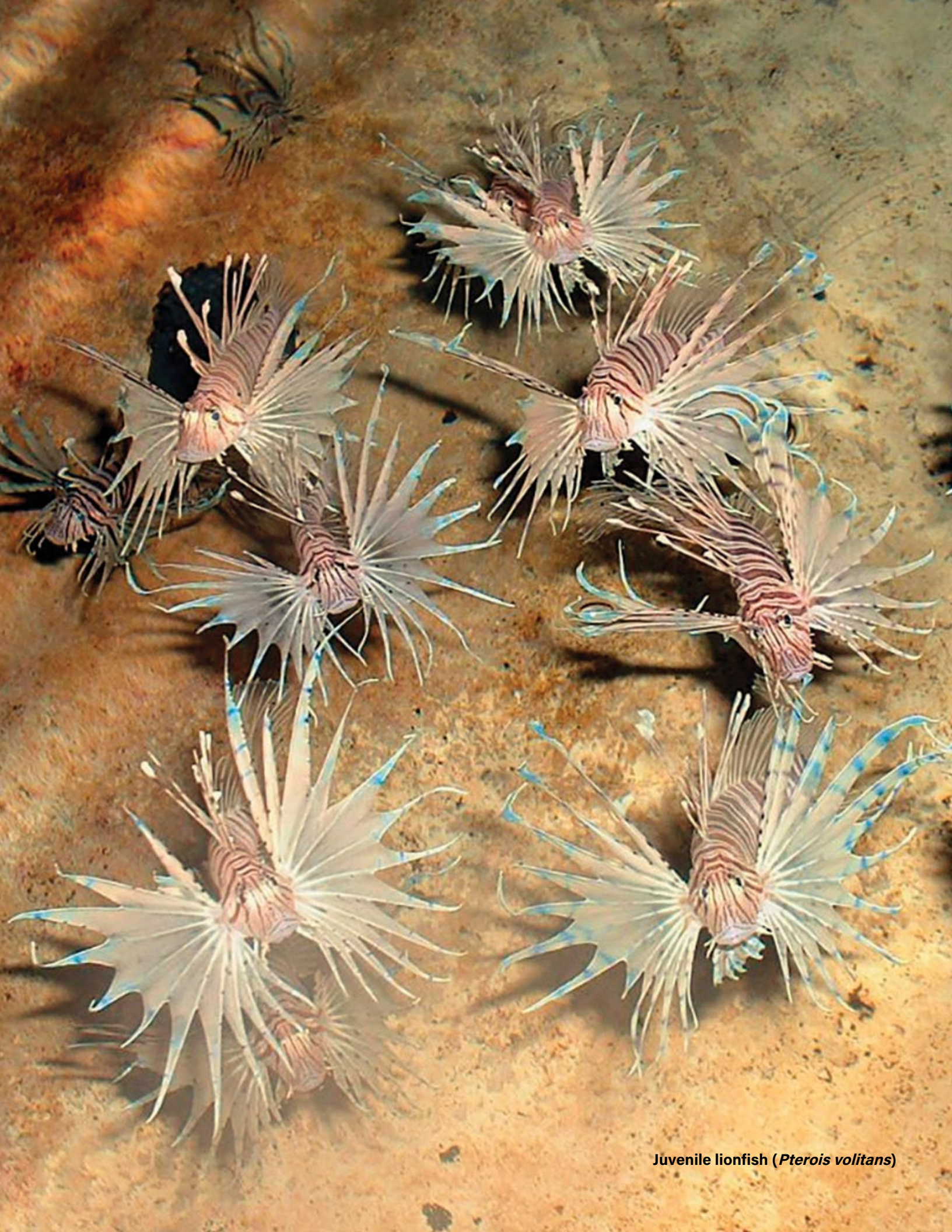
REGIONAL ACTIONS AND ACHIEVEMENTS IN *Managing* INVASIVE ALIEN SPECIES THREATS

Preventing the Costs of IAS in Barbados and the OECS

16 STORIES FROM THE CARIBBEAN



Juvenile lionfish (*Pterois volitans*)

Credits

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Prepared by:
Denyse Johnston and Naitram Ramnanan

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Photos:
Freepik and Shutterstock, under license;
The Project;
Inside front cover - James Morris, Jr., NOAA National Ocean;
Pg. 3 - Zeynel Cebeci, Ranjith Chemmad;
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Pg. 19 - Mark J Andrews II, Jpatokal, Lugiadoom, Wald1siedel;
Pg. 22- CABI, CSIRO, Invasive Algae Database, Jack Randall, Antoine Taveneaux;
Pg. 30 - Arne Witt
Pg. 34 - Michelle Sherwood

Website:
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Message from the Project

The Caribbean is one of the thirty-six global biodiversity hotspots. A significant percentage of our rich biodiversity is native or endemic—many to single islands. Of the 13,000 species of plants found in the Caribbean, 50% are endemic. Over 100 mammalian species are present, with 50% being endemic and 25% facing threats. There are over 600 reptile species, 82% of which are unique to this region. All 200 species of our native amphibians are endemic. We must collectively work to protect this rich biodiversity.

Human-related activities have introduced invasive alien species (IAS) into the Caribbean over centuries. Rats were introduced via ships. Mongooses were introduced over 350 years ago to control snakes in sugar cane fields. Cane toads were brought in to control insects in sugarcane plantations. Rats and mongooses have caused species extinctions and extirpations from many offshore islands, with many other species also being threatened. Antigua and Barbuda have successfully eradicated rats, mongooses, and goats from offshore islands, which has led to a remarkable rebound of endemic threatened species. Rapid restoration is currently underway, and it is hoped that we will soon return to a situation similar to that before the invasion. The green vervet monkeys, which were introduced over 350 years ago as pets during the slave trade, are now considered the number one problem for farmers in Barbados as well as in St. Kitts and Nevis. However, the introduction of new species, such as the recent croton scale in Grenada and Barbados, occurs almost annually. Citrus greening is a cause of the decline of the citrus industry. Black Sigatoka has increased the cost of production, making Caribbean banana production uncompetitive.

In addition to the impact on biodiversity and the economy, IAS also has negative impacts on human and animal health. Invasive mosquitoes kill hundreds every year in the Caribbean by transmitting mosquito-borne diseases such as dengue hemorrhagic fever, yellow fever, and zika, among others. Even if a disease is not spread, mosquitoes can severely disrupt sleep and one's ability to enjoy the outdoors. Rats and giant African snails transmit meningitis that can be deadly if not treated on time. The introduction of invasive species can also cause severe disruptions in trade, travel, and tourism. A good example of this is the Covid-19 virus, which caused a worldwide pandemic.

Preventing the introduction of new invasive species and managing the ones that have been present in the Caribbean for millennia is an imperative to save our species, safeguard lives and livelihoods, and protect the region's rich biodiversity. This was the basis of the project, *Preventing the Costs of IAS in Barbados and the OECS*, that was implemented between 2018 and 2024. The previous regional project, *Mitigating the Threats of Invasive Alien Species in the Insular Caribbean*, which ran from 2010 to 2014, served as the foundation for this one.

As we come to the end of the current project, this magazine seeks to highlight the successes and lessons learned. The project highlighted native biodiversity to garner public support in managing the IAS present while setting up structures to prevent new introductions.

The United Nations Environment Programme (UNEP) served as the implementing agency for the project. Their main role was to ensure that the funds were used to achieve the maximum benefits to the region while contributing to the global targets for biodiversity conservation.

CAB International (CABI) executed the project with collaborating agencies in the seven participating countries. Several regional agencies, including the OECS Commission, Flora and Fauna International, the Caribbean Plant Health Directors Forum, and the University of the West Indies, provided strategic support in the project implementation, alongside numerous consultants, national NGOs, and government agencies. The articles presented here demonstrate the significant contributions the project has made to short-term biodiversity conservation, including an increase in Hawksbill turtle hatchling survivability in Barbados and the recovery of endemic reptile populations in Antigua and Barbuda. We have increased awareness, built capacity, and promoted tools to enhance surveillance and prevent the introduction of new invasive species into the region.

Introduction

Invasive alien species (IAS) threaten the valuable terrestrial and marine biodiversity in the Caribbean region. These IAS can be plants, animals, or microbes, and their impact can be almost irreversible. The region already has more than one-third of the world's worst 100 species on the International Union for Conservation of Nature's (IUCN) list, as well as eight of the top ten agricultural pests and some of the worst weeds.

IAS affect our biodiversity and endanger native and endemic species populations by competing for food and habitat, as in the case of the Barbados leaf-toed gecko, which is threatened by mammals such as rats, mongooses, feral cats, and dogs. The endemic reptiles in the offshore islands of Antigua and Barbuda are threatened by rat predation and goats destroying their habitat, as demonstrated on Redonda. Invasive plants, such as bamboo, Leucaena, and Prosopis, reduce groundwater levels, which can affect potable water supply. They also alter the habitats that allow local birds and other wildlife to thrive. Many invasive insects and microorganisms cause diseases in crops and livestock, resulting in severe losses to agriculture and consequently affecting the region's food security. Some viruses, such as dengue and yellow fever, can have severe repercussions on human health.

IAS also disrupts trade and travel, with significant consequences for vital economic sectors like agriculture and tourism. Prevention is the most effective means of managing IAS. This is a challenging task, further complicated by our vast coastlines, which offer numerous landing sites, thereby diminishing the effectiveness of inspection and surveillance efforts aimed at preventing the arrival and spread of IAS in the region. However, effective and efficient IAS management is critical for biodiversity conservation and the protection of lives and livelihoods.

