasion. In addressing the threat of this bird and its potential impact on local bird species, methods of eradicating the birds are being explored, including mist netting, trap and euthanize, nest destruction, poisoning and shooting methods used in countries, such as, Mauritius.

The sparrow is also present on other Caribbean islands, including Cuba, Jamaica, The Bahamas, Puerto Rico, Hispaniola, Guadeloupe, St. Thomas and St. Martin.

The House Sparrow (*Passer domesticus*)



The House Sparrow is a petite compact bird which ranges in size from 14–18 centimetres and has a rounded head, a short tail and a stout bill. The males are a bright brown with grey heads, white cheeks, a black bib and a rufous neck. The females are a light brown, with gray-brown breast and their backs have black and brown stripes. Studies have shown that these sparrows mature quickly and can live for up to 12 yrs.

(Photo: Faraaz Abdool)

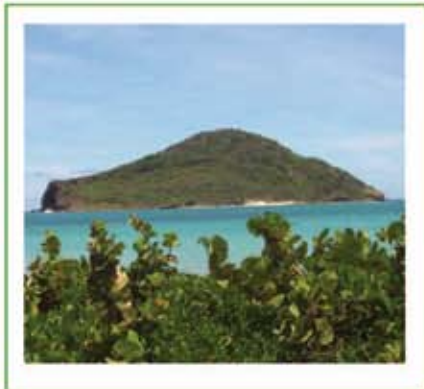
Contributor: V. Ferguson-Dewsbury



# Annihilating Invasive Alien Iguanas & Preserving Maria Island Nature Reserve

## WHY ANNIHILATE INVASIVE ALIEN IGUANAS?

- The St. Lucian iguana is the largest native land animal on the island but its low population makes these iguanas critically endangered
- An alien species of iguana, used for display at a local hotel, escaped and established a local breeding population in and around Soufriere. If interbreeding takes place the genetic uniqueness of the native species could be lost



## WHY PROTECT MARIA ISLAND RESERVE FROM IAS?

- The Maria Islands, part of Pointe Sable National Park is home to the most threatened, endangered and restricted endemic reptile species. Of the eight reptile species on the island, five are endemic including the St. Lucia Racer snake (*Liophis ornatus*) and the Maria Island's ground lizard (*Cnemidophorus vanzoi*)
- Biological invasion by IAS have the potential to disrupt this fragile ecosystem

### The projects aim to:

- Determine the spread of the alien iguana and evaluate methods for eradication
- Conduct an inventory of biodiversity on Maria Island and reefs
- Prevent the entry of IAS by creating general awareness among the general public and in particular officers at ports of entry. Focus will be placed on improving capacity in monitoring, early detection and rapid response

## Alien Plant Invaders

“Is it a bad thing if I bring just a few seeds or cuttings of a pretty plant from abroad for my own garden?”

Yes, Yes and YES!

A number of ornamental plants grown for decorative purposes in gardens, landscape etc., are invasive and have the potential to grow, outcompete and replace native plant species.

Humans tend to look on plants with a sense of indifference or consider all plants to be beneficial. We have no idea of the social, economic and ecological costs and long-term impacts of introducing these ‘exotics’ into local environments.

Invasive plants ‘escape’ and if left unchecked, will naturalise and eventually dominate the landscape, displacing local species. Many invasive plants are pioneering species: they rapidly colonize areas of non-vegetated and disturbed soil.

*Contributors: D. Gustave & V. Sealys; A. Davis*

## A problem to a solution

The Bahamas has a particular challenge – open, exposed and vulnerable sandy coasts. A solution! Landscaping - using plant species that are hardy and thrive in salty areas and sandy coastlines.

However, landscaping tree solutions are quickly becoming a major problem, invading the Bahamian natural landscape, posing a major threat to native plants, habitats and ecosystems!

Hawaiian Seagrape (*Scaevola taccada*) has become well established along coastlines and beaches in the Bahamas. Hawaiian by origin, *Scaevola*'s glossy broad leaves, small white flowers and white berries make it a perfect plant for the coastline and sandy soils throughout The Bahamas. It is extremely hardy, grows rapidly, is very easy to propagate and requires little maintenance, offering an easy landscape solution for a difficult environment. It can quickly form an attractive hedge or groundcover.

Australian Pine (*Casuarina equisetifolia*), is also an attractive, tall, slender and fast growing tree. Growing up to over 100ft., it is a perfect shade tree and windbreak for coastal gardens. However, once established, it radically alters the temperature, light and soil chemistry of beach habitats, and inhibits the growth of native dune and beach vegetation, vital for coastal ecosystems. It also affects the habitat of nesting sea birds, sea turtles and the highly endangered native Iguana Species. When the Australian Pine was introduced in the 1920's, there was no inkling that this 'perfect' coastal landscaping solution would become such pest!

Both species are targeted for eradication, and if that fails, control!

If unchecked, these invasive alien trees could take-over mangroves, wetlands and render native plant species extinct. Natives, such as, Fan flower, Inkberry or Beachberry (*Scaevola plumieri*, which has blue berries), Sea Oats, Sea Lavender, Blue Inkberry, Mangroves and others that stabilize the beach and prevent erosion, are under threat!

Hawaiian Sea Grape  
(*Scaevola taccada*)



Photo: <http://treeflower.la.coocan.jp/Goodeniaceae/Scaevola%20taccada/Scaevola%20taccada.htm>

Australian Pine  
(*Casuarina equisetifolia*)



Photo: <http://www.hear.org/starr/images/image/?q=040704-0029&o=plants>

Seen as a landscaping solution for difficult environments, these invasive alien trees will cover, out-compete and eventually dominate and displace neighbouring plants, including native dune species, particularly near the coast.

## The big Bamboo!

The common bamboo was introduced into the Caribbean in the 18th century. It is now well established, growing in areas at sea level, along embankments of rivers and other freshwater bodies and in higher elevations, such as the Blue and John Crow Mountains in Jamaica's National Park and mountain ranges in Trinidad and Tobago and Hispaniola.

Bamboo, the fastest growing plant in the world, matures within 3-4 months depending on the soil quality and climatic conditions, especially in open areas where it gets much sunlight. In 2002, several common bamboo shoots over one foot high, growing within the Lower Montane rainforest of Tobago were measured daily over a nine day period during the wet season. In these nine days, the fastest growing shoot grew by seven feet, i.e., about nine inches new growth per day!

Bamboo quickly occupies lands previously cleared for agriculture, such as on the several abandoned hillside farms, pastures and deforested mountainous areas. Where the native vegetation has been removed, bamboo is usually planted in its place as a means of reducing the impact of soil erosion. Bamboo's rapid growth slows the recruitment of native tree species and can significantly reduce and displace undergrowth of native grasses and shrubs that are important for some birds and many other native species.

Contributors: M. Curtis; W. Trim

Bamboo (*Bambusa vulgaris*; *B. vulgaris*)



Bamboo, a perennial evergreen, is now common vegetation, used as a valuable resource in the Caribbean. While the economical, environmental and cultural inputs and benefits of *B. vulgaris* have not been quantified or formally collected, the economic value appears to be considerable, while the environmental impact remains unquantified.

### Some Common Uses of Common Bamboo in Caribbean Countries

- Domestic Use: traditional medicine, making water troughs; fuel and lighting (flambeau); personal items;
- Ecotourism: river rafting; landscaping; handicrafts, basket making, musical instruments e.g., tamboo bamboo music;
- Construction: huts, building material; scaffolding; boundary markers; furniture making;
- Farming: crab traps, fishing rods, fish baskets; rafts; fencing, plant supports and soil ilizer





# Protecting our Marine Biodiversity from the threat of Lionfish Invasion

- Lionfish *Pterois volitans* venomous dorsal, anal, and pelvic spines make them almost immune from predators;
- Native to the Indo-Pacific;
- Highly invasive in the Western Atlantic Abundant along the US Continental Shelf, The Bahamas and spreading within the waters of the Caribbean;
- An efficient carnivore that outcompetes native predators – potential for severe loss to commercial fisheries;
- Venomous spines are a serious threat to human health.

## We will:

- Evaluate removal techniques and frequency
- Provide training in safe handling
- Conduct lionfish ecological studies to improve management
- Enhance and implement policy to manage lionfish
- Enhance public awareness

## “Punked”

‘*Melaleuca quinquenervia*’ or the ‘punk tree’, ‘paper bark tree’, ‘bottlebrush tree’ as is commonly referred to in other parts of the world, has its origins in Australia.

The ‘punk tree’ believed to ‘have arrived’ or ‘introduced’ Bahamas since the 1950s, is very well settled in the Bahamas. It is considered attractive and as it requires little care, homeowners are likely to maintain the tree on their properties.

It has no native pests in the Bahamas and competes with slow growing Bahamian plants for resources, particularly water! Although the invasion is considered to be in its early stages, potential threats include:

- loss of native biodiversity, as pine, mangrove and coppice forests are lost to invasion and fire and wildlife is displaced. Forests and ecosystems near human communities are already fragmented and have lower resistance to invasion.
- increased fire hazard in wildlife areas. The bark of the tree forms layers that regularly peel off and oils in the leaves and bark support very hot fast burning crown fires.
- reduction in ecotourism potential, particularly in less developed islands, where native wildlife is a vital part of the economy.
- potential decline in fisheries, as coastal habitats such as mangroves and coastal coppice are no longer able to support fish nurseries and have reduced potential to clean water and runoff into creek systems and near shore coral reefs.

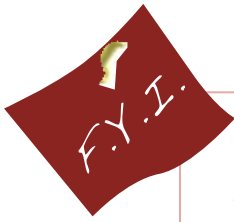
The Paperbark Tree (*Melaleuca quinquenervia*)



A single tree creates millions of seeds and when damaged by cutting or fire will release the microscopic seeds which can easily travel on air currents or water. After settling, these seeds have a high rate of success and eventually create single species stand.

F.Y.I.

*With predictions of higher temperatures and less rainfall, the scenario for escape and dominance of invasive plants possibly increases with climate change. Drought and wildfires favour pioneer species and these invasive plants are more likely to survive and out-compete native species as they have a higher tolerance level to variable conditions than native species do.*



## Wildfires and plant invasions

*Global surface temperatures are predicted to rise a further 1.1 to 6.4°C (2.0 to 11.5°F) during the 21st century. A drastic increase in wildfires is among the projected negative impacts for island countries in the Caribbean. An increase in wildfires would subsequently fuel conditions for an explosion of invasive alien plant species.*

A wildfire is considered a raging conflagration, which rapidly spreads out of control, most frequently in the summer, when the brush is dry and flames can move unchecked through a wooded area.

Fire in  
Caura Hills,  
Trinidad

May 2007

(Photo: CARDI)

Growth and spread of invasive plant species depend on two main factors (a) the availability of cuttings, seeds, or spores (or propagules) that can produce a new plant, and (b) the amount and quality of resources that newly arrived 'propagules' need to grow (sunlight, soil nutrients etc).

Post-fire conditions can create ideal habitats for certain plants. When these conditions are created within easy range of cuttings, seeds, or spores of invasive plants, the situation becomes ripe for invasion. Minimizing or eliminating introduction of invasive plant cuttings, seeds, or spores into fire areas and/or minimizing the amount of resources available to any such plants that might find their way into the burnt area are the best approaches to prevent their growth and survival.

## Alien Aquatic Invaders

Freshwater or marine fish, molluscs, crustaceans, reptiles, plants and other water species that change the aquatic habitat and ecology are aquatic IAS. They threaten native species!

They 'arrive' accidentally or by design, through aquaculture, or the ornamental freshwater and aquarium trade of aquatic animals and plants. More than one third of species on International Union for Conservation of Nature's (IUCN) list of worst aquatic invaders have been identified as aquarium or ornamental releases.

The Caribbean Sea has recently been invaded by a highly ravenous native of the Far East – the Lionfish.

*Contributor: U. Krauss*

## Aliens in our waters!

Approximately 5-10% of all aquatic organisms for the ornamental trade are wild-caught. The others are farm-bred. Of the wild-caught aquatic ornamentals, almost half are South American in origin with a significant portion passing through Trinidad's ports.

Trinidad's southern position in the Caribbean chain has made it a major in-transit port and major hub for trade of aquatic ornamental plants and animals to the rest of the Caribbean, North America and Europe

- Of the approximately forty-four species of freshwater fish in Trinidad, at least four are introduced species with established populations;
- There are at least three freshwater gastropods (aquatic snails) that inhabit Trinidad's waterways;
- The Gouramy (popular Labyrinth fish), native to Cambodia and bred in fish farms worldwide, has been found in one drainage system in South Trinidad. Information about its invasiveness and environmental impacts is still unknown;
- Pencil fish, which established after dying fish were 'disposed of' at the airport are found in the vicinity of the Piarco airport;
- The Red-eared pond slider, a semi aquatic turtle native to southern states of North America, is popular in local pet and captive breeding trades. In captivity this turtle seems to be more aggressive than the three native species and is listed as an IAS in several countries outside of the Caribbean;
- The Malaysian prawn, introduced by government as a high income aquaculture species in the 1980s, has been observed in West Coast Rivers;
- Tilapia, also intentionally introduced by government as a high income aquaculture species, has proven to be the most prolific species of all aquatic IAS in Trinidad.

Except for the last two, the ornamental freshwater trade has been the most common source of aquatic species introductions in Trinidad. Hobbyists and persons in the pet trade are strongly advised to reduce the risk of further introductions by investigating the feeding, behaviour and eventual size of the pet species before they are acquired.

So far, Tobago has been spared by the problem of aquatic IAS. This is mainly due to its lack of exposure to the trade and a lesser number of hobbyists.



- *Release of wastewater from farms breeding ornamentals or unwanted pets is a common cause of aquatic IAS introductions.*
- *Past government policy was a factor in aquatic IAS introductions. New policies must be guided by criteria for importation and management of various species introduced to the country.*
- *Poor management of private and government grow-out facilities can lead to the failure of freshwater fish farms and hence escape of alien species into waterways.*
- *If one has grown tired of the pet, it should not be discarded in the wild. Fisheries Division Officials and the Aquaculture Association of Trinidad and Tobago (aqua-TT) are willing to house the animals until a home is found.*

## Aquarium seaweeds can invade our seas

Algae are plant-like organisms that live in the water. Invasive algae first appeared outside of its native range in 1984, when a cold-tolerant strain was accidentally introduced into the Mediterranean Sea off Monaco. Early eradication was not addressed and the infestation of this invasive 'aquarium strain' is now beyond control in countries in the Mediterranean. It is listed by IUCN as among the top 100 invasive species on earth.

