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DANGEROUS INVASIVE SPECIES THREATENING OR WITH A FOOTHOLD IN THE CARIBBEAN

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ABSTRACT: In recent years, a spate of dangerous invasive alien species (IAS) have become established in the Caribbean, and many others threaten the region. Some established species continue to spread, causing economic and environmental damage. This paper reviews the status and significance of IAS in the Caribbean. Factors contributing to the upsurge of new problems and pathways are discussed from a perspective of prevention. Steps recently taken to prevent or mitigate the impact of these species are also discussed. On the basis of these experiences, suggestions are made for the future direction of efforts to prevent or manage such invasive species within the Caribbean context.

KEY WORDS: Invasive alien species, Caribbean

INTRODUCTION

Globalization of trade, transport, and travel during the last century has led to an unprecedented movement of species, intentionally and unintentionally, across natural biogeographical barriers. For instance, based on estimates by Holt (1996, cited in Wittenberg and Cock, 2001), one new alien invertebrate becomes established in Hawaii every 18 days compared to the estimated natural rate of one every 25-100,000 years. Such accelerated movement of species is not without consequences, especially when they become invasive; that is, when they become established and spread, causing economic or environmental damage, or posing a risk to human health.

The damage caused by such invasive alien species (IAS) (referred to as exotic pests in most agricultural literature) to agricultural production has long been recognized. Beyond agriculture, however, it is only in the last few decades that the threats posed by IAS to the environment have become increasingly recognized. These threats include loss of biodiversity and interference with ecosystem processes and services. The 1992 United Nations Convention on Biological Diversity recognized these threats, and called on signatory nations to 'prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species' (Article 8h).

The Caribbean has not been immune to IAS. Indeed, their incidence has increased considerably in recent years. The growing importance of IAS has been acknowledged in several recent regional meetings (e.g., Klassen, 1999; Hernandez et al., 2002) including the present one. Furthermore, it is known that evolutionarily and/or geographically isolated ecosystems, such as the islands of the Caribbean, are particularly vulnerable to the negative impacts of IAS. Against this background, this paper gives an account of IAS in the Caribbean. Specific attention is given to the broader nature of the IAS problem, particularly environmental effects, vulnerability of the region, scope of the problem, and measures to address the problem. Examples of invertebrate IAS in agriculture are used as case studies.

Invasive alien species and Caribbean biodiversity. Caribbean islands support many rare, declining and threatened species, across a range of taxa, as do the surrounding seas. Mittermeier et al. (2000) and Myers et al. (2000) recognize the wider Caribbean as one of the world's biodiversity "hotspots," supporting some 7000 species of endemic plants and 779 endemic vertebrates. Invertebrate endemism is also extensive but is relatively poorly documented. Thus, it is not surprising that Caribbean habitats are of international importance for their biodiversity and conservation value. Direct removal for instance through hunting, habitat destruction, and IAS impact have resulted in rapid species extinctions on islands. While these mechanisms often act in combination, on many islands, introduction of IAS is the most important factor in the loss of indigenous biodiversity (Whittaker, 1998). Experimental work in the Caribbean has demonstrated that invertebrates, as well as plants and vertebrates, are vulnerable to the impact of IAS (Schoener and Spiller, 1996).

Why the Caribbean is vulnerable to IAS? Several ecological as well as human-derived factors serve to increase the vulnerability of the insular Caribbean. Many of the biological characteristics that make islands special, and of substantial conservation value, also render them particularly vulnerable to the establishment and impact of invasive species (Cronk and Fuller, 1995; D'Antonio and Dudley, 1995). The relative paucity of indigenous species per unit area, for instance, provides greater vacant niche space and less competition for potential invaders than would be found on the mainland, and small size of indigenous island populations renders them prone to extinction. Additionally, evolution of island species in isolation leads, for example, to loss of defensive behaviors and consequent vulnerability to introduced predators. A single non-native species can drive numerous indigenous species to extinction, as witnessed by the effects of introduction of the brown tree snake, *Boiga irregularis* (Merrem) into Guam, or the invasive shrub, *Miconia calvescens* Schrank & Mart. ex DC to Tahiti (Whittaker, 1998).