Feral dog

Soursop plant infested with croton scale insects

Giant Tiger prawn (*Penaeus monodon*)

Project Overview

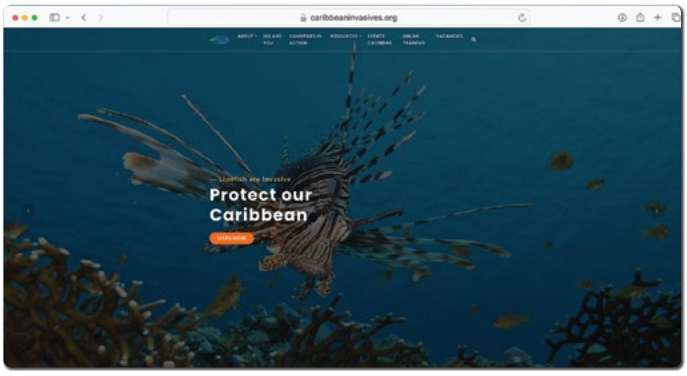
The *Preventing the Costs of IAS in Barbados and the OECS* Project ran from September 2018 to March 2024. It contributed to the prevention, early detection, control, and management of IAS in the Caribbean region, as well as to global efforts to safeguard biodiversity. Antigua and Barbuda, Barbados, and St. Kitts and Nevis participated in all three project components: IAS policy, institutions, and capacity; control and management of IAS impacts; and regional biosecurity. Dominica, Grenada, St. Lucia, and St. Vincent and the Grenadines were only involved in the regional biosecurity component.

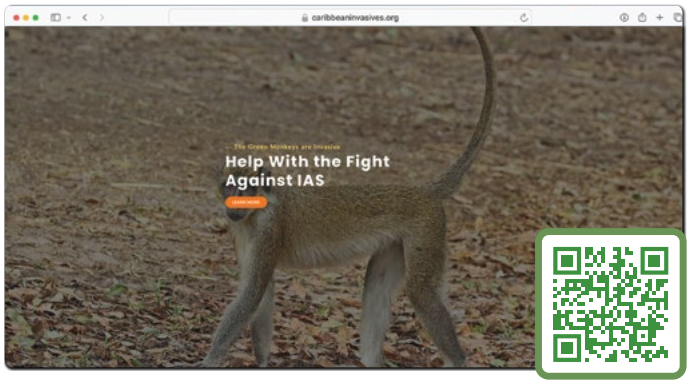
The project focused on nine key barriers that affect the effective management of IAS in the region, including:

1. The numerous pathways for introducing IAS into and within countries.
2. The lack of sound scientific data and information on economic impacts of IAS.
3. The narrow focus of existing efforts in addressing IAS impacts on agriculture.
4. Limited technical capacity and effective tools to prevent the entry of IAS.
5. Weak legal and policy frameworks for effective IAS management.
6. Inadequate national and regional coordination on IAS issues.
7. Inadequate awareness and information.
8. No dedicated or sustainable funding mechanism focused on prevention.
9. Inadequate surveillance at air and sea ports.

The approach to addressing these barriers was strategic and planned. National IAS Strategies and Action Plans were developed for Antigua and Barbuda, Barbados, and St. Kitts and Nevis. These also contributed to the framework for updating the legislative framework for IAS. With the Organisation of Eastern Caribbean States (OECS) Commission, we updated the harmonised regional action plan for strengthening national IAS management and control in the OECS and wider Caribbean. In addition, both national and regional communication programmes significantly increased public awareness of IAS and their impact on national economies, biodiversity, and livelihoods. The existing CIASNET.org was revamped and relaunched as CaribbeanInvasives.org, which showcased the project's output and updates and included an online training portal.

The project successfully managed and eradicated IAS to benefit native biodiversity. These significant successes are highlighted in this publication. In addition, significant capacity was built and tools developed to prevent or minimise new IAS introductions. These included the Caribbean Biosecurity Interception System and an IAS app that was developed in Antigua to assist with IAS identification and to facilitate citizens reporting on potential invasive species. Two guides, one on invasive plants and the other on invasive animals, were published and circulated. These will assist border officials in keeping out or minimising the spread of IAS to assist with IAS identification.





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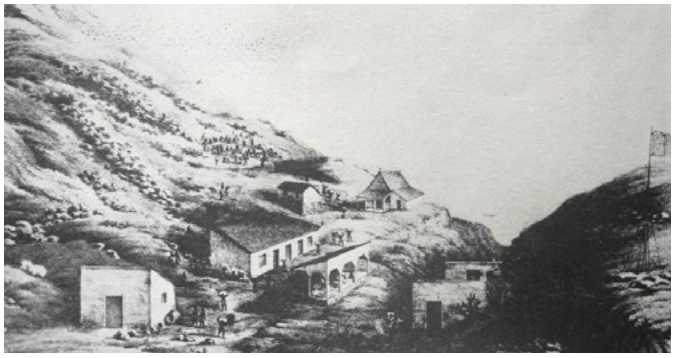
Models for Managing IAS and Protecting Biodiversity in the Caribbean

Bringing REDONDA back to life

A model for biodiversity restoration on other islands

There are over fifty-one offshore islands in Antigua and Barbuda. For almost thirty years, the government, non-governmental organisations like the Environmental Awareness Group (EAG), and international partners have been working together to rid these islands of rats and other harmful invasive alien mammals. Through their restoration efforts, the number of birds, other animals, and plants on fifteen islands has increased exponentially. The area, which is home to some of the country's most endangered wildlife, is now formally protected as part of the North East Marine Management Area (NEMMA) and designated as a Key Biodiversity Area (KBA) and Important Bird and Biodiversity Area (IBA). The *Preventing the Costs of IAS in Barbados and the OECS Project* (IAS Project) contributed to advancing biodiversity conservation on the islands by hiring the EAG, one of the local organisations at the forefront of conservation efforts. Their work focused on Redonda, which was the highest priority island due to its threatened wildlife and excellent prospects for long-term success. After two years of work, there was an exponential increase in several species, including critically endangered species, vegetation cover, and biomass.

Redonda is the most rugged and least accessible island in Antigua and Barbuda. It has a unique biodiversity and is home to four critically endangered endemic reptile species: the Redonda ground lizard (*Ameiva atrata*), the Redonda anole (*Anolis nubilus*), the Redonda skink (*Copeoglossum redondae*), and the Redonda pygmy gecko (*Sphaerodactylus* sp. nov.). It is also an internationally designated Important Bird Area (IBA).



From **1865** to **1914**, seabird guano was mined on Redonda by over **100 workers**. About **7,000 tonnes** of phosphate-rich guano was shipped to the UK annually

Before World War I, the island was swarming with birds and supported a seabird guano mining industry. Following the outbreak of World War I, the mining community abandoned the island. Black rats and feral goats deforested and degraded the island, leading to a severe decline in seabirds, reptiles, and plants. This confirmed an ongoing decline in the abundance and diversity of native species of seabirds, reptiles, and plants.

The EAG took a passive approach to managing IAS on Redonda by simply airlifting the goats to Antigua and eradicating the rats using bait stations that attracted rodents but not birds, lizards, or other wildlife. The stations also contained an anticoagulant poison.

The rat population, estimated at 6,000, decreased to zero in 2017. However, to declare the island 'rat-free', it must be demonstrated that no signs of rats were seen for a period of two years. This two-year rat eradication check took place in 2018, and Redonda is now designated rat-free. A 2012 survey recorded

Recipe for disaster

The guano miners left behind a huge population of ship rats (aka black rats)

The rats hunted reptiles and birds

Feral goats struggled under the harsh conditions

62 feral goats, but many could not survive the harsh conditions. Those that remained on the island were translocated to Antigua.

It was anticipated that the regrowth of vegetation would take one to two years, but well before that time, Redonda was green again, even though nothing was planted. By 2019, the vegetation had increased by over tenfold, the population of tree lizards had expanded by threefold, and the population of brown lizards had increased by sixfold. Butterflies, moths, beetles, crickets, and other invertebrates also increased.

During the period 2012–2016, when the rat infestation was evident, there were only two species of birds recorded, one of which was a Caribbean Martin seen in 2016. By 2019, the island was home to fourteen distinct species, and its wildlife population grew by 50%.

Redonda and its surrounding seas, amounting to approximately thirty thousand hectares, were declared a protected area in August 2017. It is one of the largest marine protected areas in the Eastern Caribbean. The government authorised the EAG to continue managing this protected area. This is the first time an NGO will be governing a protected area in Antigua and Barbuda.

A bare Redonda, stripped of its vegetation (2008)

Placing rat bait on the steep slopes required mountaineering skills

Redonda's conservation transformation

Redonda 2012: Invasive rats and goat present

Redonda 2018: 1 year post-eradication

Redonda 2020: 3 years post-eradication

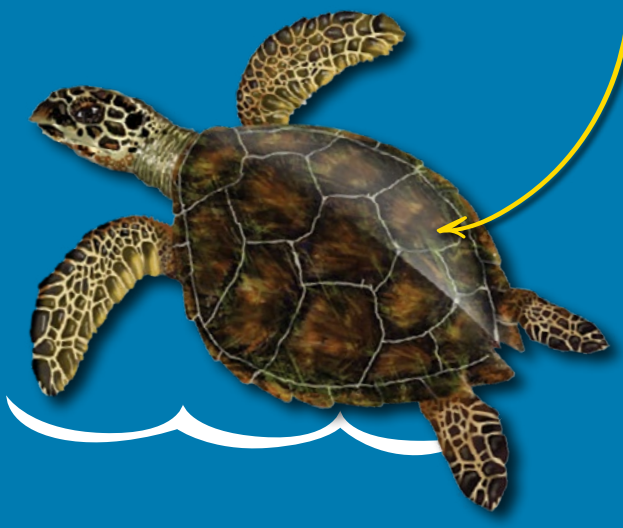
Barbados is successfully protecting its biodiversity

from the threat of invasive alien species

Barbados is actively working on managing the IAS that threatens their ecosystems, habitats, and species. It is in the final stages of establishing a biosecure exclusion zone to protect the endemic biodiversity, and is one of the first countries in the region to do so.

1 The focus of the exercise is the endangered leaf-toed gecko, which is found exclusively in Barbados.

2 Selective mongoose management greatly improved hatchling survival rates during a crucial nesting period for Hawksbill turtles.