*Caulerpa taxifolia in situ*



(Photo: Creator, Kyle Demes, from <http://biogeodb.stri.si.edu/bioinformatics/dfm/metas/iew/31162>)

*Caulerpa taxifolia* is also known as aquarium strain of *C. taxifolia*. This tropical marine macroalgae or seaweed outgrows and displaces native seaweeds, seagrasses, reefs and other marine life forms in sand, rock or mud.

It is widely used as a decorative plant in the aquarium trade and is considered a major ecological threat to the native biodiversity of temperate coastal ecosystems. This invasive 'aquarium strain' can also grow in tropical environments and threaten native or wild strains found in the Caribbean.

Over fifty years ago, the native seaweed strain was recorded in Trinidad and Tobago, found mainly in the east coast of Trinidad. Recently, (in late 2007) the seaweed was observed on the west coast of Trinidad, at Williams Bay, Chaguaramas, in an area where seaweed biomass has been monitored by the Institute of Marine Affairs (IMA) since 2002. The site of the observation is adjacent to a bauxite trans-shipment facility, and is the location of the most extensive seaweed communities in Trinidad (Juman and James-Alexander, 2006).

DNA analyses on recent sightings of the seaweed from three sites in Chaguaramas confirmed that it was not the killer aquarium strain, but rather the "native" or "wildtype". Protecting native seaweed is important since they subtly perform their ecological role of providing a habitat for a myriad of marine invertebrates and fish, as they are an invaluable link in the marine food chain in the sheltered waters of the Gulf of Paria.

Fish hobbyists should be extremely cautious when cleaning aquarium tanks or disposing of exotic plants and animals. This is to ensure that invasive species are not introduced into our natural environment, since it is uncertain what the consequences might be.

## The 'taliban' fish!

With their bodies covered in bony plates, these alien fish are 'well armed' and equipped to survive and thrive.

These tropical armoured natives from South America and Panama are 'bottom feeders', found at the bottom of small to large streams, floodplains, swamps and waters with low oxygen levels and high organic pollution levels.

Their mouth, placed on their undersides, is in the best position for bottom-feeding, which is usually scraping off algae and loose material on river beds. This quality makes the catfish popular among aquarists as it efficiently removes 'unsightly' algae attached to aquarium surfaces.

The Suckermouth Catfish, aka 'janitor fish' and 'pond cleaner' is considered the 'taliban' to Jamaica's freshwater systems and fisheries. It was detected in 1996, in Jamaica's Black River, St. Elizabeth.

Two GOOD reasons to STOP their spread!

1. They are an environmental hazard, degrading and disrupting the ecological balance of freshwater systems by:
  - burrowing of nests in river banks,
  - competing with native species for food and altering food web dynamics,
  - even strangling fish-eating birds that try to feed on them.
2. They have negative economic effects, especially on fisheries:
  - destroying nets, traps and fish pots of artisanal fishermen, incurring costs of replacement, and
  - reducing desirable fish catch, such as tilapia, due to both overcrowding of traps and indirect effects on outcompeting native species for food.

Contributors: A. Jones & E. Hyslop

Suckermouth Catfish  
'*Pterygoplichthys pardalis*'



Overcrowding of suckermouth catfish in Artisanal Fisherman's Trap.

(Photo: Aisha Jones)



*Black River and the surrounding wetlands represent one of the most diverse and invaluable freshwater ecosystems in Jamaica and the wider Caribbean.*

*The area also provides many beneficial commercial services upon which the local Black River community depends.*

*The Catfish was likely introduced in the upper reaches of Black River and distributed downstream by flooding. There are now viable populations established throughout the Black River and its extended freshwater system.*

## Beauty IS the Beast!

This spectacularly decorative fish, is native to the Indian and Pacific Oceans, belongs to a group of venomous fishes and belongs to the scorpionfish family. Scorpionfish are regularly found in Jamaica.

Lionfish are highly invasive in the Caribbean with wide ranging negative effects. They have the potential to decrease the abundance of ecologically important species such as parrotfish and other herbivorous fishes that keep seaweeds and macro-algae from overgrowing coral.

They are "sit-and-wait" predators, efficient carnivores that feed with insatiable appetite on a wide variety of smaller fishes, shrimps and crabs. They are capable of consuming large quantities of fish and shellfish daily, increasing pressures on already stressed commercial fish stock.

There are signs of impacts on juvenile fish and shellfish and many countries are now reporting staggering numbers of lionfish on their reefs and other marine environments. This can negatively impact the fish stocks in a country with risk of loss to commercial fishers.

Their venomous spines which protect them from becoming prey for other fish, are also capable of inflicting a very painful sting to humans, with serious socio-economic and public health impacts and consequences. Already there is reluctance of local and overseas tourists to swim, snorkel or dive in lionfish inhabited waters due to real and/or perceived fear of being stung. This poses a severe threat to reef-based tourism.

The National Lionfish Project in Jamaica, led by the University of the West Indies, funded mainly by the Global Environment Facility, the Government of Jamaica and the University of the West Indies among others, and administered by the National Environment and Planning Agency (NEPA), aims to track the invasion through underwater surveys islandwide, document the impacts through predation of native fish, design a trap capable to catching lionfish and formulate a management plan for Jamaica and the rest of the Caribbean region.

Contributor: D. Buddo



*Lionfish on Jamaican Reef*

Lionfish in the Caribbean reproduce all year round (every 4 days). A female lionfish is capable of producing 2 million eggs each year. In Jamaica, lionfish have been found in very shallow seagrass areas to areas 335m (1100 ft) deep below the surface and recorded to lengths of 51 cm (20 inches). They are found in ALL designated fish sanctuaries in Jamaica

(Photo: Dayne Buddo)



## A Tail of two Snails

### The Quilted Melania Snail

Hidden in the sands, mud or on rocky sediments in Jamaica's freshwater habitats - rivers, streams, lakes and pools is an Asian alien invader - the Quilted Melania Snail.

In 1996, the snail was widely distributed in freshwaters systems across Jamaica, including along the Black River, Rio Cobre and Wag Water as well as still water environments, such as, the Moneaque Lake. They can quickly displace populations of native freshwater snails in freshwater systems. They have the potential to cause ecological disturbance and have already disrupted Jamaica's freshwater systems. In fact, they have continued the displacement of the native Bussu snail (*Neritina punctulata*), the chief ingredient in the Bussu soup of Portland, central to the annual celebrated Bussu festival in Eastern communities. Their success is also due to their tolerance to pollutants and changes in environmental conditions. Their presence is therefore also used as an indicator of water quality.

Contributor: M. Curtis

The Quilted Melania Snail (*Thiara granifera*)



Photo: Femorale. Source: USGS

The several rows of beads on its relatively long and spiraled shell gives it a "quilted" appearance.

[http://www.texasinvasives.org/animal\\_database/detail.php?symbol=16](http://www.texasinvasives.org/animal_database/detail.php?symbol=16)

The Giant African Snail (*Achatina fulica*)



They have both male and female sex organs – and away from their natural enemies, after a single mating, can lay up to 1,200 eggs in a year. The snail has, in many cases, been deliberately introduced for food, medicinal use or as an ornamental species. They are capable of surviving adverse conditions.

(Photo: Gregorz Polak (Wikimedia Commons) from 'More giant snail news', posted by Graham\_Land in Conservation, Wildlife & Flora, 17. Nov. 2011)

<http://www.greenfudge.org/2011/11/17/more-giant-snail-news/>

### The Giant African Snail

The Giant African Snail is a tropical species native to East Africa. It was first found in West Trinidad in late 2008 in Petit Valley. Since then, despite an eradication programme, this invasive alien species has spread to neighbouring communities. They are nocturnal, but may become active at dawn and dusk if very wet. They prefer damp, shady places and avoid direct sunlight. In the day they are commonly found under bricks, rocks, fallen logs, plant mats, decaying leaves, wall ledges, houses, air conditioners, or discarded containers; and in or on plants, trees, heavy vegetation, brick holes, crevices. They feed on over 500 plant types, including agricultural and food crops. Since they are a host for the rat lungworm, which causes eosinophilic meningitis in human beings, they are also extremely dangerous to human health.

Source: Giant African Snail Advisory

<http://www.health.gov.tt/news/newsitem.aspx?id=64>

## Four-legged Aliens

A great number of animal species found in Caribbean countries, including pigs, goats, cats and dogs are not native. They were purposely introduced, often as livestock or pets. Others, like rats, come along as blind passengers.

No matter how they initially got here, these alien species are disrupting the balance of local ecosystems, making it necessary to intervene and try to restore the balance.

*Contributor: C. Dalmeier*

## This green is not in!

In every single country in the world (and there are many) where alien iguanas have become a problem. It started with people keeping the alien iguanas as pets.

The invasive green iguana is a serious threat to endangered native iguanas in the Caribbean. These include the:

- Lesser Antillean Iguana (LAI) (*Iguana delicatissima*) which has already disappeared from some islands and
- Saint Lucian Iguana (*Iyanola*) which cannot be found anywhere else in the world!

The more adaptable and aggressive South and Central American species were introduced in the 1970s to Martinique from the Îles des Saintes. In the late 1980s, these alien iguanas were brought into Saint Lucia from Canada as pets - and without a permit! This invasive destroys crops, preys on bird eggs, consumes and spreads seeds of invasive plants in their faeces.

They are bigger than native species and can grow up to six feet long with a life span of almost 20 years! They produce twice as many eggs as the Saint Lucia iguana and could out-compete native iguanas for food. Their burrowing habits destroy building foundations and cause blackouts by nesting near the warmth of electrical cables. They have also been linked to cases of human salmonellosis.

They have been a new and very worrying threat to Saint Lucia's iguana since 2008, when they were found living free and breeding, around Soufrière. So far, this 'alien' iguana population is separated from Saint Lucia's native population. However, wherever native and alien green iguanas share the same habitat, hybridization is common. Both species are found in the French Islands of Martinique and Guadeloupe. Hybrid offspring have been found to be fertile and the gene pool of LAI is now being diluted by the green iguana.

Invasive Green Iguana (*Iguana iguana*)



Despite being listed in CITES Appendix 2, the green iguanas are traded quite freely, including via the Internet. Export permits are easily obtained, particularly if bred in captivity. Import control is the responsibility of the recipient countries' legislators and law enforcement agencies.

(Photo: <http://iguanapets.org/wp-content/uploads/2010/03/iguana1.jpg>)

Contributors: R. Williams, M. Morton; U. Krauss; E. Seely; C. Rodrigues

## Voracious and wild!

Wild pigs world-wide are listed as among the worst invasive species.

- they are an enormous liability to natural ecosystems and biodiversity, competing directly with native fauna, even causing extinction of some species;
- their omnivorous diet also contributes to altering forest processes, reducing the recruitment and growth of native plants (e.g., hardwood species), and consequently paving the way for soil erosion and introduction of invasive plants.
- they are especially attracted to water-logged and riparian habitats, and can alter the structure, functioning and quality of these vital water sources;
- they are an agricultural pest, causing significant damage to crops and livestock, directly resulting in revenue loss of several million dollars to national economies.
- they are vectors and reservoirs for a number of livestock and human diseases.

Wild Pig (*Sus scrofa*)



Pigs are native to Europe and continental Asia, as far south and east as the Malaysian Peninsular, as well as to the Indonesian islands of Sumatra and Java. It is generally believed that domestic pigs were introduced to the West Indies during the voyages of Christopher Columbus in the 1400s and subsequently spread to other islands.

(Photo: [www.ctahr.hawaii.edu/littonc/research.html](http://www.ctahr.hawaii.edu/littonc/research.html))

Pigs have been farmed in Saint Lucia from colonial times, proliferating and escaping through negligence or otherwise. Over several generations, the strays or 'escapees' have survived and settled in forest areas. They have become abundant in Saint Lucia and are now considered 'pests'.

Wild pigs might be causing harm to a number of native species including birds, such as the ruddy quail dove (*Geotrygon ecogni*) and bridled quail dove (*Geotrygon mystacea*), which nest low, just above ground, and hence vulnerable and ground dwelling reptiles, such as three of Saint Lucia's endemic species: the pygmy gecko (*Sphaerodactylus mirolepis*), Saint Lucia boa constrictor (*Boa constrictor orophias*) and Saint Lucia viper (*Bothrops caribbaeus*), the poisonous snake.

Contributor: A. Dornelly

## Small pets - big pests!

The red-eared slider is incredibly hardy and has the ability to survive against the odds, making it a popular pet.

It is an aquatic turtle found in the eastern three-quarters of the United States. The slider is one of the few pets being exported from the United States, rather than imported. Over 52 million of them have been exported from their North-American origin to foreign markets between 1989 and 1997 (GISD, 2010). It is now found the world over.

This turtle does very well in captivity, is relatively easy to take care of when compared to some other exotic pets, and has a clownish, playful demeanor uncommon among reptiles. They:

- have a remarkable ability to adapt to a range of climates and invade novel habitats.
- are omnivores, feeding on plants and preying on small waterfowl, fish, amphibians and invertebrates.
- are strong competitors to native terrapins.
- are known to be carriers of Salmonella bacteria and people should always thoroughly wash their hands after handling any turtle or any portion of the turtle's environment.
- exhibit a basking behaviour which may impact nesting water birds: if nests get pushed into the water, eggs are killed.

Given the longevity (up to 40 years) as well as invasive and destructive history, imports of Red-eared sliders into the European Union have been banned!

Red-eared slider (*Trachemys scripta elegans*)



The Red Eared Slider Turtle  
(Photo: [www.lane46.com/?p=249](http://www.lane46.com/?p=249))



Red-eared sliders cluster together to catch the sun on a spring day at Texas Discovery Gardens at Fair Park in Dallas.  
(Photo by Ed Darrell, 2010,  
<http://timpanogos.wordpress.com/2010/05/31/red-eared-sliders/>)

## Stealthy stowaways!

Rats do not naturally belong in the Eastern Caribbean. The first rats probably arrived in the early 17th century, carried as stowaways on sailing ships.

Black or Ship Rat (*rattus rattus*) pose a serious threat to the country's rarest wildlife.

Famously prolific breeders, a single pair of rats can give rise to well over 1,000 descendants within one year. Some authors have put that figure at 15,000.

Two Asian species have invaded Antigua and Barbuda:- the brown or Norwegian rat and the black or ship rat.