The vulnerability of the Caribbean is exacerbated further by the wide range of deliberate or accidental pathways for species introductions (Table 1). Growing numbers of tourists, as well as high volumes of traded commodities, are among the most important of these. Many of the island nations have inadequate capacity for implementing preventative measures, further increasing the risk of potential IAS introductions. Close cultural and economic ties also mean that (once established) an IAS is likely to move rapidly through the insular Caribbean and may subsequently threaten North, South, and Central America. The converse is also true, IAS established in Florida, for example, are relatively likely to spread into and through the Caribbean. These facts are well illustrated by the recent spread of the pink hibiscus mealybug, *Maconellicoccus hirsutus* (Green) through the Caribbean Basin (Figure 1). Sugarcane smut and sugarcane rust spread through much of the Caribbean Basin over periods of less than six years during the 1970-80s provide further examples (Shaw, 1982).

Quantifying the IAS problem in the Caribbean. Few efforts have attempted to document the wide range of IAS affecting or threatening the Caribbean. Cock (1985) discusses a range of IAS from the perspective of management, while Pollard (1986) developed a list of major pests of quarantine importance. Hernandez et al. (2002) noted that an inventory of IAS present in and/or threatening the region was lacking. Whereas problems in agriculture surface very quickly, especially when they constrain production or negatively affect trade, IAS impact on the environment is not so obvious. Thus, an important starting point for the development of efforts to deal with IAS is an inventory and specification of the problems.

Towards this end, CAB International and The Nature Conservancy are developing a database of IAS as part of an effort to capture as much information as possible on established IAS within the insular Caribbean. The information in the database is arranged by species, each entry comprising a number of fields as listed in Box 1.

Box 1. The key elements of the invasive alien species database.

• Identity - species name, synonyms, and common names by country.
• Type of organism - plant, bird, mammal, etc.
• Broad natural community type affected - terrestrial, marine or freshwater.
• Distribution - native distribution and non-native distribution in the Caribbean including information on non-native distribution in Caribbean below country level.
• Entry pathways - means of spread (e.g., contaminants in agricultural produce).
• Dates of introduction by country.
• Caribbean countries where each species is present as an exotic, or naturalized and invasive.
• Factors contributing to spread.
• Habitats at risk.
• Impact in different locations.
• Key aspects of species biology.
• Information on risk assessments.
• Agencies involved.
• Programs targeted at each species.
• Approaches to management.
• Any other relevant information.

An initial report from the database lists a total of 552 alien species in the insular Caribbean region (Kairo et al., 2003a). Most occupy terrestrial habitats, with fewer species reported from freshwater and marine environments (Table 2). It is clear, however, that there are serious gaps in our knowledge of these aquatic ecosystems. It should be noted that this is work in progress, and as information is gathered the total number of alien species recorded in the database is likely to more than double. Of the 552 alien species initially reported, 75% were regarded as naturalized (established in the wild) and/or invasive (established, spreading, and constituting a biological, environmental or socio-economic threat). The remaining 25% were known to be present, but had not been reported as naturalized or invasive in any of the territories in the region. Knowledge of the ecological and economic impact of those species identified as invasive is largely lacking. Such information will be useful in the development of priorities for action.

Genesis and spread of recent invertebrate IAS problems in agriculture. Table 3 gives some examples of non-native invertebrates, which have emerged as serious pests in Caribbean agriculture during the last decade. The majority originated from the Old World, but there are also examples from the New World. Some of the species are strictly pests affecting agricultural production, such as the citrus blackfly, *Aleurocanthus woglumi* Ashby. However, a few have had a wider ranging impact, including effects on natural environments, such as *M. hirsutus*.