3 Research on the reefs in Barbados demonstrated that the lionfish did not pose a significant threat.

Barbados will continue to implement some components of this regional IAS Project with funding from the GEF-7 Replenishment Fund. This is a tangible example of upscaling in action since the Project outcomes are being used to inform future development.

Establishing safe habitats

that enable the endangered Barbados leaf-toed gecko to thrive

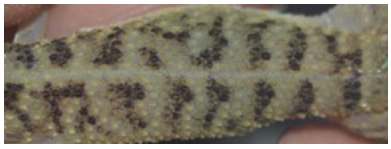
The IAS Project used the rare Barbados leaf-toed gecko, or *Phyllodactylus Pulcher*, to brand the outreach publications and create an awareness of biodiversity and the potential impact of invasive species.

Despite being endemic to Barbados, scientists believed the gecko to be extinct until its sighting in 2011. The project sought to help preserve this critically endangered species by establishing a biosecure site in the south-eastern section of the island. This is still ongoing, so a project extension will allow the activity to continue beyond March 2024. Within this artificially isolated area, predators as well as competitors could be removed and excluded to create a safe haven for the leaf-toed gecko. Habitat augmentation within the proposed biosecure site made the existing habitat more suitable for the gecko. The strategically placed 'gecko hotels' included a well for the gecko to access fresh water as needed, as well as a safe pathway through which they could make it from one side of the biosecurity area to the other side.

Experts from New Zealand provided advice on the construction of a predator-proof biosecure fence to prevent the reintroduction of predators, such as rats, mongooses, and even centipedes, as well as competitors like the *Hemidactylus* or House Gecko. As the activity continues, ongoing surveillance within and around the biosecure site will keep track of the IAS in the area and any attempts to re-enter. As adjustments to the fence are made to suit the Barbados rock type and landscape, best practices will guide the replication of biosecure sites along the island's coastline.

Some leaf-toed geckos are already moving into the augmented habitats. Once the site is fully completed and eradication is done, more geckos will be reintroduced. A database will identify and keep track of each leaf-toed gecko. Since the markings on each leaf-toed gecko are unique, they can be used to identify each individual. Photos of the dorsal surface will therefore be used instead of labelling.

Habitat augmentation and enclosure: **gecko hotel**



Gecko markings

Establishing a bio-secure site in southeast Barbados

Members of the Welch Bath Community Group and Mosaic Eco Consult, a local conservation firm that provided training on the safe use and deployment of mongoose traps.

Stakeholders unite to control mongooses on Hawksbill turtle nesting sites

Flattened sand around turtle nest (centre, foreground) and waste pile (right, Background)

The Hawksbill sea turtle nesting population at Bath Beach, Barbados, is genetically distinct from the rest of the island's population. In 2010, researchers found that the mongoose, *Herpestes auropunctatus*, was a persistent and widespread predator of the Hawksbill at Bath Beach. The IAS Project therefore assessed the impact of the mongoose on Hawksbill populations and implemented a control and monitoring programme to alleviate predatory pressures on the Hawksbill sea turtles' nests. The interventions were successful, and members of the Welch/ Bath Land Community Group were trained to continue the necessary control work.

Broken turtle eggs (foreground) outside of a hole (upper left) of a predated hawksbill sea turtle nest

Camera trap set up to monitor an area where eggs from a hawksbill sea turtle nest have been consumed by mongooses

In 2021, the first project year, there was considerable nesting at Bath Beach, with a total of 63 nests. In 2022, there was a slight increase to 72 nests. The extent of the presence of mongoose across the selected area was determined using a combination of camera traps, tracking tunnels, and visual encounter surveys. The camera traps were able to show behaviours that would not have been seen or encountered otherwise, such as defecating within the nest, possibly to identify the nests upon their return.

A monitoring plan was designed specifically for the management and control of the mongoose and rats at Bath Beach. Members of the surrounding communities, as well as the Ministry of Health, the National Conservation Commission, the Ministry of Environment, and the National Beautification and Biodiversity Department, were among the many stakeholders that helped shape the plan. Members of the Welch/Bath Land Community Group were successfully trained on how to properly monitor, capture, and euthanise the mongooses. They assumed responsibility for continuing this work beyond the scope of the project.

The project was successful in reducing the number of mongooses observed on the selected site throughout the 2022 nesting period. This led to a dramatic decrease in the number of nests predated by mongoose. In 2021, the predation rate was nearly 40% of the nests. After control efforts were implemented, the number of predated nests decreased to about 10%.

After the research ended in 2022, one of the field assistants continued to monitor the nests until the beginning of 2023. He realised that predation had resumed. Since the area was not a biosecure site, there was no way to prevent the mongoose from returning. So, the Bath/Welch Land group was approached, and they instituted further control measures, which once again led to a reduction in the number of nests being predated.

Tracking tunnel constructed of plastic and wood at the base. Mongoose paw prints are visible on the green tracking card

A small mongoose captured in a Tomahawk 205 collapsible live trap

'Eat it to beat it' strategy for Lionfish reduces threats to reefs

The IAS Project found that the densities of lionfish within Barbados' coral reefs remained relatively low, and the presence of the IAS caused no significant damage to the reefs.

This is probably because of a proactive approach that encouraged people to eat lionfish. It was also promoted with private stakeholders such as the fisheries industry, spear fishermen, free divers, and water sports operators. Spear fishing accounted for twenty-three percent of the lionfish caught.

Managing the Green Vervet Monkey population in St. Kitts and Nevis

The Green Vervet Monkey (*Chlorocebus sabaeus*) has been causing significant damage to agriculture, biodiversity, and human health in St. Kitts and Nevis. However, the monkeys are small and attractive to tourists, who pay handlers to pose with the animals. Therefore, there is resistance to their control and eradication.

While tourism serves as the primary economic driver for the country, prioritising agriculture is crucial for ensuring food security. Reducing the monkey population is essential, but any monkey management strategy must be supported by sound data, which is almost nonexistent, as well as the presentation of humane and cost-effective methods of control. The proposed monkey management strategy for St. Kitts and Nevis evaluated humane and economically viable methods of reducing the monkey population, which farmers and policymakers regard as a significant threat to crop production and a major impediment towards reaching the goal set by the Caribbean Community (CARICOM) to reduce the food import bill of the region by 25% by 2025.

Green monkeys have moved from the forests into urban areas

The green monkey has been in the Caribbean since the 1600s, having travelled across the Atlantic Ocean from West Africa as pets on ships transporting enslaved people. They escaped captivity, thrived, and proliferated in the central forests of both islands, as well as the southeast peninsula of St. Kitts.

Although they fed on forest fruit trees, the monkeys have always been a threat to crop production. In St. Kitts, they consumed sugar cane, while it was still the main economic activity of the island, and uprooted and ate subsistence crops planted in the 'provision grounds', which was land given to slaves and later estate workers in a buffer zone between the sugar cane plantations and forests.

In an effort to reduce crop damage, each estate hired rangers to shoot monkeys entering the fields. At that time, it was estimated that approximately 15,000 monkeys were shot annually around the island. When the sugar industry closed in 2005, rangers were no longer employed to shoot monkeys. As their numbers grew, they moved into the lowlands, closer to urban areas.

The situation in Nevis was similar, although there was a more well-established monkey control programme since the island, which had significantly more individually owned agricultural land, had been experiencing crop damage by monkeys for decades longer than St. Kitts. The devastation caused by Hurricane Hugo in 1989 prompted the monkeys to expand their range even further in search of food, accelerating their migration out of the forests and into agricultural and urban areas.

The green monkey has been in the Caribbean since the 1600s, having travelled across the Atlantic Ocean from West Africa as pets on ships transporting enslaved people

The absence of natural predators of the green monkey in St. Kitts and Nevis means that there is no population control. It is therefore considered the most problematic invasive species in the country. The work done on the IAS Project expanded upon Dr. Kerry Dore's PhD research work, which she started in 2010. Dr. Dore estimated the monkey population in St. Kitts to be between 22,000 and 38,000 individuals. The same population density was assumed for Nevis.

Under the IAS Project, the impact of green monkeys on agriculture, biodiversity, and households was investigated in a pilot study, beginning with a critical situation analysis that provided much-needed data. The study found that on both islands, monkeys negatively affected earnings in agricultural areas, and in residential areas, they adversely impacted social interactions and posed health risks.

Crop damage caused by the monkeys

Farms in St. Kitts and Nevis have the potential to produce approximately EC$31 million worth of produce per year. However, between monkey damage to existing farms and lost revenue from abandoned farms, annual revenue losses were nearly EC$3.1 million in 2021. This is equal to about a 10% loss in total annual agricultural revenue.

Crop damage was assessed in St. Kitts and, for the first time, in Nevis. Between 2010 and 2011, monkeys were responsible for almost EC$400,000 worth of crop damage in St. Kitts, or 2% of the possible production. By 2019–2020, that figure had risen to EC$1.2 million worth, or 14% of the possible crop production. In Nevis, the monkey damage was about EC$1.5 million worth of crops in 2020–2021, which was 7% of the possible production.

The project pilot studies all fed into creating a monkey management strategy, which proposed the most humane way of managing the monkey in the long term. An economic analysis allowed the team to identify different management options, quantify the cost and benefits of each option, and weigh the trade-offs of these options.