They have flourished across the region. The black rat in particular has successfully colonised even the smallest and remotest islands, where they feed on a wide range of plants, eggs and small animals. Black rats can severely affect plant populations by consuming seeds, shoots, roots and other parts.

Antigua and Barbuda's dozens of small low-lying islands situated off the Northeast coast are particularly prone to Black Rats. These offshore islands are internationally recognized as an Important Bird Area and Key Biodiversity Area. Great Bird Island, for example, receives around 50,000 visitors every year on numerous vessels from mainland Antigua.

These islands support important populations of a number of globally threatened species, including hawksbill turtles, West Indian whistling ducks and snakes, such as the Antiguan racers. On Antigua's Great Bird Island, black rats have become so common that they could easily be seen hopping around even during the day. They have had a devastating effect on Antigua and Barbuda's offshore islands indigenous species.

Black or Ship Rat (*rattus rattus*)



These invasive rats pose a serious threat to the country's rarest wildlife.

(Photo: John Cancalosi, FFI-OICP)

Contributor: J.C. Daltry et al

# SOS

## Save Our Species

“Tens if not hundreds of West Indian animals have already been lost because humans have unwisely released harmful species from other parts of the world. To do nothing is not an option.”

Jenny Daltry, Senior Conservation Biologist with  
Fauna & Flora International.

in 'Meet the world's rarest snake: only 18 left' by  
Jeremy Hance, mongabay.com, July 10, 2012.  
<http://news.mongabay.com/2012/0710-hance-st-lucia-racer.html#>

The Nariva Swamp is the largest freshwater wetland in Trinidad and Tobago and has been designated a Wetland of International Importance under the Ramsar Convention.

The Moriche Palm, which is found in abundance in the Nariva Swamp, is a habitat and source of food for the birdlife, including the Macaw.

Decline of the Moriche Palm as a result of Red Palm Mite Infestation can lead to migration of these birds and a reduction of their populations in the Nariva Swamp.



*(Nariva Photo: F. Hosein)*

**The Nariva Swamp is host to a wealth of biodiversity, including the Macaw and parrots.**



In the Caribbean:

- over 600 species of birds have been recorded,
- 163 of these are endemic of which, 105 species are confined to single islands.
- 13 bird species have already gone extinct, 6 of those species were of the genus *Ara*, the large and brightly-feathered macaws. The Cuban macaw (*Ara tricolor*), the last of the six to disappear, was hunted to extinction for food and the pet trade during the second half of the 18th century.
- Parrots are among the most important bird symbols for conservation, including the St. Vincent parrot (*Amazona guildingii*, VU), Saint Lucia parrot (*Amazona versicolor*, VU), and the Dominica imperial parrot (*Amazona imperialis*, EN).

Source: Conservation International

## SOS

### The Saint Lucia Forest Thrush

The Saint Lucia Forest Thrush (*Cichlherminia lherminieri sanctaeluciae*, *Turdus lherminieri*) is the rarest of the Caribbean Forest Thrushes. Known locally as the 'White Forest Thrush' it is on the list of species offered protection by the US Endangered Species Act.



[www.greenantilles.com/2010/08/18/st-lucia-forest-thrush-received-protection-under-us-endangered-species-act/](http://www.greenantilles.com/2010/08/18/st-lucia-forest-thrush-received-protection-under-us-endangered-species-act/); [www.biologicaldiversity.org/species/birds/St\\_Lucia\\_forest\\_thrush/index.html](http://www.biologicaldiversity.org/species/birds/St_Lucia_forest_thrush/index.html)

The native Thrush is found in its deciduous seasonal forest, semi-evergreen seasonal forest and lower montane rainforest. It is suspected that its numbers are declining due to competition from the invasion of the Bare-Eyed Thrush. In 2009, 34 surveyors spending six weeks surveying birds in the Forest Reserves in 2009 failed to detect a single Forest Thrush. This extreme rarity means that conservation measures beyond general habitat conservation and alien invasive predator control may not be sufficient.

Source:

information extracted, with permission, from the authors Toussaint, A., John, L., & Morton, M. (2009) 'The Status and Conservation of Saint Lucia's Forest Birds'. Technical Report No. 12 to the National Forest Demarcation and Bio-Physical Resource Inventory Project, FCG International Ltd, Helsinki, Finland.

[www.bananatrustslu.com/doccentre/National\\_Forest\\_Demarcation/The%20Status%20and%20Conservation%20of%20Forest%20Birds.pdf](http://www.bananatrustslu.com/doccentre/National_Forest_Demarcation/The%20Status%20and%20Conservation%20of%20Forest%20Birds.pdf)

# SOS

## Iguanas



Iyanola, the Saint Lucian Iguana

[www.yomagazine.net/features/2011/march/19\\_03\\_11/About.htm](http://www.yomagazine.net/features/2011/march/19_03_11/About.htm)



The critically endangered Jamaican Iguana

<http://www.iguanafoundation.org/files/e9e88305-ece8-4163-a16d-bd614746766b.jpg>



The Ricord's Iguana - Lake Enriquillo , Dominican Republic

[www.dominicantoday.com/dr/forum/travel-and-explore/places-to-go/1192/Dominican-Republics-Wildlife-and-Landscapes-Photo-Gallery/3](http://www.dominicantoday.com/dr/forum/travel-and-explore/places-to-go/1192/Dominican-Republics-Wildlife-and-Landscapes-Photo-Gallery/3)

The Iyanola population has declined substantially due to habitat loss, sand mining, hunting, babies eaten by introduced predators (dogs, cats, mongoose and maniocou), introduced competitors and loss of genetic integrity. They are now restricted to an area in the North East of Saint Lucia.

**Iyanola is now critically endangered and at extremely high risk of extinction!**

Thousands of Jamaican students and adults were told that the Jamaican Iguana was extinct, never to be seen again by generations to come. Luckily this story has a happy ending as these reptiles were "rediscovered" in the Hellshire Hills having survived predatory species.

**The Jamaican Iguana are now being carefully bred and tracked in order to bring their numbers to a viable level.**

The distinctive, red-eyed Ricord's Iguana is one of the most specialized iguanas of the Caribbean *Cyclura* genus, and survives as three sub-populations within the Jaragua-Bahoruco-Enriquillo Biosphere Reserve in southwestern Dominican Republic. The wild population, estimated at between 2,000 and 4,000 individuals, is believed to be declining due to loss of habitat, habitat degradation, and introduced species.

**The species is Critically Endangered and a recovery plan is underway by several NGOs.**

# SOS

## The Saint Lucia Whiptail Lizards



**Male (left) and female (right)**  
(Photo: M. Morton)

**Saint Lucia is the only place in the world where Whiptail Lizards can be found!**

By the time scientists first recognised and described it in the 1960s, they had already succumbed to the threats that many native species face today – predators or competitors introduced by humans. They have managed to survive in Saint Lucia's Offshore Maria Islands. But their population is too small to guarantee long-term survival.

**They are at high risk of extinction!**

But they have had help from the Saint Lucia Forestry Department and the Durrell Wildlife Conservation Trust who have been working together to bring them back from the brink of extinction!

*Contributor: C. Dallmeier*

# SOS

## Saint Lucia racer (*Liophis ornatus*)



*World's rarest snake, only 18 left!*

(Photo: G. Guida)

The Saint Lucia Racer holds the dubious honour of being the world's most endangered snake. For nearly 40 years the snake was thought to be extinct until in 1973 a single snake was found on the Maria Major Island, a 12-hectare (30 acre) protected islet, a mile off the coast of Saint Lucia, free of the mongoose that killed off the population of Saint Lucia. Non-venomous, the Saint Lucia racer feeds on local lizards. Conservationists working with the Saint Lucia racer are closely looking at successful efforts to save the Antigua racer (*Alsophis antiguae*). (Source: 'Meet the world's rarest snake: only 18 left' by Jeremy Hance, mongabay.com, July 10, 2012)

---

## The eponymous Antigua racers (*Alsophis antiguae*)



The eponymous Antigua racers (*Alsophis antiguae*) are harmless snakes unique to Antigua. There were only 50 individuals left in 1995, all confined to a single, 8.4-hectare offshore island, Great Bird Island. More than half of the snakes had been badly scarred by rat bites, and more than 40% had had their tails bitten off. Some males had been so badly injured that they were believed to be incapable of breeding. The Antigua racer today has a population of over 900. Eradicating invasive predators, such as mongoose and rats, as well as education efforts have helped the Antigua racer bounce back. Source: Daltry et al

# SOS

## Trinitario - fine flavoured cocoa

### Cocoa is more than just a tree crop!

It contributes to soil stability, biodiversity conservation and sustainable livelihoods! Trinidad and Tobago is home to one of the world's most diverse collection of cocoa germplasm, hosted at the International Cocoa Gene Bank at La Reunion Estate, Trinidad. It is also globally recognized as the producer of the highest quality world renowned 'fine flavoured cocoa'.



Trinidad and Tobago - through partnership with the Ministry of Food Production, the University of Trinidad and Tobago and the European Union - is moving to rehabilitate its cocoa industry. But a major threat is the number of pests and diseases that affect cocoa, including **Frosty Pod Rot** which can cause decline in yield of up to 80%.

*Contributor: V.Ferguson-Dewsbury*

# SOS Save our Sanctuaries

## Offshore Islands

Valuable but vulnerable habitats for our endangered species

Offshore islands are sanctuaries for some of the Caribbean's unique and the world's rarest wildlife. In many ways, they provide refuge for animals under threat by invasive species. But these islands can be easily invaded by species introduced that can destroy this rare and unique wildlife. Small offshore islands can be successfully freed of these threats, providing many species with a chance to recover.

In the Caribbean some Offshore Island are hosts to indigenous and some endemic species, and include:

- Saint Lucia Offshore islands - Maria Islands (Maria Major and Maria Minor) off the Southeast coast, and Praslin, Rat and Dennery are home to important endemic species, some found only in Saint Lucia.
- Cabritos Island, off Hispaniola, is a biodiversity gem, housing a number of indigenous wildlife species that are unique to the Dominican Republic
- Great Bird Island and the other dozens of small, low-lying Offshore Islands off the Northeast coast of Antigua, which support a number of globally threatened species, including several indigenous and endemic species of birds and reptiles.

Offshore islands are an immensely important asset in the conservation of threatened species. But they are not a 'magic bullet' and have their own limitations. Small offshore islands:

- cannot provide the right kind of habitat for every animal;
- cannot always sustain a healthy population size for larger species;
- are susceptible to the introduction of non-native predators –often rats– which are remarkably good at stowing away on boats;
- face higher likelihood that their species gene pool will become stagnant due to in-breeding and lack of genetic variation;
- are highly vulnerable to extreme weather events, notably hurricanes, which can inflict irreversible damage to a population confined in a small area.

*Contributor: C. Dallmeier*

## Cabritos Island - before and after IAS

Cabritos Island, off Hispaniola, is a biodiversity gem, housing a number of indigenous wildlife species that are unique to the Dominican Republic. These include the Hispaniola native iguanas, Ricord iguana (*Cyclura ricordi*) and the Rhinoceros iguana (*Cyclura cornuta*). These indigenous species are listed as critically endangered and/or vulnerable in the IUCN list.

The Presence of IAS continues the degradation of Cabritos Island.



(2007. Natural History Museum)



(2012. C. Rijo).

Since its discovery in 1519 and its subsequent 'human' settlement, the process of invasion and degradation began. Island habitats are extremely vulnerable to overgrazing and predators and the presence of goats and other grazing mammals significantly alter the conditions of native flora and fauna. From the 16th and 17th centuries, the early colonials of neighbouring Turtle Island in the northwestern part of the Hispaniola used Cabritos Island as a safe place to raise animals as a source of protein. It was this initial use of the lands for raising goats that started the process of degradation of the island's ecosystems and desertification.

In the 20th Century, a long drought created a temporary peninsula 'bridge' linking Cabritos Island to western Hispaniola, opening up of the Island to mainland settlers and their livestock. Donkeys, cattle and horses were introduced, affecting all natural resources, but particularly the island's flora. Grazing on cacti as a water source led to the destruction of adult indigenous cacti species, as well as other valuable species. Donkeys also used their hooves to dig into the sand to filter the salt water for drinking, negatively affecting iguanas nesting areas. Further, with the constant animal traffic throughout the island, soil became compacted, preventing germination of seeds and destroying the few seedlings that managed to germinate under such harsh conditions. Lands were used extensively for agriculture and forests were cut for timber, fuel and charcoal.

The extensive loss of flora consequently accelerated the desertification of Cabritos Island. Conservation scientists became alarmed by the excessive deterioration of the island and its unique wildlife. The invasive and alien presence and practices gradually re-shaped the island's natural landscape. By the early 1970s, the situation reached crisis proportions! Cabritos Island was under siege! In 1974, through Act 664, Cabritos Island was established as a National Park. In 1996 it was extended to the National Park Lake Enriquillo and Cabritos Island.

Contributor: C.Rijio Guilamo



# Eradicating IAS Safeguarding Biodiversity in Protected Areas: Alto Velo and Cabrito Islands



## WHY PROTECT ALTO VELO ISLAND?

- Alto Velo Island is part of Jaragua National Park
- Important bird reserve
- Home to one of the most endangered reptile species in the world, the Noble's Anole (*Anolis altavelensis*), an iguana

## IAS THREAT TO ALTO VELO

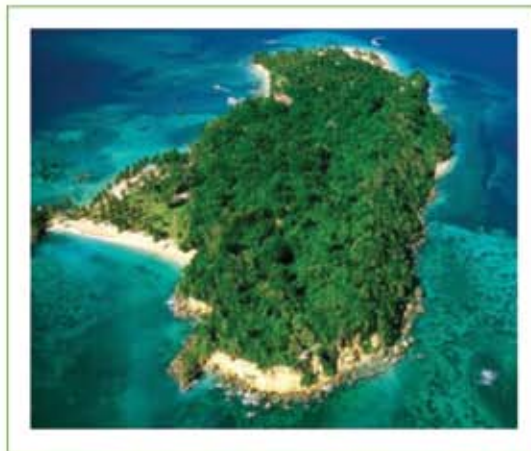
- Rats and cats prey on native seabirds and the Noble's Anole
- Neem present at shoreline is potentially invasive and endangers native dry forest

## WHY PROTECT CABRITOS ISLAND?

- Cabritos island is the biggest island in Lake Enriquillo, a Ramsar site
- Home to critically endangered reptiles: 2 endemic iguana species, Ricord's iguana (*Cyclura ricordi*) and Rhinoceros iguana (*Cyclura cornuta*) and American crocodile (*Crocodylus acutus*)

## IAS THREAT TO CABRITOS ISLAND:

- Cats, dogs and mongooses prey on young iguanas
- Overgrazing by herbivores: donkeys, cattle and goats reduce the availability of food



## PROJECT WILL:

- Conduct baseline survey of flora and fauna
- Quantify prevalence of IAS
- Devise eradication strategies



## 2. Combating the threat!

“This is a global problem and to think Florida is an exception to the rule is silly,”  
“The Fish and Wildlife Commission can’t do it alone - they need help and we have to have partners in this with every agency and the general public. Everyone has to be on board; it’s a very serious issue.”