An appraisal of the pattern of emergence of the various IAS problems reveals a number of important trends:

- New IAS can become established and spread rapidly across the region.
- Some long-established alien species with limited distribution can quickly extend their distribution.
- Some long-established alien species continue to expand their ranges only gradually.

There are several examples of new IAS, which have become established and spread rapidly across the region, for instance *M. hirsutus*. Since its first appearance in the Caribbean in 1994, the insect has now spread throughout most of the region (Figure 1). Of greater concern is the fact that, despite specific and heightened preventative measures, the pest continued to spread. The spread of *Thrips palmi* Karny and *Bemisia tabaci* (Gennadius) (B biotype) during the 1980-90s, and that of *Phyllocnistis citrella* Stainton during the 1990s, are other examples. The high populations during the explosive invasion phase may have contributed to the rapid rate of spread.

Also during the last decade, several IAS, which have been present in the region for a long time, have extended their ranges in a similarly dramatic pattern. The most notable are *A. woglumi* and the imported red fire ant, *Solenopsis invicta* Buren. *A. woglumi,* which is native to Asia, first appeared in the Caribbean in the early part of the last century, and then spread to the mainland and effectively controlled by using classical biological control. During the mid-1990s, the pest re-emerged as a serious problem in Dominica. Although recorded there as early as 1969, it had never been observed as a serious pest, and there are no records to indicate that specific control measures were undertaken at the time. While it is possible that natural enemies were fortuitously introduced with it, there are no adequate explanations why, 30 years later, very damaging populations have built up. Since its emergence as a serious pest in Dominica, recent years have seen *A. woglumi* extend its range to several other countries, including Trinidad & Tobago and St Kitts & Nevis.

S. invicta is native to South America and has been present in the United States since the early part of the last century. Despite its close proximity to the region, it is only in the last two decades that this insect has rapidly extended its range to many islands in the Caribbean (Davis et al., 2001). In contrast, the spread of the coffee berry borer, *Hypothenemus hampei* Ferrari through the region has happened only gradually.

Whereas many of the most serious pests of Caribbean agriculture have their origins in Asia or Africa, a number originate from within the western hemisphere. Examples include papaya mealybug, *Paracoccus marginatus* Williams and Granara de Willink and coconut whitefly, *Aleurodicus pulvinatus* Maskell, as well as *S. invicta. P. marginatus* is probably native to Mexico or Central America (Miller and Miller, 2002). It was not recorded from the Caribbean islands before 1994, but has been extending its range in the region. *A. pulvinatus* is widely distributed in warmer parts of the New World, and has been reported as a serious pest in Nevis (Martin and Watson, 1998).

Dealing with IAS. These examples emphasize the regional nature of many IAS problems and, therefore, the need for concerted cooperative efforts if effective counter measures are to be developed and implemented. Many previous efforts to deal with IAS have been reactive, but a more comprehensive approach is now required.

At the global level, there are more than 40 international instruments that deal with some aspect of IAS. These include the Convention on Biological Diversity, World Trade Organization Sanitary and Phytosanitary Standards Agreement, and The International Plant Protection Convention. While these provide an international framework for action and cooperation, many countries have not developed coordinated policies and strategies to address IAS problems. Even where countries are willing to take action, efforts have often been hampered by insufficient technological, scientific, and financial resources. Recognizing that ecosystem boundaries have nothing to do with political borders, greater cooperation at both the regional and international levels is necessary. McNeely et al. (2001) provided an overview of a global strategy to deal with IAS, while Sherley (2001) gives an example of a regional strategy adopted by the Pacific Islands. These publications provide a good starting point for the development of a strategy for the Caribbean. At the technical level, Wittenberg and Cock (2001) provide a generalized account of tools and approaches for dealing with IAS. They identify four key steps: prevention, early detection, eradication, and control.