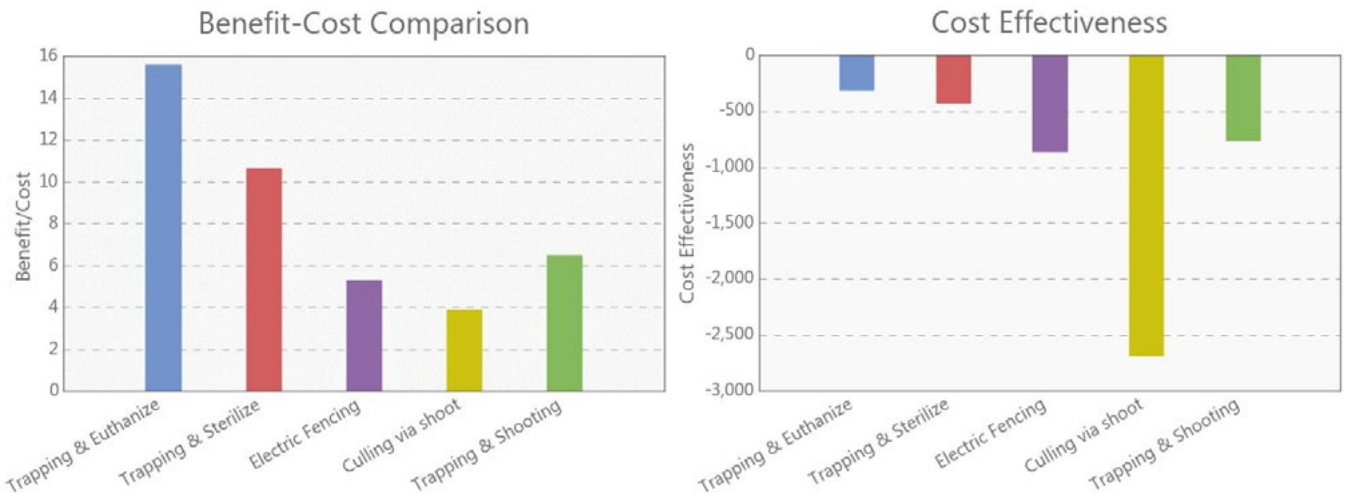
Using crop damage to quantify the dollars saved after removing animals from agricultural areas, the highest cost-benefit ratio came from culling after trapping and sedating, followed by sterilising, then shooting after trapping, and then using electric fencing. The least beneficial strategy was shooting the free-ranging animals. The cost effectiveness per monkey removed further illustrates that trapping, culling, and sterilising are the best options. Every dollar invested in removing a monkey from agricultural land yields between EC$4 and EC$16 in benefits through the reduction in crop losses. Ultimately, after 20 years, if all interventions were fully implemented, damages could be reduced to a few hundred EC dollars a year in all instances except for shooting.

Government buy-in and the prioritisation of monkey management at the national level are essential to the success of the management strategy, which will reduce agricultural crop damage and improve food production and food security to the benefit of farmers and consumers.

Camera traps set to record nest predation activity of the green monkey in Liamuiga and Nevis Peak. Artificial nests contained real quail eggs

...between monkey damage to existing farms and lost revenue from abandoned farms, annual revenue losses were nearly EC$3.1 million in 2021. This is equal to about a 10% loss in total annual agricultural revenue

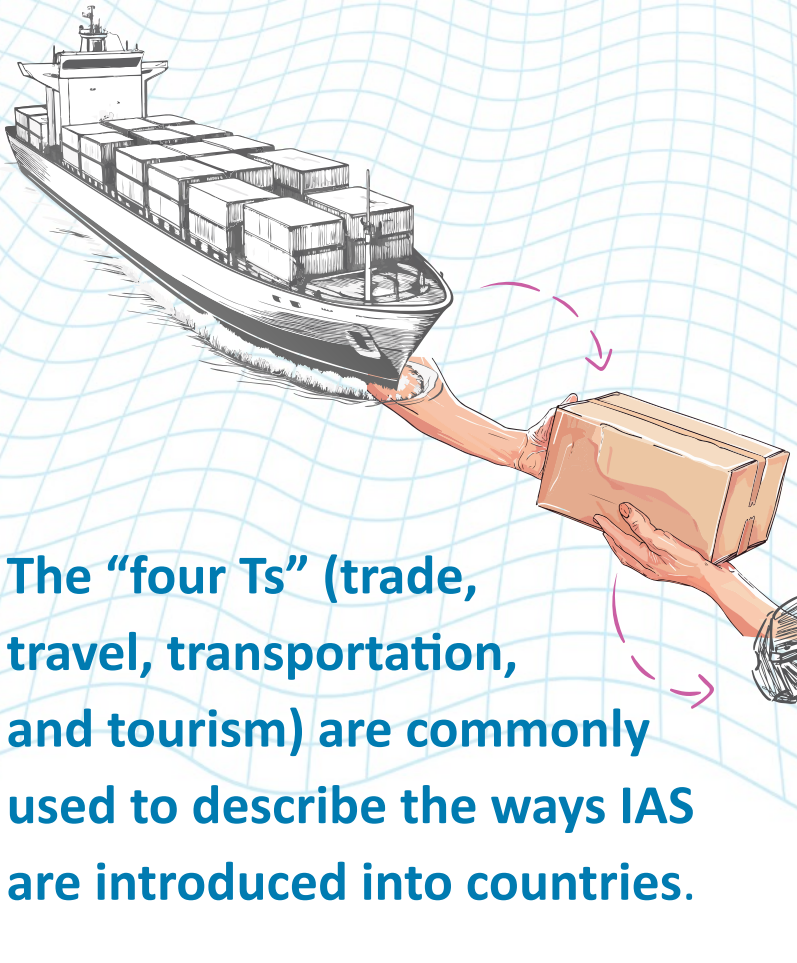
Agricultural Land Management Estimates



Every $1 invested in monkey management on agricultural land yields $4-$16 in benefits (via reduced crop losses). This would lead to a $20-$31 million net benefit over 20 years.

Trapping and euthanising or sterilising were found to be the most cost options ($310-$420/monkey)

Analysing high-risk pathways for IAS introduction



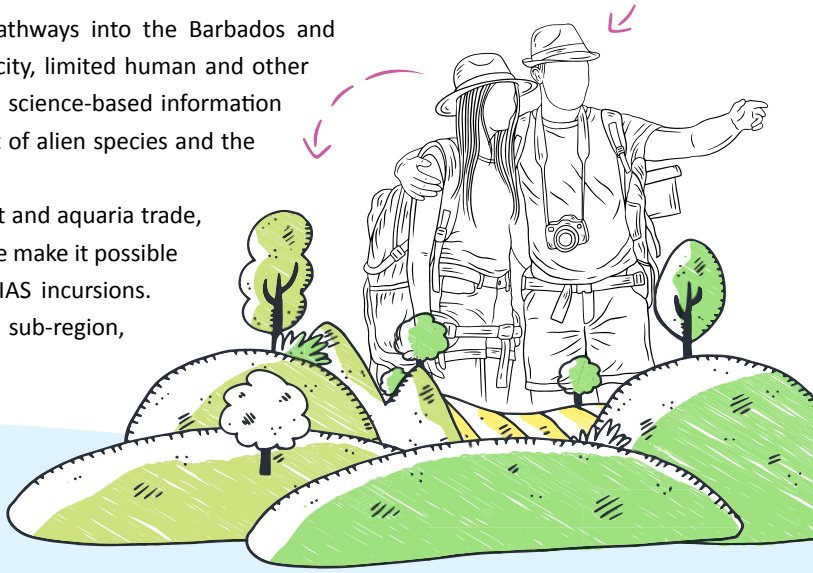
The "four Ts" (trade, travel, transportation, and tourism) are commonly used to describe the ways IAS are introduced into countries.

Through these pathways, IAS escape their traditional habitats and spread to non-native environments, where they can pose a threat to the economy and human health. Additionally, they pose a threat to biodiversity and the environment by reducing or eliminating indigenous species through competition, predation, hybridisation, and pathogen transmission.

Invasive species problems have been intensifying with the expansion in international trade and greater movement of people, biological material, and other commodities around the world.

Consultants undertook risk assessments for high-risk IAS pathways into the Barbados and the OECS. Despite the challenges of inadequate technical capacity, limited human and other resources, and a lack of records and data, the consultants used science-based information to examine the likelihood of the introduction and establishment of alien species and the potential consequences.

The risk assessments done for marine invasive species, the pet and aquaria trade, the horticulture trade, international trade, and passenger luggage make it possible to anticipate, prevent, and proactively respond to impending IAS incursions. They provide initial evaluations of the primary threats to the sub-region, serving as a solid foundation for further analyses.



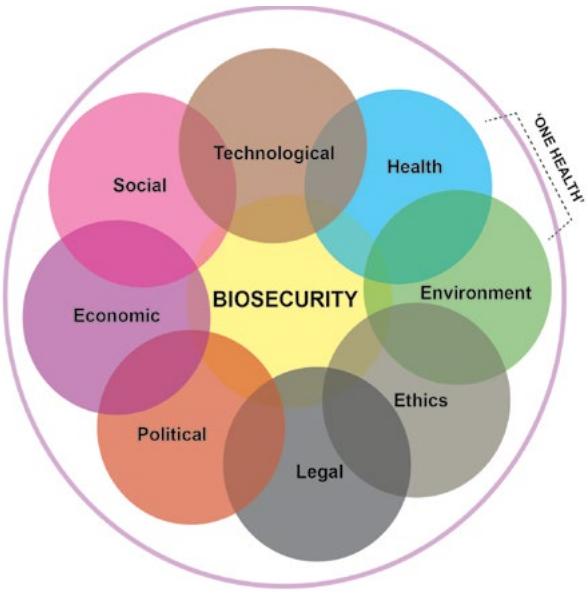
The Pet and aquaria trade: A route for IAS incursion

The trade in pet and aquaria species has been well documented as a pathway for IAS into countries across the globe. The imported animals, along with their pathogens and parasites, run the risk of being released or escaping into the new environment. Often, these escapees become invasive, preying on indigenous species, competing for habitats and food, crossbreeding with indigenous relatives, and altering the ecosystem. Dr. Kirk Douglas carried out a risk assessment of the pet and aquaria trade as a pathway for IAS in project countries. He identified and prioritised the key species involved in this trade, reviewed existing safeguards, and recommended strategies to manage these risks using best security practices.

Dr. Douglas proposed improvements to existing systems and infrastructure to facilitate much-needed data collection, analysis, and reporting at the country level, all of which would be synced into a regional system.

A risk priority list of relevant IAS was compiled and ranked using factors such as the popularity of pet or aquaria species, their availability and establishment potential, their socio-economic impact, their influence on food and agriculture, and their impact on human health. Two other major factors considered were the ease of its concealment for smuggling and the availability of proven eradication methods.