Kenneth Krysko, Herpetology collection manager at the Florida Museum of Natural History on the UF campus. Science Daily (Sep. 15, 2011)

## Prevention

### always better than the cure

There are gaps in national and international regulatory frameworks that allow IAS to 'slip through' accidentally or intentionally, rendering prevention measures ineffective. Such gaps are particularly worrisome in the pet trade and the construction industry. Although there is a recognized risk of accidental introduction of plant pests, with a few specific exceptions, there are no specific international standards that address risks of invasions associated with the pet trade or that deals specifically with IAS in the construction sector.

Targeting and curbing illegal wildlife trade depends on more cost-effective and innovative law enforcement measures.

### Green Customs Initiative (GCI)

Environmental crime is growing into a very lucrative industry. National and International crime syndicates earn an estimated US\$20-30 billion dollars annually by illegal environmental trade, in all its forms, resulting in harmful effects to both human health and the environment and natural resources. Most global environmental issues have a trans-boundary nature and a global impact. International cooperation and shared responsibility, enabled by various Multilateral Environmental Agreements (MEAs), are the only effective approach. In fact, several MEAs regulate cross-border movement through imports, exports and re-exports of articles, substances and products.



Visit: <http://www.greencustoms.org/index.htm>

Customs officers

- have the primary responsibility for controlling trade across borders;
- are critical in providing frontline protection to national and international environments;
- need to be provided with a list of IAS, their possible routes and potential damage.

The Green Customs Initiative (GCI) aims to prevent the illegal environmental trade by enhancing the capacities of customs officers to understand and enforce multilateral environmental agreements through effective monitoring, detection and seizure of illegal shipments. GCI was created by the United Nation Environmental Program (UNEP), the World Customs Organization (WCO) and various MEA Secretariats.

The need to explore ways of integrating IAS issues into the GCI will be an important preventive strategy for the Caribbean. This tool is already available for implementation, practically at low cost, since it only involves the training of customs officials regarding IAS, as well as the contact numbers for the government agencies that are a focal point for this matter.

Contributor: M. D. Perez

## Voluntary Codes of Conduct and the Wildlife trade

Voluntary codes of conduct (VCoC) have been used to involve the private sector in regular awareness-raising of their clientele, thereby reducing the risk of pets being released or abandoned.

For example, the Marine Aquarium Council (MAC) an international association of conservation organizations, the aquarium industry, public aquariums, hobbyist groups and government agencies, promotes responsible and sustainable marine aquarium trade.

MAC established independent certification of best practices and raises awareness. MAC's Handling, Husbandry and Transport (HHT) International Standard ensures segregation from uncertified organisms, optimal health and proper documentation during export, import and retail. Organisms sold as MAC Certified must be handled only by MAC Certified professionals, facilities, exporters and retailers. This is very similar to Hazard Analysis Critical Control Point (HACCP)-based approaches.

In their National Invasive Species Strategies, Caribbean countries of Anguilla and the Bahamas, adopted identical VCoCs for: (a) Zoos and Aquaria, (b) Farms (Agricultural and Aquacultural), (c) Pet Stores, Breeders and Dealers, (d) Pet Owners and (e) Veterinarians.

*Contributor: U. Krauss*



Zookeeper showing an iguana to visiting children.  
(Source: [http://zoocamp.files.wordpress.com/2012/07/dsc\\_0789.jpg](http://zoocamp.files.wordpress.com/2012/07/dsc_0789.jpg))



Red-eared sliders hatching in breeding cages  
(Source: [http://www.ncsx.com/2012/031912/Hungere/turtle\\_cage.jpg](http://www.ncsx.com/2012/031912/Hungere/turtle_cage.jpg))

Prevention ... always better than the cure

## Protect the Cocoa Industry

**Frosty Pod Rot (FPR) is one of the most invasive and devastating diseases of cocoa.**

FPR is caused by the fungus *Moniliophthora roreri* and affects both the fruits/pods and seeds. The symptoms, which appear on the pods 3 – 8 weeks after infection, include:

- light coloured external swellings and distortion of young pods;
- premature ripening of large pods;
- internal pod rot and breakdown of seeds which spread to the placenta and endocarp resulting in a soft watery seed mass.

During the late stages of infection, the outer pod becomes covered with a white dense frost-like mass of fungal growth. The infected pod will gradually shrink and become hard necrotic mummies. FPR has a high potential for transmission which enables it to easily extend its range of infection. The fungus produces spores which are spread naturally by wind or air currents over long distances. These spores may be released from diseased pods during harvesting or pruning and can remain viable for up to 9 months on a carrier such as tools, shoes, clothing, equipment, vehicles, shipping containers, etc.



**Information dissemination is essential in the prevention strategy!** "Knowledge is power" and being knowledgeable about the disease will encourage persons to take all precautionary measures necessary to keep the disease out! **FPR is a highly invasive and destructive disease! The best strategy is a good offense! Prevent FPR from reaching T&T's shores.**

Contributor: V. Ferguson-Dewsbury

Originally identified in Ecuador in 1917, the disease spread rapidly throughout Central America (infected areas in red). By 2009, FPR had arrived in Costa Rica, Nicaragua, Panama, Honduras, Guatemala, Belize and Mexico.



## Prevent FPR Entry!

FPR is present in neighbouring Venezuela! If this disease enters the country it will significantly impact on the country's cocoa industry negatively impacting on the recent attempts at revitalizing the industry.

- A number of steps are being taken to protect Trinidad and Tobago's cocoa industry from FPR. These include:
- confirming, through a survey, that FPR is NOT in Trinidad!
- training stakeholders in the FPR field and laboratory identification;
- FPR emergency plan to restrict spread as soon as it is detected;
- analysing the possible pathways/means of FPR introduction;
- establishing a FPR hotline for reporting the disease;
- sensitising the public about the disease, its impact and control options.

## Eradication

not always possible!

Eradication is among the four main and inter-connected strategies for dealing with established IAS. Successful eradication depends on early detection and rapid response.

But not all IAS can be easily eradicated. When prevention has failed to stop the introduction of an alien species, eradication - the elimination of the entire population of an alien species, including any resting stages in the managed area – is the next best action.

Requirements for successful eradication:

- public education and support, through, e.g., social marketing of activities and dissemination of information regarding the threat;
- accurate information about current distribution and extent of the IAS establishment;
- priority areas for eradication, i.e., protected and community use areas, must be considered;
- expertise through a team of scientists and trained personnel to implement a thorough and coordinated plan that addresses the issue in a timely manner;
- follow up treatment, to prevent IAS recovery;
- dedicated resources and funding for sustainable management and control of invasive species.

### Follow up treatment, Important!

**The Dominican Republic:** Efforts to eradicate *Mimosa pigra* L., started on the 8th of April, 2010 in Uvero Alto in the province of La Altagracia. The eradication strategy was to visit all the locations where the plant was previously observed. Mature, ripe and dried fruits were harvested and placed in polythene bags to be later destroyed by crushing. The plants were cut using machetes and arboricides were applied to the stump using a 1½ brush. The vegetative matter was then burnt and the site marked for follow up visits to spray seedlings using a backpack sprayer.



*Mimosa pigra* L.



Workers collecting and readicating the fruit



The first follow-up visit on May 28, 2010, discovered previously untreated plants as a result of growth from seeds that germinated after the previous eradication efforts. In total about 40 newly germinated seedlings approximately 15 to 20 day old were treated. To ensure the success of the eradication work, monitoring was recommended at a 2 month interval.

Contributor: C. Rijo Güilamo

A diver in a black and yellow wetsuit is shown underwater, holding a magnifying glass to inspect a large green fern frond. The background is filled with more ferns and some brown branches, creating a dense underwater environment.

## Some IAS Impossible to eradicate!

**Casuarina:** The cost of eradicating this tree, measured against the potential for economic loss due to inaction, is considered too high in The Bahamas. Removing every tree from the islands of the Bahamas would cost millions of dollars per year and take several decades to complete. In terms of current human and financial resources, this would be impossible.

**Aquatic IAS:** Control of aquatic IAS is very difficult, mainly due to the fact that once the organism is established in a habitat, they will proliferate. The key to control of aquatic IAS is to prevent their introductions in the first place, regardless of the difficulties.

*Contributor: A. Davis*



## Success Story & Best Practice

### The Antiguan Racer Conservation Project took on the challenge of getting rid of rats in Antigua and Barbuda's offshore islands using rat poison!

- 'Brodifacoum', a rodenticide used one year earlier to eradicate rats from one of Saint Lucia's offshore islands, disrupts the blood clotting process and within a few days of ingesting a fatal dose rats die from internal bleeding.
- Two or three blocks of poison were placed by hand, on or near the ground at every flag. These were inspected and, when necessary, replenished, for 30 days. Great Bird Island's 27-metre high cliffs were baited by lowering the poison on fishing line. Signs placed on the beach warned visitors not to tamper with bait.
- This method was effective in eradicating the entire rat population from Great Bird Island, as well as a further dozen off-shore islands. Every rat eradication operation took between four and 12 weeks to complete, with successful operations on all 13 offshore islands and positive outcomes for a wide range of native species.

### Unfortunately, rats subsequently reinvaded several of these islands including:

- Maiden Island in 2001 shortly after a small restaurant was illegally built there, with rats likely transported accidentally with construction materials or food.
- Green Island in 2005, probably through accidental transport on recreational or fishing boats. Green Island was successfully made rat free, again, in 2006!

**The ecological effects of eradicating and keeping the Islands rat-free have been rapid and remarkable.**

## Rat-proofing Antigua's islands!

- The Antiguan racers more than doubled within two years of eradicating rats from Great Bird Island and have since been successfully reintroduced to three islands. Their total population exceeded 500 by the end of 2010: a ten-fold increase since the rat control programme began.
- Bird colonies on offshore islands, namely red-billed tropic birds, brown pelicans and white-crowned pigeons, expanded as their eggs and chicks were no longer destroyed by predatory rats. A recent study of 23 islands around Antigua found seabirds breeding on every rat-free island, but none on any islands that were still rat-infested.

Great Bird Island in 1995 before rats were eradicated



Great Bird Island in 15 years later (2010) after eradication



(Photos: Mark Day, FFI-OICP)

Eradication of IAS ... not always possible

# Managing IAS

Methodologies, processes and strategies in IAS management around the world as well as experiences from the MTIASIC pilot national projects will help to identify lessons learnt and best practice tools to build capacity within the Caribbean for combating existing and future biological invasions. The critical and basic steps in IAS management are:

## **PREVENT THEM FROM ENTERING! FIRST BEST OFFENSIVE STRATEGY**

Investments in prevention are the most cost effective long-term economic, environmental and social solutions to ongoing control and management. Prevention activities will ultimately result in fewer unintended and intentional introductions with unintended consequences. Prevention calls for conducting risk assessments; identifying major pathways and developing prevention plans that target the species to prevent their entry and subsequent damage to the biodiversity, and economic sectors such as tourism, agriculture, trade or disruption to the health systems. Prevention should be based on a black list and everyone at ports of entry, in industry and the general public should be aware of the black-listed species to be prevented and sensitized to report any suspicious sighting.

## **PREVENT THEM FROM SPREADING! SECOND BEST DEFENSE STRATEGY**

Once an alien species is introduced to a new country in the region, there will be a brief period when its chances of establishment will hang in the balance. However, not all introduced species will become established and only a small percentage of those that establish become invasive. Species known to be invasive elsewhere, especially those spreading within a region, should be a priority for early detection and black-listed. In this situation, early detection becomes the next best and absolutely critical defence strategy. Early detection requires the conduct of both general and specific site surveys including production systems that are targeted by the IAS, such as poultry for the H5N1 virus. Specie-specific surveys may also be required, such as for the Red Palm Mite in palm and other host trees close to air and sea ports. Data collection and storage are also essential aspects of the survey process.

## **CONTROL THEIR POPULATIONS! WHEN ALL ELSE FAILS**

The four main and inter-connected strategies for dealing with established IAS are Eradication, Containment, Control and Mitigation. The key issues of these general strategies are in keeping with the thrust of the Global Invasive Species Prevention (GISP) programme. The objective of control strategies of non-indigenous invasive species is for long-term reduction in the density and abundance of their populations to a level below a pre-set and acceptable threshold. Under this threshold, the potential harmful effects to biodiversity and the economy that could result from invasions are considered acceptable. Various cultural or chemical strategies may be employed but bio-control where this option is available is always the best method.



# Lessons Learnt in IAS Management

## Lessons Learnt

- **Understanding the opponent!**

To fight an enemy, one has to know the enemy! There is still much that is unknown about several IAS species. There is even more to be learned about several of the region's native and endemic species. As countries of the region attempt to either eradicate or control IAS, the knowledge base on both IAS and indigenous species is growing.

### **don't just leave the bait and hope they find it!**

Antigua learned that it was not sufficient to leave the poison on the beach and hope that the rats find it! Black rats typically forage within small, overlapping home ranges and bait had to be placed within all ranges to ensure that every rat had ample opportunity to find bait. Narrow parallel footpaths had to be cut and 'flagged' 10 metres apart in a neat grid-like pattern across the island across the island.

Contributor: Daltry et al

### **don't let their apparent similarities fool you!**

In control of *P. pardalis* in Black River, Jamaica has found out that this invasive is growing similarly to native and other non-native populations of *P. pardalis*. Jamaica is building a knowledge base on the dynamics of invasions by investigating the biology and ecology of the invasive and has so far made the first taxonomic identification and scientific record of *P. pardalis* in its waters. The preliminary results also show that next to tilapia, *P. pardalis* is the most dominant fish in the Black River and surrounding morasses.