Biosecurity involves managing risks to the life and health of humans, animals, plants, and the environment. It has traditionally been associated with the STEM disciplines: science, technology, engineering, and mathematics. Dr. Douglas presented a new biosecurity framework with a broader, interdisciplinary perspective. The framework known as PESTHEEL encompassed the elements that shape the biosecurity threat: political, economic, social, technological, health (human, animal, and plant), environment, ethics, and legal factors. PESTHEEL encourages cross-collaboration and reinforces systems thinking, resulting in more comprehensive and inclusive solutions that ultimately preserve lives and livelihoods.



Using PESTHEEL, IAS management of the pet and aquaria trade in the Caribbean includes:

	Adopting a biosecurity approach to manage IAS risks from pets and aquaria species
	Strengthening the capacity for dynamic risk analysis
	Utilising digital tools for risk analysis and communication
	Strengthening prevention and control infrastructure, systems, and capacity
	Factoring behavioural change for sustainable impact
	Managing intensive risk communication strategies

Integrating comprehensive IAS management into a more complete intersectoral and multidisciplinary national biosecurity system that connects to regional communities will achieve maximum efficiency and impact.

PET AND AQUARIA SPECIES OF PRIORITY THREAT TO BARBADOS AND THE OECS

Mammals:
The specific species will need to be determined based on an in-country consultative process

Primates

- Wedge-cap Capuchin (*Cebus olivaceus*)
- Tufted Capuchin (*Cebus apella*)

Birds:

- Non-native songbirds
- Eurasian collared dove (*Streptopelia decaocto*)
- Indian Ringed neck parakeet (*Psittacula krameri*)
- Parrots of any kind
- Macaws of any kind

Amphibians and Reptiles:

- Burmese python (*Python bivittatus*)
- Red-eared sliders (*Trachemys scripta elegans*) already present and allowed entry as pets in several countries

Aquaria Species:

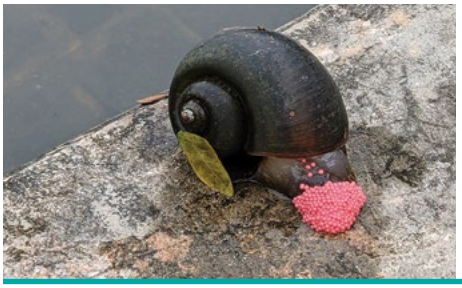
- Three Spot Gourami (*Trichopodus trichopterus*)
- Red rimmed Melania snails (*Melanoides tuberculate*)
- Apple snails (*Pomacea maculata*)
- Sail Fin Mollys (*Poecilla latipinna*)
- Non-native crayfishes
- Teta fish (*Hypostomus robinii*)

Tufted Capuchin (*Cebus apella*)

Indian Ringed neck parakeet (*Psittacula krameri*)

Burmese python (*Python bivittatus*)

Red-eared sliders (*Trachemys scripta elegans*)



Apple snail (*Pomacea maculata*)

Invasive plants enter the Caribbean primarily via the horticulture industry

The desire to own exotic ornamentals, which are essentially non-native plants, fuels the horticulture industry. The majority of these imports are harmless, but those that escape into the environment and become pests pose a problem. In Barbados and the OECS, there are well-documented cases of species that have invaded and are still present. What is less clear is the science-based evidence of the actual threats, which would allow interventions or exclusion measures to be targeted at these species. By assessing risks and developing recommendations, the IAS Project helped to improve IAS management associated with the horticultural pathway in Barbados and the OECS. This was a first step toward a more focused investigation beyond the well-known priority pests in agriculture.

Dr. Jeffery Jones spearheaded a study to identify the risks associated with imported ornamental plants commonly used in the industry, whose families include invasive alien plant species (IAPS). The risk assessment identified specific threats and dangers posed by these IAPS to the sub-region. Since these plants are to be avoided, regulators, horticultural operators, and the general public needed this critical information to raise awareness and encourage proactive action.

The IAPS already present in the Caribbean have not been effectively managed. Dr. Jones therefore proposed that these species be prioritised for the selection and application of management measures while implementing exclusion or prevention measures for imminent threats.

Land species

Giant hogweed (*Heracleum mantegazzianum*)

Wild parsnip (*Pastinaca sativa*)

Sickle bush (*Dichrostachys cinerea*)

Miconia (*Miconia calvescens*)

Cogongrass (*Imperata cylindrica*)

Weeping lovegrass (*Eragrostis curvula*)

He also suggested incorporating the following recommendations into the **development of a framework for IAPS management of the horticulture trade pathway:**

Mainstreaming of invasive alien plant species (IAPS) in legislation using the case study from Barbados to add pieces of legislation missing in other countries of the region.

Creating an Area of Protection

(Barbados and the OECS as a single protection zone)

Strengthening and integrating
the Caribbean Agricultural Health and Food Safety Agency (CAHFSA)

Strengthening and integrating
The University of the West Indies (UWI)

Conducting a public awareness campaign for industry and regulatory agencies

Implementing practical preventive measures
through pest risk analysis enhanced capability

Developing voluntary codes of conduct for IAPS management

The next step in addressing the IAPS threat to the sub-region is to create a work plan that outlines priority actions based on these recommendations.

Marine species

Seagrass (*Halophila stipulacea*)

Ribbon sea lettuce (*Ulva reticulata*)

Freshwater species

Australian swamp stonecrop (*Crassula helmsii*)

Water fern (*Azolla filiculoides*)

Floating pennyworth (*Hydrocotyle ranunculoides*)

Prevention is key to managing incursions of invasive marine species

Oceans, which cover more than 70% of the earth's surface, facilitate the global spread of marine organisms to new locations where they become invasive, causing devastation to ecosystems, fisheries and aquaculture, human health, tourism, and coastal development.

Spotted scat *(Scatophagus argus)*

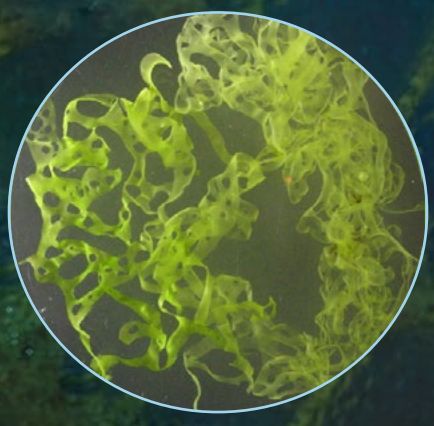
There are already more than one hundred invasive marine species in the Caribbean. Managing the impact of these invasive species is difficult and expensive, and predicting which species may become invasive is even more challenging, particularly in changing conditions brought about by issues like climate change. However, risk assessments can assist in pinpointing the non-native species that should be monitored and targeted for control or eradication efforts. A marine risk assessment of IAS Project countries was commissioned. Researchers led by Dr. Nicola S. Smith provided a retrospective relative risk assessment of vectors in the Caribbean region, as well as an assessment of the risks posed by non-indigenous species currently present.

The retrospective relative-risk analysis confirmed that the aquarium trade, shipping (specifically, ballast water and biofouling), fisheries (the capture of fish), and aquaculture (the farming of aquatic animals and plants) were the predominant vectors by which exotic species entered regional waters.

There are already more than one hundred invasive marine species in the Caribbean

Giant tiger prawn *(Penaeus monodon)*

Atlantic sea nettle *(Chrysaora quinquecirrha)*



Atlantic sea lettuce *(Ulva reticulata)*

Recommendations focused on prevention, which is by far the most economical and effective method of managing invasive species. The assessment of the risks posed by non-indigenous species identified potential threats. Three watch lists were created for IAS that are likely to reach the subregion:

Red - High - likelihood of becoming invasive
Orange - Medium likelihood of becoming invasive
Green - Low likelihood of becoming invasive

Red list	
Species	Common name
Chrysaora quinquecirrha	Atlantic sea nettle
Penaeus monodon	Giant tiger prawn
Scatophagus argus	Spotted scat
Ulva reticulata	Ribbon sea lettuce
Orange list	
Species	Common name
Acanthophora spicifera	Erect sea moss[1]
Acanthurus guttatus	Whitespotted surgeonfish
Acanthurus pyroferus	Chocolate surgeonfish
Arcuatula senhousia	Asian date mussel
Chaetodon lunula	Racoon butterflyfish
Crepidula fornicata	Slipper limpet
Dascyllus aruanus	Whitetail damselfish
Gemma gemma	Amethyst gem clam
Heteractis crispa	Leathery sea anemone
Heterodontus zebra	Zebra bullhead shark
Hypnea musciformis	Crozier weed
Litopenaeus vannamei	Whiteleg shrimp
Naso lituratus	Orangespine unicornfish
Ophiothela mirabilis	Brittle star
Perna perna	Brown mussel
Phyllorhiza punctata	Australian spotted jellyfish
Pomacanthus maculosus	Yellowbar angelfish
Pomacanthus semicirculatus	Semicircle angelfish
Protemblemaria punctata	Warthead blenny
Rhinecanthus aculeatus	Lagoon triggerfish
Scylla serrata	Mud crab
Tridemnum solidum	Overgrowing mat tunicate
Zebrasoma scopas	Twotone tange
Zebrasoma veliferum	Sailfin tang
Green list	
Species	Common name
Amphiprion ocellaris	Clown anemonefish
Aplysia cervina	Sea hare
Gelagna succincta	Lesser girgled triton
Watersipora subtorquata	Redrust bryozoan

These lists are invaluable in helping managers make the best use of limited resources by prioritising groups that are most likely to cause harm.

The management and prevention of IAS incursions through transport vectors will make it possible to detect new arrivals early and respond quickly to prevent them from establishing themselves in the marine environment. This will require agency-led formal surveillance as well as general awareness campaigns to engage the public in recognising and reporting local occurrences.

One important management strategy to reduce the likelihood of ships becoming vectors for marine introductions is to treat ballast water. It is imperative that Dominica, and St. Vincent and the Grenadines join the other Caribbean countries in becoming signatories to the Ballast Water Management Convention.

Two major management approaches have been proposed to lower the overall risk of invasion through the aquarium trade:

1. Raising awareness of invasive species among sellers and hobbyists.
2. Improving labelling practices to include the accurate identification of marine species for sale, their life histories, and behavioural traits such as maximum size, growth rate, and aggressiveness. This would warn consumers about the potential risks of their purchases while also reducing the possibility of them releasing unwanted pets into the wild.

Mitigating the risk of IAS introductions from aquaculture is difficult because many species are transported via this vector as cryptic hitchhikers on species targeted for farming. Management involves:

1.	Placement of aquaculture facilities away from any water bodies, protected areas, or otherwise ecologically valuable or vulnerable areas.
2.	Strict controls and monitoring of aquaculture transfers and practices. Maintaining and cleaning farm infrastructure -to limit the dispersal of IAS from detached farm materials, such as ropes and buoys.
3.	Establishing rearing facilities within the country. This will eliminate the need for imports and their associated risks. Conducting environmental risk assessments that include the threat of releases of invasive species into the wild should be conducted as a precondition for aquaculture start-ups.
4.	Limiting the importation of stock for breeding facilities.

Prevention is the key to managing the infiltration of our countries by invasive marine species. This requires the enactment and enforcement of laws and regulations aimed at preventing the introduction and spread of non-native invasive species, including regulations for vessel operations, mandatory labelling of species in the aquarium trade, and even banning the importation of high-risk species.

International Trade

In the Caribbean, there are inadequate biosecurity measures to block the introduction of IAS via the trade pathway.

The IAS Project addressed this with the help of Dr. Philip Taylor, who facilitated an assessment of what was being imported into countries in the region and the IAS that might be associated with items being brought in through freight. Each country was involved in determining the most appropriate way to inspect and document the incoming IAS, given their particular sanitary and phytosanitary (SPS) inspection staff and facilities at ports of entry.

The inspection focused on vehicles and equipment, wood, particularly wood packaging, and food items. Since it is not feasible to inspect entire shipments, a sampling regime described by the North American Farm Protection Organization (NAPPO) was used to determine how much of a cargo had to be inspected in order to be 95% sure of detecting pests.

The IAS Project provided all project countries with tablets installed with the Caribbean Biosecurity Interceptions System (CBIS) application, which was developed under the project, photos of pests of concern, and cameras capable of taking very detailed pictures of pests and diseases. These photos were to be shared with colleagues and stored so that even if identification was not possible, the incident was recorded.

Regional sanitary and phytosanitary (SPS) inspection staff at an IAS Project training session

Inspection of imported produce

Wooden pallets can harbour IAS

Evidence of pests caught on packaging tape

Indian leafhopper damage

The Indian leafhopper has crossed the Atlantic and is now in the Caribbean region

Once CBIS is being used across the region, cross-referencing the data collected with the Automated System for Customs Data (ASYCUDA) collected by customs authorities and shared in real time would enable a detailed analysis of the high-risk commodities and high-risk exporting countries.

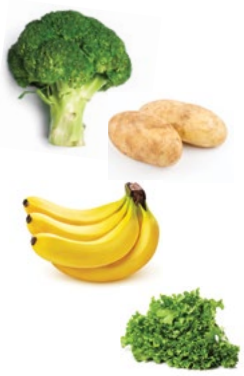
From the data collected to date, a list of the top 20 crops of concern was generated. This included citrus, bananas, Irish potatoes, the cabbage family, and live plants and seeds. Banned, high-priority hosts were also listed. The pests of concern included Mediterranean fruit fly, *Fusarium oxysporum*, Tropical Race 4 (TR4), red palm weevil, two spotted mites, western flower thrips, taro leaf blight, tomato leaf miner, citrus canker, and Giant African Snail.

The challenges that arose were documented, and suggestions were made for improvement. This included providing internet access and laboratory facilities at ports, staff training in pest and disease identification, computer technology, and photography.

Underscoring the importance of inspection, Dr. Taylor issued a warning about a new pest in the region. CABI received samples from one of the islands and identified it as the Indian leafhopper, which had crossed the Atlantic and was now in the Caribbean region. It is a polyphagous pest and so feeds on many different plants and is resistant to organophosphates, nicotinoids, cypermethrin, and pyrethroids.

20 crops of concern

1	Any banned or high priority hosts	11	Avocado
2	Live plants or seeds	12	Cut flowers
3	Cabbage, broccoli, Cauliflower, sprouts Kale	13	Sweet & chili peppers
4	Irish potato	14	Zucchini / Squash
5	Banana / Plantain	15	Sweetcorn
6	Citrus	16	Tomatoes
7	Lettuce	17	Carrots
8	Pineapples	18	Celery
9	Honeydew & cantaloupe melons	19	Ginger
10	Strawberry	20	Coconut



During the IAS Project Training session, regional inspection staff visited the SPS facilities at ports of entry in Barbados and the OECS

ST. KITTS

ANTIGUA

DOMINICA

NEVIS

ST. VINCENT

SAINT LUCIA

GRENADA

BARBADOS

Capacity Building Initiatives for Effective Regional IAS Management

Stopping IAS at the border:

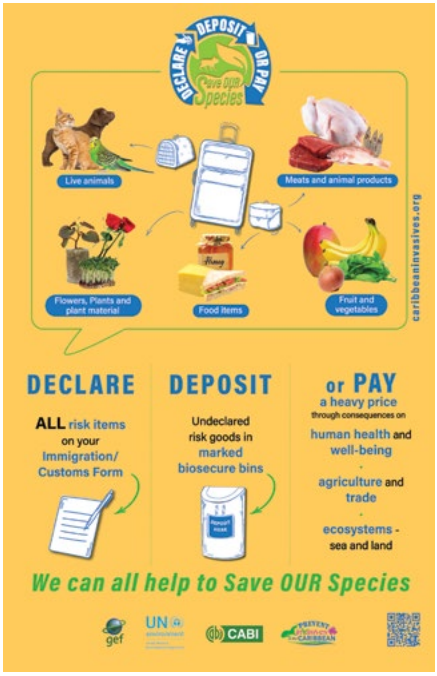
The *Declare, Deposit, or Pay* campaign

The *Declare, Deposit, or Pay* campaign was created to support port biosecurity activities in Barbados and the OECS and encourage passengers to self-declare items that pose an IAS risk. St. Kitts and Nevis was the first country to officially launch the programme.

The Caribbean campaign drew on the experience of a similar, very successful Declare or Dispose activity in New Zealand, which resulted in a clear reduction in potential biosecurity risk items seized at the border. There was also a significant shift in passenger behaviour, with many choosing to leave items behind even before they travelled and declaring suspect items on arrival. With this expectation, the *Declare, Deposit, or Pay* campaign focused on gaining the support of Caribbean travellers and encouraging a similar behaviour change leading to persons choosing not to transport anything that can harbour IAS, declaring any item of concern, and disposing of suspicious items in specially designed bins provided for that purpose. The word 'deposit' was deliberately used so as not to encourage people to 'dispose' or throw away items in garbage bins along the way.

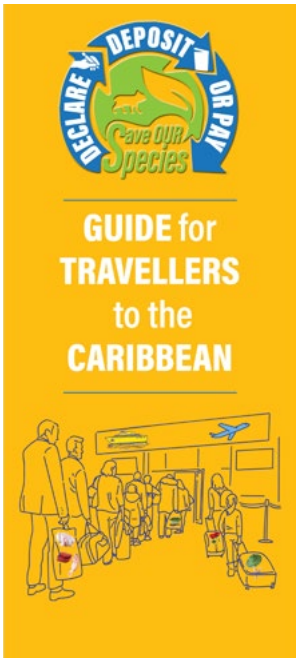
The campaign material was designed and shared so that countries could use them without change or modified to suit their situation. A popular brochure for the general public and an information sheet for journalists and other stakeholders were among the publications. There was also a poster, a large banner, an informational movie, and biosecurity bins with signage. A feedback form assessed the effectiveness of the various communication materials. Campaign launch guidelines provided advice on suggested activities before, during, and after the launch. All products were branded with a campaign identifier and logo.

Campaign identifier



Campaign poster

Campaign banner

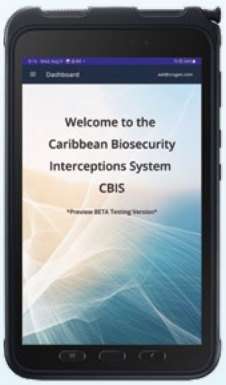


Campaign brochure

Stopping IAS at the border:

The Caribbean Biodiversity Interception System (CBIS)

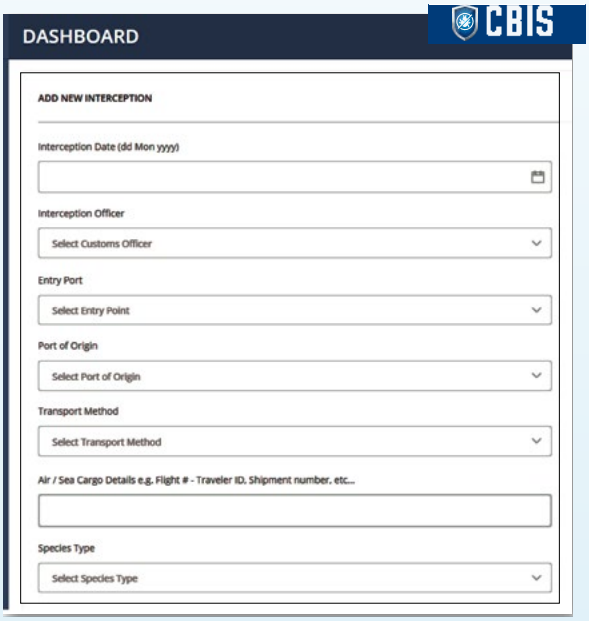
Minimising the impact of new IAS in the Caribbean requires effective surveillance and early detection, particularly at ports of entry. However, limited resources and outdated surveillance techniques reduce efficiency and the ability to intercept these invasives. The Caribbean Biosecurity Interceptions System (CBIS), developed under the IAS Project, is a database tool that can capture IAS seized at ports and help reduce the biosecurity risks posed to native species. Its implementation has brought the Caribbean's online systems for sanitary and phytosanitary systems up to international standards.