Contributor: Jones et al

### **don't let lack of research deter you!**

A better understanding of the immune defenses of invasive species against native and new parasites can help in the fight against these species. This improved understanding can be achieved by applying Ecological immunology to study factors which aid the establishment and expansion of the Bare-eyed thrush which is invading the Lesser Antilles. 'Ecological immunology' research is concerned with the ecological factors (biotic as well as abiotic) which determine the evolution of the immune system and which may therefore provide the key to understanding how to combat IAS through natural methods.

Contributor: Arnoux et al

### **NB:**

**"We have a difficult task in simply finding a cryptic (good at hiding) animal that spends most of its life high in trees. We need to deploy as many methods as we can to improve our search efficiency. Recently, some trial work using tracker dog searches to assist locating iguana in the field has been very encouraging"**

Robert Williams  
Durrell Wildlife  
Conservation  
Trust, Saint Lucia.

## Building Knowledge and Learning Networks

Information is critical to address IAS problems, especially for species of conservation interest! And effective networking – to address information gaps and improve data and information exchange - is critical for building a knowledge base for IAS management, as the experience of the Natural History Museum of Jamaica (NHMJ) below illustrates.

### An experience from Jamaica

Since the late 19th century, IAS have been collected and stored in the biological collections of the Natural History Museum of Jamaica (NHMJ). In identifying information needs and gaps on IAS in Jamaica, it was discovered that term 'IAS' was apparently not used until the 1990s. The early knowledge base was built on 'introduced species that became agricultural pests or threats to native species.' Hence the only information available on IAS was on animals and plants deemed agricultural pests, e.g. Indian Mongoose, Coffee Berry Borer and rats. Information on freshwater and marine IAS was virtually non-existent! There is now increased awareness of IAS in Jamaica and of their grave threat to natural resource-based economic activity, biodiversity and human health.

*Specimens of the invasive Lime Swallowtail in the Natural History Museum of Jamaica*



*(Photo: Leonard Wright, 2011)*

Through continued networking and partnerships with various government and non-government entities, the NHMJ provides services in identifying unknown species while receiving specimen deposits of newly introduced species. The collections are mainly research based and the specimens provide a wealth of useful information on Jamaica's plants and animals. The strength of the museum lies in its ability to maintain and preserve the various IAS specimen groups. NHMJ can be considered as the only institution in Jamaica that houses a wide range of plants and animals invasive to Jamaica from various taxa. The collections house IAS specimens from over 20 taxonomic families. The collections also receive donations and deposits by local and visiting researchers, the general public and agencies directly involved in IAS research, management and control.

**The experiences of the NHMJ point to a multi-pronged and mutually reinforcing approach involving:**

| Networking  | Capacity Building  | Public Education & Outreach  |
|---|--|--|
| <p>The trans-boundary nature of biological invasions across marine, freshwater and terrestrial eco-systems, points to networking at national and international levels as critical in linking and integrating specialist knowledge. The NHMJ is Jamaica's focal point for the CBD's Clearing House Mechanism (CHM) and the Inter-American Biodiversity Information Network (IABIN).</p> <p>Both IABIN and the Jamaica CHM foster technical collaboration and the collection, sharing, and use of biodiversity information for decision-making. In 2002, the Jamaica CHM synergized with IABIN through a pilot project to locate, systematically document and provide electronic access to IAS information and its sources. Key outputs of the project include identification of available literature and its sources, identification of deficiencies in ecological information and existing legislation, identification of new information resources, the opportunity to promote greater information networking, especially since some of the participants were previously unaware of the full range of stakeholders involved in IAS management.</p> | <p>Building capacity for Natural History Collections Management and information dissemination is essential to combat IAS. Use of ICT can greatly reduce the costs of acquiring decision-support tools, provide communication services at a minimum cost and improve biological database management by digitizing the collections. Online access to biological collections will improve access to specimen data, facilitate online research and promote exchange of information among countries worldwide.</p> <p>Building the capacity of the NHMJ Science Library to serve as a scientific research resource and a point for information dissemination has proven to be an important strategy for national IAS information management. Opened to the general public, the library is utilized mainly by secondary and tertiary students and researchers.</p> | <p>Public education and support are among the main factors that can guide species control. Public education therefore, is an important strategy in the fight against IAS. In Jamaica, public education and outreach is capitalizing on various opportunities, through expositions, workshops, conferences and school presentations, and display of NHMJ biological specimen as educational tools. This has enhanced the effectiveness of disseminating credible and accurate information to the public. Educational brochures, posters featuring selected invasive species and their impact on various habitats and periodic inclusions of IAS news and notices in the regular biodiversity e-news of the Jamaica CHM are all efforts in the IAS public education and outreach campaign.</p> |

This three-pronged strategy is essential in narrowing data and information gaps, improved dissemination and exchange of information in support of IAS management.

Some of the resultant online resources include:

- Invasive Species in Jamaica [http://jamaicachm.org.jm/ioj\\_wp/index.php/introduction-to-jamaican-biological-diversity/invasive-species](http://jamaicachm.org.jm/ioj_wp/index.php/introduction-to-jamaican-biological-diversity/invasive-species)
- The Jamaican Virtual Herbarium <http://www.jamaicavirtualherbarium.com/>
- Aliens of Xaymaca Vol. 5, Issue 1 [http://jamaicachm.org.jm/ioj\\_wp/wp-content/uploads/2012/01/Aliens\\_Newsletter\\_5\\_1\\_2012.pdf](http://jamaicachm.org.jm/ioj_wp/wp-content/uploads/2012/01/Aliens_Newsletter_5_1_2012.pdf)

*Contributors: A. Davis and D. Newell*

## An experience from Saint Lucia

The Caribbean/Florida Fire and Invasive Species Learning Network seeks to (a) assess the state of knowledge about the interactions of fire and invasive plants, (b) identify and prioritize management & research needs, (c) identify critical barriers to the prevention of invasion, (d) identify successful implementation of restoration projects and (e) develop integrated management plans that appropriately coordinate the management of fire and the control of invasive species

Saint Lucia joined the Caribbean/Florida, Fire and Invasive Species Learning Network in 2009. Wild-fires often begin unnoticed and spreads quickly, lighting brush, trees and homes. In Saint Lucia the majority of wildfires which occur are recognised as being, agricultural in origin, however, they may be started by other means, for example, a tossed cigarette, burning debris or even set maliciously.

In 2010, local authorities undertook a consultative exercise, engaging local expert botanists, and identified five priority flora species as it relates to wildfires. These were:

1. Ivy Gourd (*Coccinea grandis*), a smothering, very aggressive vine native to Africa and Asia,
2. Barbados sour grass (*Bothriochloa pertusa*) a herb of coastal grasslands, savannahs and open dry areas at low elevations, often covering large areas, native to India, Pakistan, Sri Lanka, Indochina, Thailand, Indonesia and Malaysia,
3. Madagasca Rubber vine (*Cryptostegia madagascariensis* or locally called let makak, zong makak), a woody-perennial vine native to Madagascar and Tropical Africa,
4. Sitonnelle (or lemon grass (*Cymbopogon citrates*)) found growing naturally in tropical grasslands but a native of India and Sri Lanka, and
5. Asian Sword Fern (*Nephrolepis bromnii/multiflora* ) a terrestrial, epiphytic found on buildings and at all elevations except the highest, native to Asia.



Ivy Gourd



Madagascar Rubber Vine



Asian Sword Fern

A Wildfire and Alien Invasive plant species component has been developed for incorporation into the National Invasive Species Strategy (NISS) for Saint Lucia. The action plan will incorporate the development of early detection and rapid response mechanisms/activities, which would also involve addressing legislative gaps as well as public advocacy and outreach programmes, since the general public is considered a key partner in realising the ultimate objectives of prevention, control, and eradication of wildfires and invasive plant species on the island of Saint Lucia.

Critically, the general public is being called upon to (a) become familiar with the native flora of Saint Lucia and invasive plant species present in Saint Lucia; (b) refrain from smuggling plant material into Saint Lucia regardless of the desire to do so; (c) ensure that the necessary precautions are taken to prevent the fire from getting out of control when lighting fires in the wild for any purpose; (d) establish green barriers (Plants) for example, Fat Poke along boundary lines; and (e) report sightings of wildfires to the Fire Service or the Forestry Department.

Contributor: J. D. Lewis

- **Choosing the right tools and strategies!**

**“The biggest challenge is not invasives but ourselves ... how do we manage ourselves to manage invasives.”**

Dr. Chagemu Kedera,  
Kenya

***Use their habits against them!***

The experiences of Antigua's rat eradication operation illustrate the importance of choosing the right tools for the job. Any poison will not do!

Rats are suspicious of new foods, especially when they detect other rats becoming sick and dying. Some rats are careful to avoid traps and poisons. Knowing these habits, The Antiguan rat eradication project researched a range of 'rat poison' options. The best bet was 'brodifacoum' a slow-acting poison. There are other poisons that act more quickly on rodents, but the relatively slow-acting nature of brodifacoum was in fact an advantage. The entire rat colony can be fooled into accepting the bait as a safe food for several days before the first individuals begin to die.

*Contributor: Daltry et al*

***Use them to death!***

***a common way to control the spread of the common bamboo***

Perhaps, bamboo continues to spread on the island because of some of its introduction pathways or the variety of ways in which it is utilized. Green bamboo stems in particular, propagate easily and using these stems as support and props for vine crops and others such as plantain and bananas and as a soil stabilizer contributes to its establishment and spread.

Many farmers in Tobago clear and burn common bamboo clumps with old tyres and kerosene to plant crops including cucurbits and ochro. But while manual clearing and traditional burning of bamboo may curtail its invasion, the use of tyres and kerosene is not an environmentally friendly approach.

Some farmers have reportedly suppressed the growth of common bamboo by cultivating Hibiscus species (musk ochro) within burnt bamboo clumps. Musk ochro appears to be a possible root inhibitor of bamboo. This needs to be confirmed scientifically.

*Contributor: W. Trim*

#### Wild pigs are not welcomed in Saint Lucia's forests

Left up to the authorities, their days are numbered! The question is how to rid the forests of these invaders!

- Eradication may be too expensive and in any event, more farmed pigs will eventually escape and become wild.
- Control may be the more cost-effective option! The Forestry Department is determined to keep their numbers to a bare minimum in state-owned forests and protected areas.

'Hunting' wild pigs presented a very attractive option. But while the hunters seemed quite excited about the prospects, other community members were not convinced that all the pigs were feral.

Based on similar experiences in Montserrat, which allowed hunting of pigs in some forest areas, the Forestry Department encouraged and permitted hunting of wild pigs by a small number of licensed reputable hunters. It was hoped that controlled hunting would reduce the numbers and range of pigs in the five forest ranges where they occur. However, the Montserrat experience also demonstrated that the pigs have become more wary and difficult to observe.

The Forestry Department is continuing its effort to bring the situation under control using a strategic and coordinated approach that involves stakeholder consultation and sustained efforts over time through adequate funding, adequate monitoring and evaluation.

*Contributor: A. Dornelly*



*Wild pigs (sus scrofa).*

*(Photo: <http://www.biopix.com/Temp/JCS%20Sus%20scrofa%2046382.JPG>)*

## Using Conservation Canines to Locate Invasive Iguanas in Saint Lucia

Use of detection dogs to locate wildlife droppings over large areas was pioneered in 1997 by Samuel Wasser, Director of the Centre for Conservation Biology, University of Washington. Since then, Conservation Canines (CK9) has been non-invasively monitoring a diverse array of threatened and endangered species around the world.

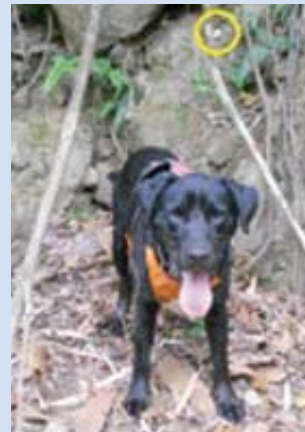
Tucker and canine handler/trainer Elizabeth Seely, worked on a pilot study in Soufriere on Saint Lucia, with the Forestry Department of the Ministry of Agriculture, Lands, Forestry and Fisheries (MALFF) and Durrell Wildlife Conservation Trust (Durrell) to locate an alien species of arboreal iguanas. Thick vegetation and tropical climate presented a major challenge in locating the alien iguana.

Multiple training tools were used to increase Tucker's chances of finding the iguanas:

- Body swabs taken from previously captured iguanas were originally used to introduce Tucker to their scent.
- Preserved iguana eggs were placed in holes and under sand to teach Tucker to dig when he detects the odour of potential nest sites.
- Native and alien iguana scat was collected to help determine specific areas within the forests where iguanas are living.

At the final stage, captive native and alien iguanas were included in the training to be certain that Tucker was alerted to the scent of live iguanas. The cages used to hold these iguanas were varied to ensure that Tucker was truly detecting iguanas rather than cueing on the scent of plastic or metal.

Tucker and canine handler/trainer were always accompanied by a member of the Forestry Department and/or a Durrell volunteer during our surveys. As Tucker's training progressed, he became better in locating iguana signs in the field. However, since a wild iguana was yet to be found, blind exercises as a proof-of-concept were set up. Forestry personnel or Durrell volunteers hid a live iguana or iguana scat in the forest without the knowledge of Tucker and canine handler/trainer. With his keen sense of smell, capable of smelling iguanas in the trees, even though he cannot climb them, Tucker found every sample, without fail.



*Tucker waiting patiently for his reward after finding an iguana egg in the opening of a hole by the river (circled yellow)*

Tucker was also able to alert the Forestry Department and Durrell volunteers with specific areas to focus their searches. However, since these iguanas live 10-40 meters up trees in dense vegetation, locating them remains a formidable challenge; only one iguana has been located by Forestry personnel over the past three months, including the duration of the pilot study, as opposed to over 150 in 2010 (U. Krauss, pers. comm., 2011). As eradication efforts progress, this difficulty will increase.

Conservation Canines hope to continue their work surveying for the invasive iguana on Saint Lucia and assist the Forestry Department to build up their own conservation dog and handler team for sustainable wildlife management.

*Contributor (article and photo): E. Seely*

## Lessons Learnt

- **Enhancing cost-effectiveness of eradication and control operations!**

IAS eradication and long-term control can be costly, both in terms of financial costs and as well, in terms of unintended casualties!