Tablet loaded with CBIS app

Initially designed as an IAS recording system for use by inspection and quarantine officers, CBIS was expanded to accommodate all pests, diseases, and animals coming into countries at air and sea ports. The app is able to work offline and can take and store photos of pests intercepted. Tablets loaded with CBIS and CABI IAS field guides were distributed to all eight project countries, aiding in the identification of IAS.

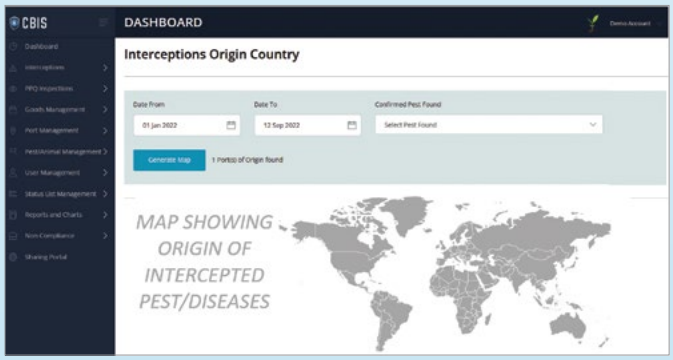
The web-based system records interception data, provides reports, and is accessible by each country, although each country's information is private. The resulting reports are timely and accurate, providing information on the identification of IAS intercepted at ports, as well as the date and frequency of interceptions and the number and type of pest or disease at various ports of entry. This reduced staff workload and enables all registered users to easily access information. The system also links plant quarantine and customs officers throughout the Caribbean, and it can issue immediate pest alerts within the region.

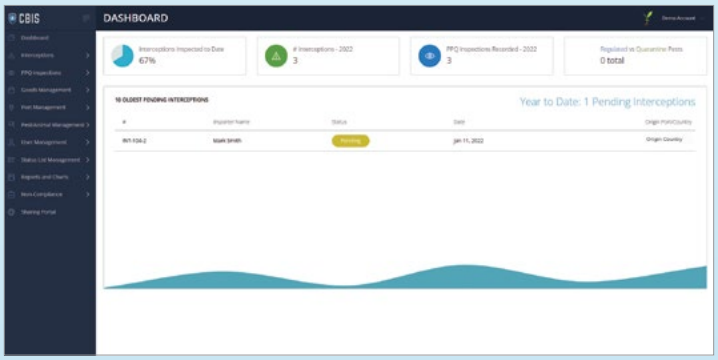


Form for new interceptions

CBIS was presented to the Caribbean Plant Health Directors (CPHD) and was approved for use within CARICOM member countries. Following its launch in March 2023, participants from 17 countries received training in its use. Ten of those countries have implemented the system and are currently using it. They share aggregated data, enabling users to see exactly what's happening within the region in real time.

CBIS, which was provided pro bono, is constantly being reviewed and updated with new features to meet the needs of the countries in the region. One such upgrade is the inclusion of negative inspections, which is when nothing is found during an inspection. The new upgrade will include both positive and negative inspections.





Sample dashboard screens

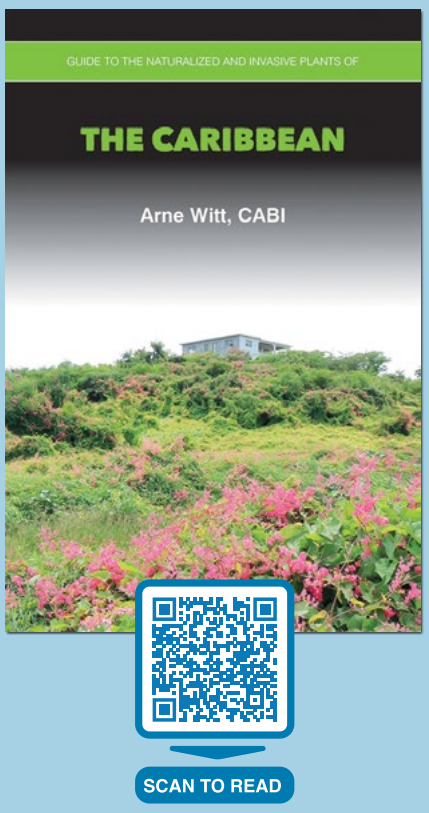
IAS Identification Tools

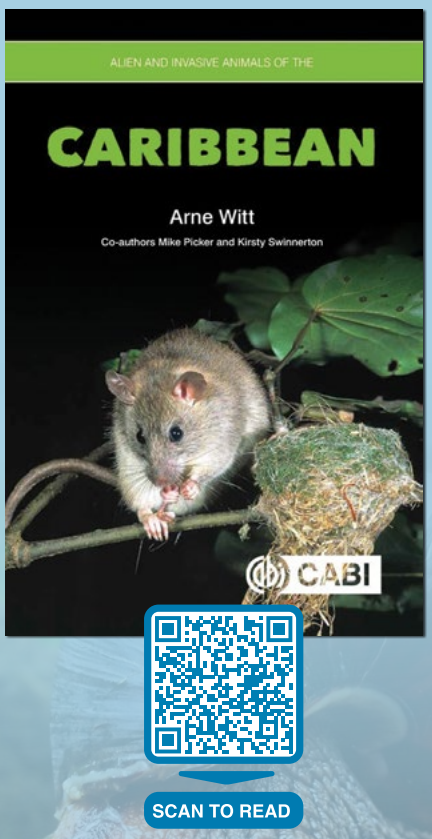
Capacity building in IAS management is a recurring need in the Caribbean region, both in terms of training and tools. A cadre of trainers were equipped with the necessary knowledge and training materials to carry out ongoing training in the future. Training materials were made available online for new staff to familiarise themselves with concepts like risk assessments and surveillance, aimed at preventing new IAS introductions.

The IAS Project was responsible for designing valuable tools to ensure that those who engage in risk assessments, surveillance, and rapid response were more successful in detecting and destroying IAS that are in the process of infiltrating the sub-region. These tools included IAS Identification Guides, which provided information on best management practices.

Dr. Arne Witt, CABI's Invasives Coordinator, South, produced a 384-page 'Guide to the Naturalized and Invasive Plants of the Caribbean', based on a survey he conducted in Barbados and the OECS in 2018 in conjunction with Mr. Naitram Ramnanan, CABI Regional Representative and IAS Coordinator. The publication includes aquatics, climbers, grasses, herbs, shrubs, succulents, and trees that threaten biodiversity, livelihoods, and economic development. Information on key characteristics, as well as colour images, aid in identification. All project countries have already received the book, an invaluable resource that will significantly contribute to the management of invasive alien plants in the Caribbean. A Guide to the Alien and Invasive Animals of the Caribbean has also been completed and is available online.

Although a planned IAS mobile application for IAS identification was not done, Antigua successfully developed an app for the same purpose. Therefore, plans for the development of a regional app were abandoned in favour of using the app from Antigua, which would be monitored, evaluated, modified, and then shared with the rest of the OECS and Barbados. This was a much more efficient use of resources.





Looking to the Future

Croton scale insect

Croton Scale is an Emerging Threat to Crop Production

In 2020, a different type of scale insect was observed infecting plants in Grenada. The sooty mold fungus associated with the scale insect was intense and very noticeable, much more so than the more familiar blight linked to other scale insects present in the country. People were deeply concerned, and there were many calls to the Ministry of Agriculture asking about the new disease. The scale was identified as Croton Scale, *Phalacrococcus howertoni*, a new IAS to the island. The immediate management of the pest involved physical and chemical measures. Finding a long-term solution to the problem required biological control, and the Ministry of Agriculture sought support from CABI to conduct a natural enemy survey.

A collection of scale insects

The Croton Scale insect is a relatively new IAS that was first described in 2008 in Florida, USA. So, it is likely that it arrived in Grenada via ornamental plants imported from the United States. The insect removes sap and nutrients from the plant using tiny stylet feeding tubes. As they feed, they secrete a high-sugar honeydew that facilitates the growth of black sooty mold. All of this results in economic losses and increased management costs due to poor-quality fruits, unattractive ornamentals, weakness, and even plant death. The main hosts observed in Grenada were croton, spondias, plums, sugar apples, mangos, guavas, and frangipani.

Croton scale insect infestation

Soursop

Croton

Plum

In 2022, a natural enemy survey identified two parasitic wasps and three ladybird beetles. One parasitic wasp identified is thought to be Metaphycus, which is listed in Florida as one of the natural enemies. If this is confirmed, it would be a promising predator. The Cryptolaemus ladybird beetle was observed feeding on Croton scale, albeit in small quantities. The ladybird beetle was introduced in the mid-1990s to control the pink hibiscus mealybug infestation, which started in Grenada and spread throughout the Caribbean. There was a one-time import and release of 25,000 ladybird beetles.

Grenada is resolute in preventing a recurrence similar to that of the pink hibiscus mealybug infestation and its subsequent spread to neighboring islands. In collaboration with CABI, the Ministry of Agriculture will launch a community-based integrated pest management programme to establish the need for biocontrol, the use of biopesticides, and the collection and use of natural enemy agents that are already in the environment.CABI received funding from the Sandals Foundation to further this work with the Ministry of Agriculture from 2024 to 2025. ■

Grenada is resolute in preventing a recurrence similar to that of the pink hibiscus mealybug infestation and its subsequent spread to neighbouring islands.