### **Managing and keeping costs relatively low!**

Antigua's strategy to reduce costs involved (a) reducing loss of 'bait' by nailing the brodifacoum briquettes onto wooden blocks or wiring them onto trees to prevent crabs from eating all the bait or dragging it away and placing the poisons inside clear plastic tubes to prevent the briquettes from being nibbled or trampled by the island's wild goats, and (b) recruiting willing volunteers (both Antiguan and international), using local fishing boats for transport, and seeking donations of rodenticide and other materials.

*Contributors: Daltry et al*

### **Minimizing the risks to non-target species of IAS eradication!**

When battling to conserve one species, the needs of others need to be taken into account. In the end, only successful restoration of a healthy ecosystem can hope to ensure the future of native flora and fauna, such as the Saint Lucia whiptail lizard. Saving indigenous species is one among the several steps along the important path of preserving rare wildlife and restoring ecosystems.

In Antigua, to minimize the risk of IAS eradication on the local species, the poison was prepared in a way that was unattractive to other animals. The poison was presented at a concentration of 0.005% within waxy Klerat™ 20-gram briquettes which birds and reptiles find unappealing and distasteful. This was done to reduce unintended kills. After the eradication operations, there was no evidence of any native or domestic animals being accidentally poisoned.

*Contributors: Daltry et al*



- **Staying vigilant and building early warning systems!**

Vigilance and early warning are key! Vigilance is not only in terms of early detection of IAS presence, but also of any possible local solutions, especially biological control, of the IAS problem. This also has the added advantage of keeping the cost of control at manageable levels. Hence the need to also ensure that these opportunities are identified in early warning systems is critical to allow for their further exploration as a potential for biological control using natural biodiversity.

**Staying on the alert!**

The experience of Antigua in reducing the chance of further reinvasions by eradicating rats from neighbouring islands is a good lesson in managing the IAS threat. Rats have been known to swim between islands. On islands that are near other rat-infested areas or occupied or frequently visited by people, the risk of re-invasion is especially high. Re-invasion was managed by establishing permanent bait stations designed to simultaneously achieve two objectives: (a) eradication - to kill rats when they arrive and (b) early warning, to provide early warning signs of an invasion. If signs of rats are detected in a single bait station, the automatic response is to apply additional poison immediately in the affected section of the island. Monitoring and follow-up for any further signs of rats are also indispensable to being vigilant. While no system is rat-proof, this rigorous level of vigilance in Antigua has delivered success. There have been no re-invasions over the five year maintenance period, in spite of heavy boat traffic.



Possibilities: using local species for biological IAS control – the fruit of *Mimosa pigra* L attacked by beetle larva

During the eradication efforts of *Mimosa pigra* L. in the Dominican Republic, some mature and immature fruits were found attacked by insects. Samples were collected for testing by an entomologist who identified the causative agent of such damages as a beetle of the family Chrysomelidae (*Cryptocephalus balteatus Suffrian*), an endemic insect and stamen feeder. These experiences in the Dominican Republic illustrates that keen observation of a potential natural predator of an IAS could be indispensable in combating against IAS, naturally! This opens the possibility of local species use for biological control of *Mimosa pigra* L.

Contributors: C. Rijo Güílamo, B. Hierro and R. Sanó

- **Keeping the public and communities educated, aware and engaged!**

Community participation is essential in helping nature to take its course. Public education and support to help prevent re-invasions and contribute to the solution are key in species control! Caribbean populations have varying attitudes towards IAS depending on cultural and socioeconomic relations/factors and over-all knowledge of the issue. While scientists and other learned individuals understand the potential dangers of IAS, communicating that message and convincing the general public that they are indeed harmful, is another matter.

### **Creating awareness and changing public perception**

#### ***“Let’s eat it to beat it”***

Jamaica has long battled the threat of predators. Since the 17th century, the Mongoose, brought in by sugar plantation managers to control mice and snakes in the fields has become a nuisance. It is now a runaway invasive. As a result of public awareness programmes, the general public recognises the Mongoose on sight. The newly arrived Lionfish has also had much publicity, including from Ministerial and agency levels. It is a direct threat to the livelihood of fishing interests who complain of large catches of Lionfish with no ready market for sale. Its negative impact on local fish stocks is also being highlighted. The main slogan for the control of Lionfish “Let’s eat it to beat it”, is actively encouraging consumption of Lionfish as a tasty dish. This slogan is also geared at correcting false perception due to the equally false belief that Lionfish is poisonous and unsafe to eat. However, campaigns such as these that put an economic value on an IAS are opposed by many since most IAS are introduced for economic reasons in the first place. Sometimes, as in the case of the lionfish, there may be no other option.

#### ***Each person has a role to play in the fight against IAS***

The MTIASIC Jamaica Project has to date developed attractive and informative material such as fact sheets, posters and brochures and manages an outreach component designed to engage and interact with the public through schools, community groups and/or built around special events and environmental commemorative dates. These include: Expo’s, Food Week celebrations and parish and national school based events. These are buttressed by newspaper reports/articles, and live media broadcasts. These medium provide opportunities for partners and specialists to make their facts and findings known to the public and stakeholders and to get the conversation started on how each person can participate in the interventions against the threat of Invasive species. The MTIASIC Project Jamaica Campaign has widened the discussion beyond the academic consultation and the strict scientific seminars, to that of including the everyday citizen who will be asked to be a part of the interventions strategies aimed at lessening the threat of invasive species.

*Contributor: Caryl Grant*

- **Community participation - key to sustainability!**

No solution is too local or too small in the war against IAS! Antigua's success in rat-proofing its Offshore islands is heavily due to the incredible commitment of Environmental Awareness Group staff and volunteers who helped to monitor and inspect bait stations every 5-6 weeks for signs of rat presence and help maintain baiting stations. Saint Lucia also benefitted from a workforce of local conservationists and volunteers from overseas. In the Bahamas, the public is encouraged to use native *scaevola* as an effective landscape alternative along with other indigenous plants, such as Sea Grape, Silver and Green Buttonwood, Sea Oats, and Sea Lavender in the coastal regions.

#### Small seed – Big solution

##### **seed banks of native species is one strategy in the fight against invasive plants**

The island of Hispaniola has approximately 6,000 different plant species, of which roughly one-third (2,000) are endemic. But not much is known about most of these native and endemic species. In attempting to solve problems and address particular needs, many invasive plant species present in the Dominican Republic were purposely introduced. These included *Acacia mangium* and *Leucaena leucocephala*, introduced for energy production; *Azadirachta indica* introduced as an insecticide; *Delonix regia* for the beauty of its flower, ...and the list goes on. This practice has reached a point where some IAS are now 'naturalized' and entrenched in commercial industry.

People are now becoming aware of the problem of planting and promoting exotics. However it is difficult to find native and endemic plants and seeds to cultivate, a situation which created the problem in the first place. To break this vicious circle, the Dominican Republic has invested in the establishment of two seed banks - one for conservation and research and the other to develop the forestry industry.

The Seed Bank in the National Botanical Garden of Santo Domingo will be devoted primarily to the conservation of the country's endangered plants. This facility is a partner of the Royal Botanic Garden's Millennium Seed Bank Project and the Università degli Studi in Pavia, Italy. A cooperative partnership that ensures excellent training, state of the art equipment and accurate field knowledge based on experience. Through propagation and introduction in the wild, it is hoped that survival of many species can be guaranteed.

The seed bank of the Ministry of Environment and Natural Resources seeks to create a market for native and endemic forestry species. The Bank buys seeds of indigenous trees so that future reforestation and restoration projects can be executed with the proper species. The research aspect of the banks is directed at determining the type of seeds that is present in the flora, soil preferences, speed of germination and the preferable conditions for this to occur, and phenology and ecology. While a lot more actions are needed to address invasive species, seed banks of native species is one strategy in the battle of invasive plants. They also provide an opportunity for adequate restoration and sometimes, profit.

Contributor: N Ruiz-Vargas

### Engaging the public and media participation

The public awareness campaign in the Dominican Republic seeks to both educate community groups about the impacts of invasive alien species on biodiversity, the economy, tourism and human health, and as well, engage their interest and involvement in reporting any suspicious species. A recent incident which occurred in January 2012 shows just how effective these public education campaigns have been in sensitising the public.

A local newspaper published an article which warned of the presence of a spider probably introduced through the Manzanillo Port in the Montecristi province in northwestern Dominican Republic. According to the reports, in recent months, a doctor treated several cases of these spider bites. The public took notice!

In an immediate response, a team of experts from the Ministry of Environment and the Natural History Museum visited the area assess the situation. They conducted interviews with the port's staff, the doctor and persons who received clinical treatment for bites, as well as inspected the area to locate and collect spiders.

All spiders found were native species typical to the area. Images of the spider species collected were shown to the interviewees. However, the answers were inconsistent. The team concluded that there was no evidence of the introduction of any alien spider and that clinical cases were common spider or insect bites.

False alarm or not, the team continued to engage an already sensitised public and persons were shown how to collect spiders and send them for identification in case of a bite. The public was also informed on the results of the assessment through the local media.

A report published in a newspaper provided details of the findings. Essentially, the report confirmed that there was no evidence of an exotic spider present in Montecristi and that cases treated by the doctor appeared to be minor infected bites or allergic reactions. This information was reported on a television interview with officials from the Ministry of Environment and Natural Resources and museum technicians who participated in the evaluation.

*Contributor: C.Rijo Güilamo*

Ultimately, public education and support are the main factors that can guide species control. Therefore public awareness, support from communities, volunteerism are essential in the fight against IAS! Communities and the general public are key stakeholders and must be involved in managing the IAS threat. Hence Development and implementation of Public Education and Awareness programmes in each participating territory is a main component of the MTIASIC Caribbean project.

management  
prevention strategy

# A Call to Action

detection restoration  
rehabilitation  
coordination information

## Who is doing what!

The following table provides a stakeholder mapping of some of the many agencies engaged in IAS control and management and their key actions.

| A Call to Action  | Some Key Actors   |
|---|---|
| <b>Advocacy and Dialogue for IAS Policy and Strategy</b>  | <ul style="list-style-type: none"> <li>• Caribbean Community (CARICOM) Secretariat</li> <li>• Caribbean Invasive Species Working Group (CISWG)</li> </ul>   |
| <b>Regional coordination and Networking, e.g., CISWG, Caribbean Pest Diagnostic Network</b>               | <ul style="list-style-type: none"> <li>• CARICOM Secretariat</li> <li>• Florida A&amp;M University (FAMU), Center for Biological Control</li> <li>• UF-IFAS</li> <li>• United States Department of Agriculture – Animal and Plant Health Inspection Service (USDA-APHIS)</li> </ul> |
| <b>Policy Development and Legislation, including harmonisation of Plant and Animal Health Legislation</b> | <ul style="list-style-type: none"> <li>• CARICOM Secretariat</li> <li>• The Nature Conservancy (TNC)</li> <li>• University of Florida – Institute of Food and Agricultural Sciences (UF-IFAS)</li> <li>• FAO</li> <li>• Ministries of Agriculture</li> </ul>                        |
| <b>Research, Knowledge Sharing and Global Networking on Priority IAS and Pest Threats</b>                 | <ul style="list-style-type: none"> <li>• FAMU, Center for Biological Control</li> <li>• Food and Agriculture Organisation (FAO)</li> <li>• UF-IFAS</li> <li>• USDA-APHIS</li> <li>• University of the West Indies (UWI)</li> <li>• CABI</li> </ul>                                  |
| <b>Technical support, Information Dissemination and back-stopping.</b>                                    | <ul style="list-style-type: none"> <li>• FAO</li> <li>• IICA</li> <li>• UF-IFAS</li> <li>• CABI</li> </ul>  |
| <b>Public Awareness, Capacity Building and Support to participate in Meetings</b>                         | <ul style="list-style-type: none"> <li>• FAMU, Center for Biological Control</li> <li>• Inter-American Institute for Cooperation in Agriculture (IICA)</li> <li>• TNC</li> <li>• UF-IFAS</li> <li>• USDA-APHIS</li> </ul>   |
| <b>Project Execution in the Caribbean</b>   | <ul style="list-style-type: none"> <li>• CABI Caribbean and Latin America (CLA)</li> <li>• IICA</li> <li>• TNC</li> <li>• USDA-APHIS</li> </ul>   |



## INTERNATIONAL CONFERENCE

# Safeguarding the Caribbean's

**Food  
Trade  
Health  
Tourism  
Biodiversity  
From IAS**

Trinidad and Tobago  
23-27 September, 2013



### Sessions on:

- Risk Assessment;
- Pathway analysis;
- Economic Impact;
- Control and Management of Marine, Fresh Water and Terrestrial IAS.

### For more information contact:

Naitram (Bob) Ramnanan  
Regional Representative and IAS Coordinator.  
[n.ramnanan@cabi.org](mailto:n.ramnanan@cabi.org)

**FIRST CALL  
FOR PAPERS**

## The MTIASIC Project:

### “Mitigating the Threats of Invasive Alien Species in the Insular Caribbean”

Invasive alien species are a major threat to the vulnerable marine, freshwater and terrestrial biodiversity of Caribbean countries, especially the many island states. IAS are also a major threat to the people depending on this biodiversity for their livelihoods and wellbeing. Due to the nature of many of the invasive species and their ability to spread and colonise new areas, any attempt to tackle this threat will require a regional effort. Caribbean states have recognised this need for a regional strategy, in line with the Convention on Biological Diversity's declaration that efforts must be made to prevent, control or eradicate invasive species that threaten ecosystems.

CABI is coordinating the project and is working with a multitude of partners from five island nations across the insular Caribbean, namely the Bahamas, Jamaica, Trinidad and Tobago, the Dominican Republic and St Lucia. This project aims to broaden the approach to deal with invasive alien species both by strengthening existing national capacity and measures and by fostering regional cooperation frameworks. In this regard a Caribbean Regional Invasive Species Strategy was developed through a series of regional consultations. This strategy is available on the [CIASNET.ORG](http://CIASNET.ORG) website

In addition their involvement in the regional strategy the five participating countries have either revised existing strategy as in the case of Bahamas or develop national strategies for combating IAS. This was done under the guidance of national steering committees. These strategies guide and inform coherent policies, legislation, regulation and management of invasive species.

These strategies and their accompanying action plans forms a basis for cooperation and coordination of efforts at both national and regional levels.

Knowledge generation, management and dissemination will allow the impact of the work to continue long after the end of the life of the project. Based on a critical situation analysis for each country, best practice guidelines as outline here will be disseminated as well as findings from all research work will be made available.