Biological Control

Cryptolaemus Ladybird beetle larval stage

Cryptolaemus Ladybird beetle adult stage

Choosing the most cost-effective IAS management strategies by conducting cost-benefit analyses

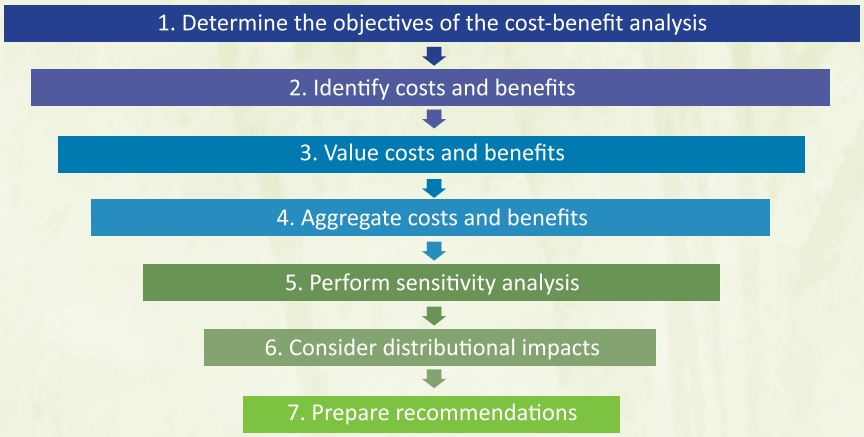
In August 2019, countries involved in the IAS Project benefitted from a one-week regional training programme on conducting cost-benefit analyses of strategies for IAS eradication and management in Barbados and the OECS. Participants were shown how to determine the most cost-effective strategies using the Economic Pest Eradication Strategies Toolkit (EPEST). Dr. Adam Daigneault, who was involved in EPEST's development in 2015, conducted the training.

Conducting sound economic analyses is considered a best practice in formulating IAS management decisions. These analyses can predict the economic impacts of an IAS prior to its entry and determine the most cost-effective control measures to adopt once it arrives. As such, the EPEST tool helps to focus the allocation of resources by prioritising which of the species, that are not present, should be kept out. It also determines the most cost-effective strategies to employ for the species that are entering and spreading.

Despite an understanding that conducting economic analyses is an international best practice in IAS management, its adoption as a tool to manage invasive species remains a rarity in the Caribbean. This is compounded by a lack of economic impact studies of IAS and a shortage of skilled personnel capable of conducting this type of analysis. These gaps were identified by a previous project, *Mitigating the Threats of Invasive Alien Species in the Insular Caribbean [MTIASIC]*, and Dr. Adam Daigneault and his colleague, Dr. Pike Brown, of Landcare Research New Zealand, conducted studies and training to help bridge the gaps.

The IAS Project training programme was upscaled from the capacity built under the MTIASIC project. This positive direction bodes well for the future of IAS management in the Caribbean.

Steps in conducting a cost-benefit analysis



Manaaki Whenwa Landcare Research

Citrus greening disease, caused by the African citrus psyllid and the Asian citrus psyllid, affects the quality of fruits and significantly reduces citrus yields

Tropical Race 4 on bananas: a cost-benefit analysis

Tropical Race 4 (TR4) is the latest race of the fungus *Fusarium oxysporum* f. sp. *Cubense*, which is disrupting the banana trade.

Currently, the resulting losses in affected countries amount to approximately US$120 billion annually. By 2040, TR4 has the potential to affect up to 1.7 million hectares, or 18% of the banana area worldwide. This has implications for both international trade and local markets, which absorb nearly 85% of worldwide banana production. If producers in countries like those in the Caribbean can remain unaffected, they have the potential to benefit through increased food security and improved trade standing.

Under the IAS Project, Dr. Adam Daigneault conducted analyses to determine what the threat of TR4 might be to the Caribbean and then to identify what the benefits and costs might be of undertaking various interventions to mitigate that threat.

Banana plants have historically faced threats. In the early to mid-1900s, Fusarium wilt affected the Gross-Michel cultivar, leading to its replacement by the Cavendish cultivar. However, TR4 began to devastate Cavendish plantations in southeast Asia in the 1990s, and it has continued to spread to new countries in western Asia, Africa, and most recently, South America. Although the Caribbean is not affected by the disease, its introduction in northern South America poses a significant threat to the Caribbean.

Dr. Daignault and his team compiled regional information on the area under banana production and the yields. He used existing models to evaluate the potential spread of TR4 globally and extrapolated it to the Caribbean. The cost of implementing each of several mitigation approaches was compared to the expected losses for each approach.

Banana production

The mitigation approaches selected were:

1	Do nothing and allow the potential incursion to occur and spread.
2	Improved exclusion, surveillance, eradication, and containment.
3	Integrated crop and disease management
4	Conventional breeding of Fusarium-resistant banana cultivars
5	Genetically modified Fusarium-resistant banana cultivars

The cost-benefit estimate over the next 25 years found that even the more costly interventions, which focused on proper surveillance, eradication, and containment, were better than doing nothing. Integrated crop and disease management was found to be the most cost-efficient. Regardless of the approach, the Caribbean is expected to benefit from the interventions. The next step is to confirm the input data and assumptions.

Sustainable funding for regional IAS management: the CIAS Trust Fund

Several excellent projects in the region have had significant impacts on IAS management. However, as these projects came to an end, so did the resources necessary to sustain the activities. Sadly, this led to the loss of breakthroughs and a stall in progress.

However, providing a small amount of money on a timely basis, such as through a trust fund, could ensure continuity and save money in the long run. The proposed Caribbean Invasive Species (CIAS) Trust Fund presents a sustainable financing mechanism for regional cooperation on the persistent problem of invasive alien species. The Trust Fund would help to build sustainability after the project ends, which is a requirement for projects funded by the United Nations Environment Programme (UNEP) and the Global Environment Facility (GEF).

The Trust Fund is expected to develop the capability required to enable a strategic focus on IAS management. This would entail mobilising and overseeing the collection and allocation of financial resources, as well as cultivating synergistic relationships with all stakeholders to form partnerships capable of combining human and financial resources to achieve common goals.

Road Map to CIAS TF

Commissioning a Feasibility Study

To
Identify and involve all **stakeholders** that will be impacted by the CIAS TF, and secure their buy-in, trust and ownership commitment.

Results
- Guiding principles of the CIAS TF.
- Mutually agreed objectives and desired outcomes.
- Legal and operational structure (including financial sustainability in accordance with regional laws).
- Commitment to participate in the CIAS TF.

The Formation of a Steering Committee

To
Finalize the design of CIAS TF, collaborate with regional governments in approaching donors to capitalize and fund the CIAS TF and act as transitional Governing Body.

Results
- Formalizing the design, structure, strategic plans, and the draft legal documents for establishing the CIAS TF.
- Retaining the first Governing Body or Board of Trustees/Directors and the Executive Director that will oversee the ongoing operations of the CIAS TF.

Prepare a CIAS TF Dossier

To define
- The core principles and orientations of the CIAS TF for use in marketing and fundraising.
- CIAS TF's mission, eligible activities, legal status, tax exemptions, governance, operations and finance structure etc.

Result
Financing is committed for start-up operations.

Establishment and development of the CIAS TF

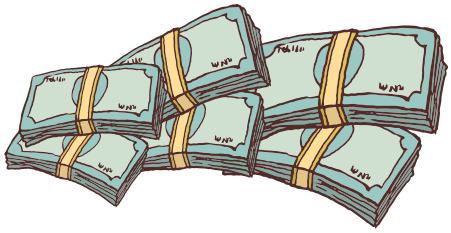
Results
- CIAS TF legally established and operationalized.
- New Governing Body in place.
- Steering Committee remains accessible to ensure a smooth transition.
- Countries sign agreement to participate and support the fund.

The goal is to raise approximately US$120 million for an endowment fund

Another anticipated outcome is the establishment of a sustainable funding mechanism for managing IAS that is common to the participating countries. This will complement national efforts to ensure funding for IAS management, and the project's increased awareness at the national level will contribute to an increase in national IAS spending. Targeted initiatives to encourage coordinated private sector participation will also help ensure financial sustainability.

The goal is to raise approximately US$120 million for an endowment fund to be managed by the Caribbean Biodiversity Fund. This amount would cover the cost of running a secretariat year-round as well as the long-term management of regional IAS. This should be complemented at the national level through the establishment of dedicated funding mechanisms with contributions from various user fees and taxes, such as a percentage of airport departure taxes and cruise ship port fees. This will provide the funds necessary to improve IAS surveillance at ports of entry.

It is now up to partners to agree to contribute to the CAIS Trust Fund. CABI has now pledged its commitment, and several countries have consented to become members of the Secretariat. So, momentum is building, and there is reason for optimism.

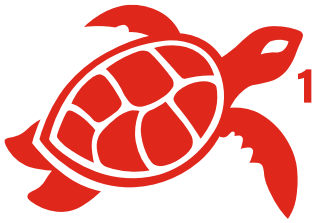


The Caribbean:
a Biodiversity Hotspot

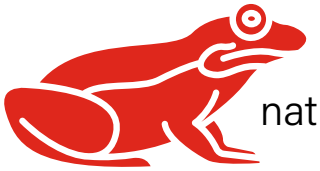
The Caribbean region, encompassing more than **700** islands, islets, reefs, and cays

The Caribbean region once supported **127** terrestrial mammal species, of which **23** are now considered extinct

Some **13,000** plant species have been identified of which **205** genera and **6,500** species are endemic



Today, **25%** of the **104** extant mammal species are globally threatened

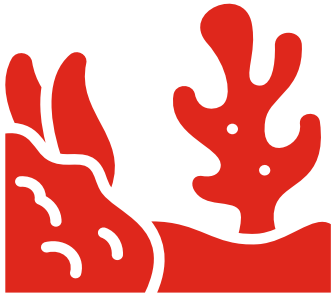


All **200** native amphibian species in the Caribbean are endemic

Of the **565** species of birds recorded in the Caribbean hotspot, **55** are currently listed as globally threatened

More than **600** native reptile species occur in the Caribbean, of which **82%** are found nowhere else on earth

The marine space, is also globally unique with endemism levels of **25.6%** and includes **the world's second largest barrier reef**

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UN
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Environment Programme

CABI

PREVENT
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