In additions the project is building capacity in managing IAS from prevention to control through the execution of 12 pilot projects. In addition training workshops have been held in Measuring the Economic Impact of IAS; Legal Tools as a Management Tool; Use of the I3N database to conduct risk assessment in the management of IAS, Invasive Species Compendium to report on and manage IAS.

The following table highlights the 12 pilot projects relating to prevention, early detection and rapid response, management, and eradication of the some invasive species.

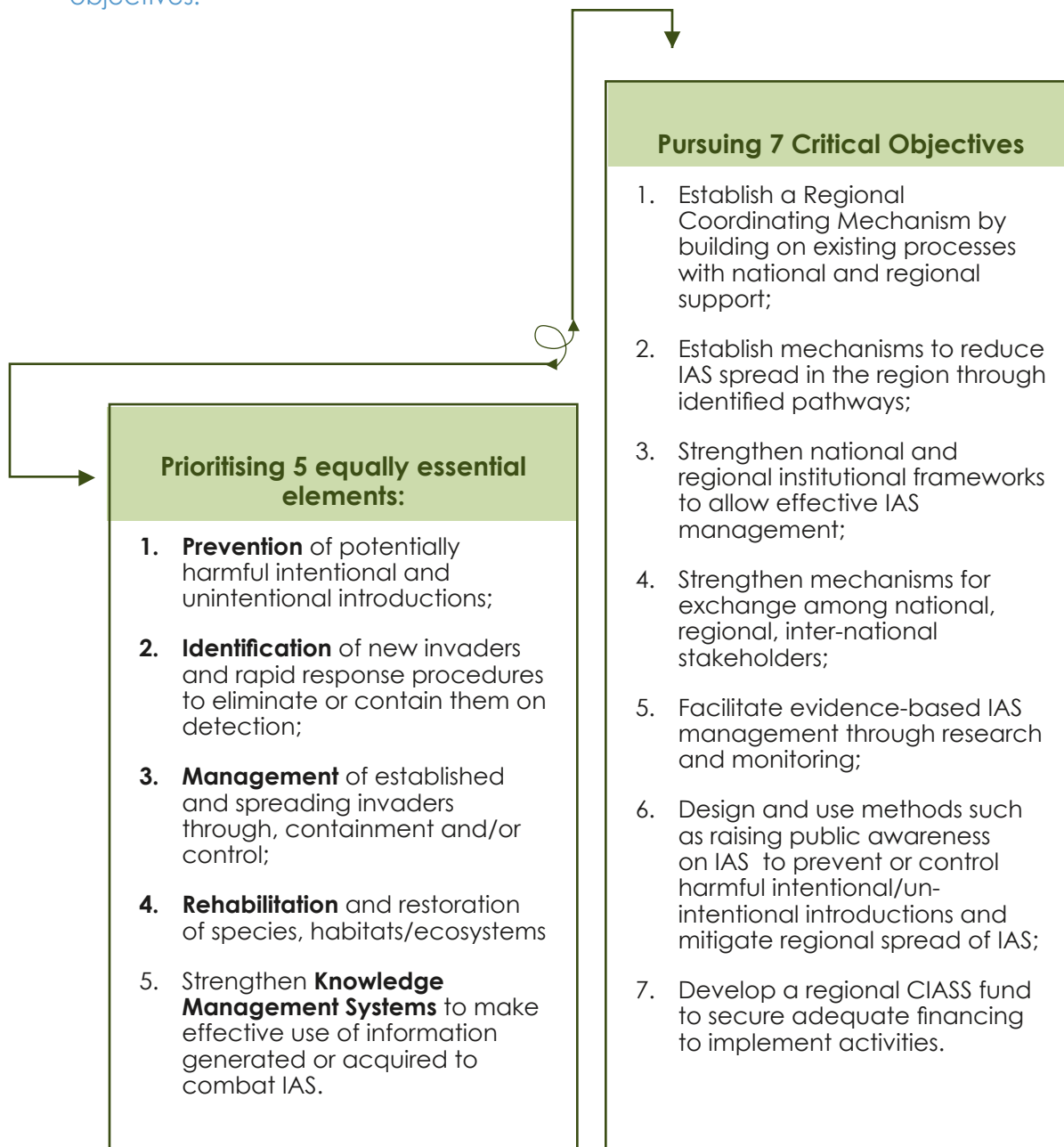


## Twelve (12) National Pilot Projects

| <b>Mitigating the Threats of Invasive Alien Species in the Insular Caribbean (MTIASIC)</b><br><b>A project by UNEP-GEF and CAB International</b> |  |
|--|--|
| Bahamas  | 1. A Local and regional research, training and Management Approach to the Lionfish. That involves revising the National IAS strategy, conducting research on the impact of Lionfish. Actively conducting research to determine best control and management strategies in various habitat types.  |
| Dominican Republic   | 2. Eradication of alien vertebrate predators and one alien invasive Plant Species from Alto Velo island (Species targeted: ( <i>Rattus norvegicus</i> / <i>Rattus rattus</i> (brown and black rat) <i>Felis catus d.</i> (cat); <i>Azadirachta indica</i> (neem).<br>3. Eradication of an alien vertebrate predators and herbivores from Isla Cabritos in Lago Enriquillo (species targeted: <i>Felis catus d.</i> (cat); <i>Capra hircus</i> (goat); <i>Equus asinus</i> (donkey).  |
| Jamaica  | 4. Management and control of the marine invasive species, <i>Pterois volitans</i> (Lionfish) to prevent the impending population explosion in the Caribbean Sea.<br>5. Monitoring and selective eradication of vertebrate predators in the last remaining habitat of the Jamaican Iguana ( <i>Cyclura collie</i> ) in the Portland Bight Protected Area. (Species targeted: <i>Canis familiaris</i> (Dog); <i>Capra hircus</i> (Goat) <i>Felis catus</i> (cat); <i>Herpestes javanicus</i> (Mongoose); <i>Sus scrofa</i> (Feral Pigs).<br>6. Control and management of two invasive freshwater animals and plants in the Lower Black River Morass (Ramsar Site) to prevent further habitat loss. (Species targeted: <i>Cherax quadricarivatus</i> (Australian Red Crayfish) <i>Pterygoplichthys paradalis</i> (Sucker mouth catfish) <i>Alpina allughas</i> (Ginger) and <i>Melaleuca quinquenneriva</i> (Paper Bark Tree/ Melaleuca). |
| Saint Lucia  | 7. Protection of Saint Lucia's unique biodiversity through eradication of invasive alien Iguanas.<br>8. To protect the Maria Island Nature Reserve for the threat of Invasive Alien Species (IAS)  |
| Trinidad and Tobago  | 9. The maintenance of the native biodiversity of the ecologically sensitive area – Nariva Swamp by the control and management of <i>Raoiella indica</i> (Red Palm Mite) and <i>Batrachedra nuciferae</i> (Coconut Moth)<br>10. Preventing the entry of <i>Moniliophthora rorei</i> (causal agent of frosty pod rot of Cocoa) into Trinidad and Tobago.<br>11. Management and Control of the marine invasive <i>Perna viridis</i> (green mussel) in Trinidad and Tobago.<br>12. Mitigating the impact of Aquatic IAS in Trinidad and Tobago through the increased awareness of key stakeholders.  |

## The Caribbean Invasive Alien Species Strategy (CIASS) 2011-2015

is a framework for Invasive Alien Species management in the Caribbean Region. The CIASS will help to create an enabling environment for effective IAS management in the Caribbean by placing priority on five critical elements and pursuing seven key objectives.



The CIASS calls for a better understanding IAS challenges in order to define strategic actions that address them directly, including adopting an eco-system approach to IAS management to protect bio-diversity, trade and livelihoods. The CIASS also calls for Governments to commit to preventing the introduction, control or eradication of those alien species including living modified organisms, which threaten ecosystems, habitats or species and with support from relevant agencies, *'to take the necessary measures to protect, preserve and manage in a sustainable manner, threatened ecosystems, habitats and species!'*

## The Ecosystem approach

For IAS management, an ecosystem approach enables a total treatment of IAS threats and more effective use of prevention, detection, management and rehabilitation strategies suited to the particular needs of an ecosystem. This holistic approach also provides a basis for coordination and information sharing among technical agencies.



*Underwater scene, Dominica*  
(Photo: Derrick Theophile)

Marine (seas and oceans) ecosystems are continuous, without physical barriers or borders. This makes it especially challenging for control of bio-invasions. E.g., Prevention of Lionfish is almost impossible! Control strategies may be useless, except in defined areas such as marine protected areas.



*Mountainous Caribbean landscape*  
(Photo: Lyndon John)

Terrestrial (*land*) ecosystems in Caribbean island states have high rates of endemic species. Their ecosystem services support sectors, such as agriculture and tourism. Predation by introduced alien species (e.g. mongoose) and habitat destruction (e.g. by goats) are among the most deadly causes of species decline and biodiversity loss.



*Nariva Swamp*  
(Photo: Naitram Ramnanan)

Freshwater ecosystems such as, rivers, streams, lakes and wetlands, host extraordinarily rich and unique biodiversity, which provide water resources and support agriculture, fisheries and tourism, among others. The Caribbean boasts several wetlands of international importance.

**IAS probably cause more biodiversity loss in these ecosystems in the Caribbean than climate change or habitat destruction.**

## Technical Papers and Articles - Participating Project Countries

### The Bahamas:



*In The Bahamas, the marine resources that surround the 700-island archipelago are critical to their environmental stability and socio-economic development. It is for this reason, that as a participating country in the project, The Bahamas has focused readily on the Lionfish. Its conspicuous appearance in Bahamian waters over a short period of time and its direct impact on fisheries resources make it an enemy that needs to be controlled. In addition to the Lionfish invasion, Coastlines around The Bahamas are being invaded by a number of invasive alien plants that threaten and do damage to native plants and ecosystems.*

- 1. Melaleuca: invasion potential in the Bahamas**  
by Ancilleno Davis M.Sc. The Nature Conservancy, Northern Caribbean Programme
- 2. Scaevola Taccada – Landscaping “Solution” Becomes Major Threat**  
by Kelly Meister and Ronaldo Smith, Dolphin Encounters, The Bahamas
- 3. The Eradication of the Casuarina, Public Views on Removal**  
by Lynn Gape, The Bahamas National Trust

### The Dominican Republic:



*Together with Haiti, The Dominican Republic shares the island of Hispaniola which has approximately 6,000 different plant species, of which about 2,000 are endemic. Dominican Republic also includes a small offshore island, Cabritos Island, a biodiversity gem housing a number of indigenous and unique wildlife species. The country is now invaded by a number of invasive plant species that were purposely introduced from other parts of the world for economic or other reasons. As part of its national strategy, the Ministry of Environment and Natural Resources is developing a public awareness and education campaign to educate community groups about the impacts of IAS on biodiversity, the economy, tourism and human health.*

- 4. Cabritos Island - impact on island biodiversity; before and after IAS**  
by Carlos Rijo Güillamo, Project National Coordinator
- 5. Restoration of Isla Cabritos for the protection of Riocond Iguana and Rhinoceros Iguana. Feasibility Plan.**  
By K. Swimerton, M. Pott, T. Hall, Island Conservation. California
- 6. Green Customs Initiative (GCI)**  
by Marlig Desirée Pérez M, Lawyer, Legal Department, Ministry of the Environment and Natural Resources
- 7. Here a seed, there a seed, everywhere a seed**  
by Natalia Ruiz-Vargas, National History Museum, the Dominican Republic
- 8. Local people and media alert on the presence of a potential alien spider species in Montecristi, Dominican Republic**  
by Carlos Rijo Güillamo, Project National Coordinator, Ministry of the Environment and Natural Resources
- 9. Mimosa pigra L eradication, Uvero Alto, La Altagracia Province, Dominican Republic,**  
by Carlos Rijo Güillamo, Project National Coordinator, Brigido Hierro, Department of Genetics Resources on the Biodiversity Directorate, Rolando Sanó, Flora Division of Biodiversity Directorate

Jamaica:



In Jamaica some 84 IAS are recognized and all have caused some change to the habitats or surrounding human communities they invade. The impacts of IAS in Jamaica span four main areas, ecology, economics, health and heritage/culture. Understanding how these organisms influence our environment and society is the first step to mitigating the dangers caused by biological invasions. Invasive species; often with little or no economic benefit, have displaced flora and fauna with commercial and recreational significance. There have been growing campaigns on the education, protection, eradication and management of IAS in Jamaica.

- 10. Alien Amongst Us—Quilted Melania Snail**  
by Monique Curtis, NEPA, Jamaica
- 11. Building a Knowledge Base for Management of and Public Awareness on IAS in Jamaica**  
by Suzanne Davis and Dionne Newell, Natural History Museum of Jamaica, Institute of Jamaica, 10-16 East Street, Kingston, Jamaica
- 12. Established Invasive Among Us- Bamboo**  
by Monique Curtis, NEPA, Jamaica
- 13. The Lionfish Invasion in Jamaica**  
by Dr. Dayne Buddo, Lecturer & Academic Coordinator, National Lionfish Project Lead, Discovery Bay Marine Laboratory and Field Station, Centre for Marine Sciences University of the West Indies, St. Ann, Jamaica WI
- 14. The Non-Indigenous Suckermouth Catfish, *Pterygoplichthys pardalis* (Pisces: Loricariidae; Castelnau, 1855), in Jamaica**  
by Aisha Jones and Eric Hyslop, Department of Life Sciences, Faculty of Pure and Applied Sciences, University of the West Indies, Mona Campus
- 15. Public Perception of the IAS Threat in the Caribbean**  
by Caryl Grant, NEPA, Jamaica
- 16. The Rose-ringed Parakeet (*Psittacula krameri*): a new invader to the Jamaican Avifaunal landscape**  
by Ricardo Miller, NEPA, Jamaica

## Saint Lucia:



*The Saint Lucia parrot is an iconic symbol and standard bearer for the country's mountainous rain forests and all their biodiversity. The parrot is among a number of native species under threat from a great number of non-native animal and plant species found on Saint Lucia today. Some of them – such as pigs, goats, cats and dogs – have been purposely introduced, often as livestock or pets. Others, like rats, have come along as blind passengers. No matter how they first arrived, these predatory IAS are disrupting the balance of the local ecosystem and must be stopped!*

- 17. Caribbean/Florida Fire and Invasive Species Learning Network Builds Capacity in Saint Lucia for Wild-fire and Invasive Plant Species Management**  
by John David Lewis, Forestry Department, Ministry of Sustainable Development, Energy, Science and Technology, Union, Saint Lucia
- 18. Feral Pigs in Saint Lucia**  
by Alwin Dornelly Department of Forestry, Ministry of Sustainable Development, Energy, Science and Technology, Gabriel Charles Forestry Complex, Union, Castries, Saint Lucia
- 19. Saving the Saint Lucia Iguana from a new alien threat**  
by Robert Williams, Durrell Wildlife Conservation Trust, Saint Lucia
- 20. Saving the Saint Lucia Whiptail Lizard and its offshore island sanctuaries**  
by Carola Dallmeier, Durrell Wildlife Conservation Trust, Saint Lucia
- 21. The Construction Industry as a Pathway for Invasive Alien Species**  
by Ulrike Krauss & Virginie Sealys, Forestry Department, Ministry of Sustainable Development, Energy, Science and Technology Union, Saint Lucia
- 22. Trends and Tools in the Management of the Pet Trade as a Pathway for Invasive Alien Species in the Wider Caribbean Region**  
by Ulrike Krauss, Invasive Species Coordinator, Forestry Department, Ministry of Sustainable Development, Energy, Science and Technology, Union, Saint Lucia

## Trinidad and Tobago:



The Trinidad and Tobago MTIASIC national projects seek to strengthen existing national measures and foster regional cooperation frameworks for managing the IAS threat. The projects focus on three IAS of economic and environmental significance - Green Mussel (*Perna viridis*), Red Palm Mite and Frosty Pod Rot. Building capacity among all stakeholder groups (public and private sector), in prevention, management and eradication strategies and raising awareness of IAS issues among the general public are critical to achieve project objectives. The results and experiences from these national projects will also be important in building capacity at the regional level to effectively manage these three particular IAS threats and/or invasions.

### **23. Aquatic Aliens- Non-threatening and invasive alien species**

by Ryan S. Mohammed, Aquatic Biologist, Strategic Environmental Services Limited. (SES Ltd.) and President, Aquaculture Association of Trinidad and Tobago (aQua-TT)

### **24. Aquarium Seaweed can invade our seas**

by Lori Lee Lum, Community Education Officer, Institute of Marine Affairs, Trinidad and Tobago

### **25. Managing *Bambusa vulgaris* (common bamboo) an IAS in Tobago**

by William Trim, Assistant Conservator of Forests, Department of Natural Resources and the Environment, Tobago House of Assembly

### **26. Protecting our cocoa industry from the impact of Frosty Pod Rot**

by Velda Ferguson-Dewsbury, National Coordinator, UNEP-GEF Project, Ministry of Food Production, Research Division, Central Experiment Station, Centeno, Trinidad

### **27. Petite, pretty but deadly - the House Sparrow**

by Velda Ferguson-Dewsbury, National Coordinator, UNEP-GEF Project, Ministry of Food Production, Research Division, Central Experiment Station, Centeno, Trinidad

### **28. The Tufted Capuchin, an Introduced Primate in Trinidad: Potential Invasive Species?**

by Darshanjit Singh Narang, Environmental Programme Officer, Biodiversity Unit, Environmental Management Authority

*These technical papers and articles on aspects of IAS, including how they enter and the damage they inflict in the region, prepared and/or coordinated by the Project National Coordinators, are contained in a document titled 'Safeguarding the Caribbean from the Impacts of Invasive Alien Species' and as well on the CIASNet website at [www.ciasnet.org](http://www.ciasnet.org)*

## Other Contributions and Resources

**29. Immunoecologic Response Study on the Bare-eyed thrush, *Turdus nudigenis* In West Indies to shed light on the nature of biologic invasions**

by Emilie Arnoux and Bruno Faivre, UMR CNRS 5561, Biogéosciences, University of Burgundy, 21000 Dijon, France

**30. Invasive Alien Species have been implicated in nearly half of recent bird extinctions**

by Bird Life International (2008), presented as part of Bird Life State of the World's Birds, [www.birdlife.org/datazone/sowb/casestudy/127](http://www.birdlife.org/datazone/sowb/casestudy/127)

**31. Methods and effects of eradicating black rats from Antigua's offshore islands**

by Jenny C. Daltry, Fauna & Flora International, United Kingdom; Natalya Lawrence, Offshore Islands Conservation Programme, Environmental Awareness Group, Antigua; Kevel Lindsay, Island Resources Foundation, USA; Matthew N. Morton, Durrell Wildlife Conservation Trust, c/o- Forestry Department, Ministry of Agriculture, Lands, Forestry & Fisheries, Castries, Saint Lucia; and Karen J. Varnham, School of Biological Sciences, University of Bristol, United Kingdom.

**32. The Invasive Green Iguana (*Iguana iguana*) is Threatening the Endangered Lesser Antillean Iguana (*Iguana delicatissima*): Brief Report of the Situation in the French West Indies**

by Chloé Rodrigues, Lesser Antillean Iguana Conservation Group, National Hunting and Wildlife Agency, 5, rue de la Dorade 97229. Martinique

**33. Tucker and the Iguanas**

by Elizabeth Seely and Samuel Nasser, Center for Conservation Biology University of Washington, Department of Biology, Box 351800, Seattle, WA 98195, USA

**33. <http://www.invasivespeciesinfo.gov/aquatics/melaleuca.shtml#.UEdVx11ITIU>**



# STOP IAS

## PLEDGE

I am a citizen of \_\_\_\_\_.

I understand that my country is connected to wider Caribbean by the Caribbean Sea, and through trade, travel, air and sea transport and that these activities pose a threat to me, my environment, my country and my Caribbean.

**I PLEDGE NOT TO DO ANYTHING THAT WILL RESULT IN THE SPREAD OF  
INVASIVE ALIEN SPECIES IN THE INSULAR CARIBBEAN.**

I, \_\_\_\_\_  
will also encourage my friends, family and fellow citizens to do likewise.



Please send this pledge to any of the centres identified overleaf or go online: [ciasnet.org](http://ciasnet.org) and sign up.  
Encourage family, friends and colleagues to do the same.

# CONTACT INFORMATION

## THE BAHAMAS

**Mr. Michael Braynen**, Director

Department of Marine Resources

East Bay Street

P.O. Box N-3028, Nassau

**The Bahamas**

Tel: 1 (242) 393-1777

Fax: 1 (242) 393-0238

Email: michaelbraynen@bahamas.gov.bs

## DOMINICAN REPUBLIC

**Mr. Carlos Rijo**, IAS Coordinator

**Mr. José Manuel Mateo**, Director Biodiversity and Wildlife

Av. Maximo Gómez esq Paseo de los

Reyes Catolicos, Antigua Cementera,

Santo Domingo

**Republica Dominicana**

Tel: 1 (809) 472-4204 ext 229

Email: carlos.rijo@ambiente.gob.do

## JAMAICA

**Ms. Nelsa English-Johnson**, IAS Coordinator

**Ms. Sherries Simpson**, Project Director

National Environment and Planning Agency (NEPA)

10 & 11 Caledonia Avenue, Kingston 5

**Jamaica**

Tel: 1 (876) 754-7540 ext. 2319

Email: Nelsa.English@nepa.gov.jm

## SAINT LUCIA

**Mr. Michael Bobb**, Chief Forestry Officer, Project Director

**Dr. Ulrike Krauss**, IAS Coordinator

Forestry Department, Ministry of Sustainable Development,

Energy, Science and Technology

Union, Castries

**Saint Lucia**

Tel: 1 (758) 468-5646; Fax 1 (758) 450-2287

Email: saintlucia.ias@gmail.com

## TRINIDAD AND TOBAGO

**Ms. Velda Ferguson-Dewsbury**, IAS Coordinator

**Dr. Lilory McComie**, National Director

Research Division, Central Experimental Station

Ministry of Food Production, Land and Marine Affairs

Caroni North Bank Road, Centeno

**Trinidad and Tobago**

Tel: 1 (868) 642-9217

Email: veldafergusondewsbury@yahoo.com

## CABInternational

**Mr. Naitram (Bob) Ramnanan**, Regional Representative  
and IAS Coordinator

CABI Caribbean and Latin America

Gordon Street, Curepe

**Trinidad and Tobago**

Tel: 1 (868) 662-4173; 1 (868) 645-7628

Email: N.Ramnanan@cabi.org



# STOP

## INVASIVE ALIEN SPECIES (IAS) ENTERING, INVADING AND DESTROYING THE CARIBBEAN

### THE OBJECTIVES OF THE PROJECT:

Promoting Regional IAS Strategy

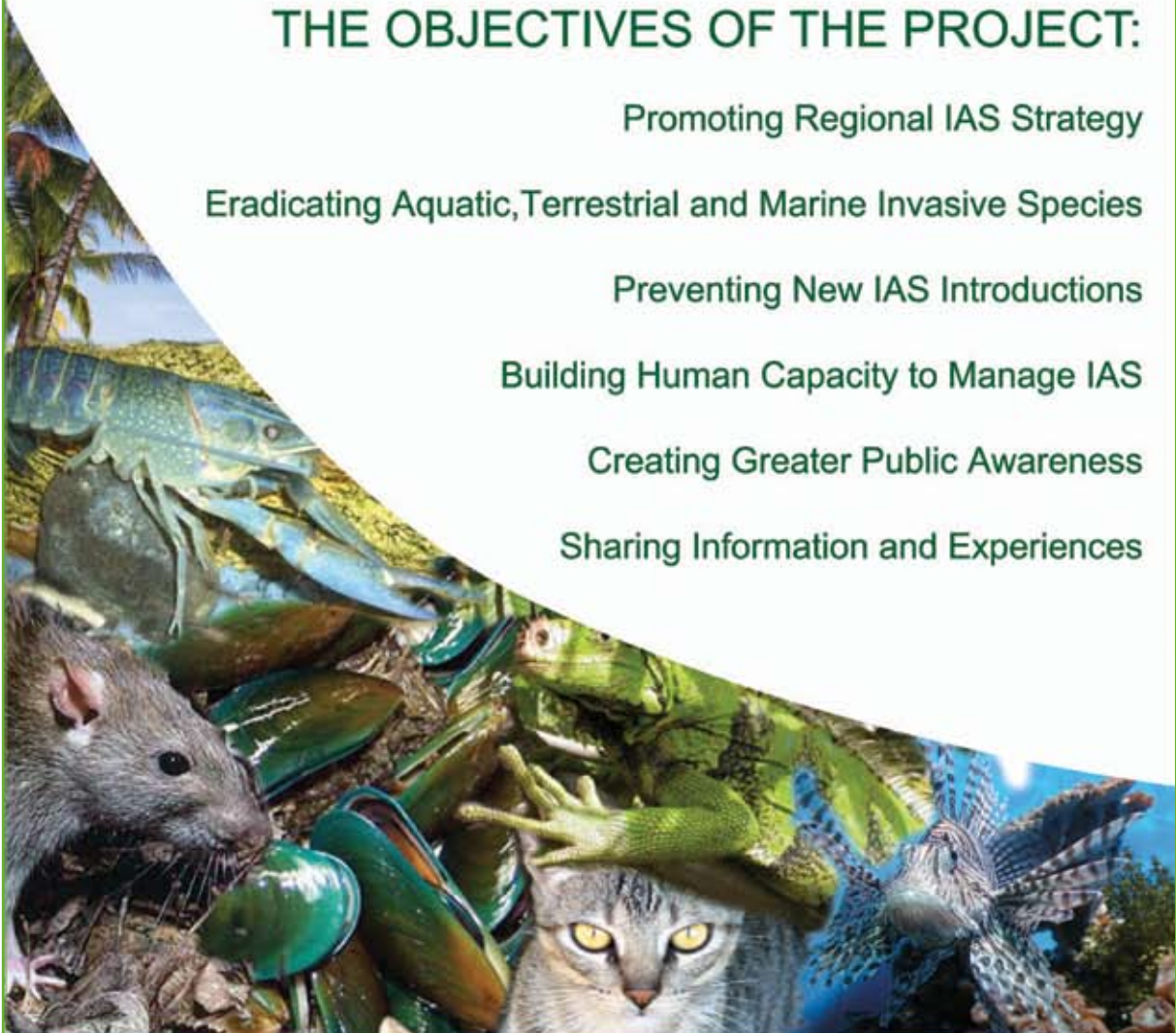
Eradicating Aquatic, Terrestrial and Marine Invasive Species

Preventing New IAS Introductions

Building Human Capacity to Manage IAS

Creating Greater Public Awareness

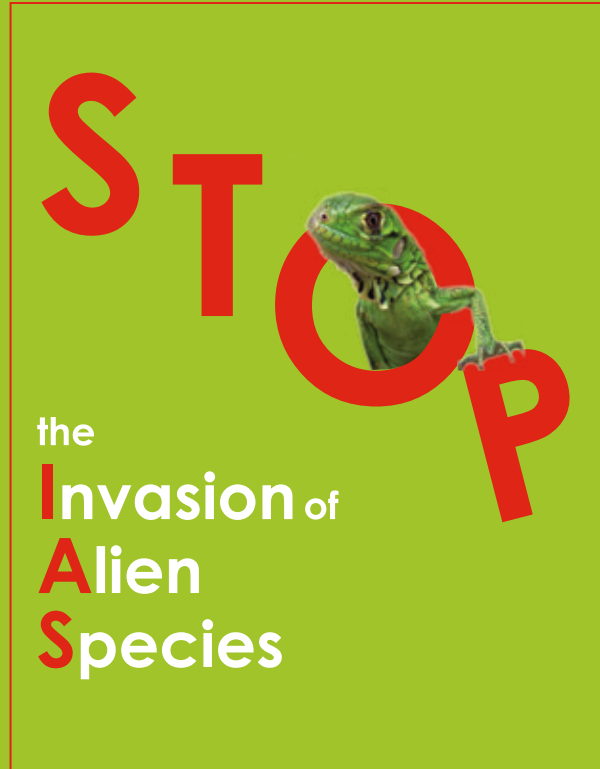
Sharing Information and Experiences



Invasive Alien Species (IAS) are a major threat to the unique and vulnerable biodiversity (the variety of species and their natural habitats) found in Caribbean seas, freshwater and land resources. They also threaten livelihoods of people who depend on this biodiversity.

IAS threats and the need to alleviate their potentially devastating impacts have prompted Caribbean states to take actions to combat IAS.

Public awareness and understanding is pivotal in the fight against IAS. Participation of communities and the general is essential to stop the introduction and spread of IAS in Caribbean states. This publication seeks to sensitize and enhance understanding of the IAS threat among a wider audience.



ISBN: 978-976-8242-21-1