Prevention and early detection. In tackling IAS, eradication attempts are likely to succeed only if they are applied at an early stage, or on sites that can be relatively well protected against reinvasion. Prevention, rather than control, is likely to be more cost-efficient and effective. Some of the measures, which need to be adopted, include effective public awareness and outreach, rigorous implementation of risk assessments, and appropriate screening of imported commodities. Adoption and enforcement of national and international regulations will be essential. Effective technologies to allow early detection of many potential IAS are still lacking. Additionally, the dearth of taxonomic expertise has to be addressed. Public awareness and a high state of alert certainly contributed to the early detection of *M. hirsutus* in most Caribbean countries, enabling timely implementation of control measures. These actions saved many countries from the levels of damage seen earlier in Grenada, and probably reduced the rate of spread of the pest.

Eradication efforts. Islands, by virtue of the strong dispersal barrier that the surrounding ocean represents, are relatively promising sites for IAS eradication attempts. Details of many such projects on islands are given in Veitch and Clout (2002). There have been several eradication projects in the Caribbean, and one current example targets the tropical bont tick (TBT), *Amblyomma variegatum*. This species was first introduced from Senegal into Guadeloupe in 1828. During ensuing years, the tick became a serious constraint to livestock production in the Caribbean, and now threatens North and South America. The Caribbean Amblyomma Program was initiated in 1995 to eradicate the tick from all infested islands (Pegram et al., 2002). The program is ongoing and several of the infested islands have been declared provisionally free of TBT. While progress has been made on individual islands, it is clear that the regional effort must be maintained to ensure that TBT is eradicated from the Caribbean as a whole, especially as the vector (the cattle egret) moves freely between islands. This program has highlighted the importance of concerted regional action, and it is clear that long-term commitment is required if eradication is to succeed. Other potential targets for eradication programs in the region include various fruit fly pests and the giant African snail.

Control of IAS. Inevitably, some IAS will escape early detection, and eradication attempts might not be feasible. A range of control measures is available, including chemical, mechanical, and biological means, as well as habitat management or the integration of various approaches. Biological control is a very attractive technique for the management of species invasions, providing a potentially low-cost, self-sustaining mechanism for controlling populations of damaging non-native species. However, to many people it is counter-intuitive to fight an invasion by one exotic species by introducing yet more non-native biodiversity.

Concerns are exacerbated by the damage caused by a number of early attempts at biological control. Coblentz (1998) cites a widely-known example: The small Indian mongoose, *Herpestes javanicus*, which was released on many islands, in order to control rats in fields of sugar cane, and is now found on many Caribbean islands, Hawaii, and Fiji. Rats are nocturnal, but had become active in cane fields during the day in the absence of any significant predators. The mongoose is a diurnal predator, and following its arrival rats simply reverted to a nocturnal habit, leaving the mongoose to feed on indigenous (often endemic) small vertebrates and invertebrates, and in some cases on the eggs and young of nesting sea turtles (Coblentz, 1998). Rigorous screening for potential impacts on non-target organisms is clearly an essential part of any responsible current biological control program in the modern age (Thomas and Willis, 1998), and international guidelines are now available (FAO, 1996; Kairo et al., 2003b).

The recent regional efforts against *M. hirsutus* serve to emphasize the usefulness of biological control against IAS. This pest first appeared in the region in 1984 in Grenada (Kairo et al., 2000). Rapidly, it spread across countries in the Caribbean Basin, including some localized infestations in northern South America, Central America, and North America (Florida and California). Within the insular Caribbean, Cuba and Jamaica are the only major islands, which are still free of the pest. Its spread has clearly demonstrated the difficulty of containing pests within individual countries. However, throughout the region, this pest has been effectively managed through the introduction of natural enemies, principally, *Anagyrus kamali*, *Cryptolaemus montrouzieri*, and *Gyranusoidea indica*. The biological control efforts largely followed the international guidelines set out in the Code of Conduct for the Import and Release of Exotic Biological Control Agents (FAO, 1996). Success was the result of concerted cooperative efforts between national, regional, and international institutions. Furthermore, once developed, the technology was easily transferable to new countries as they became infested.

Predicting IAS threats in the Caribbean. It would be desirable to be able to predict IAS threatening the region. Some information can be surmised from distributional data on known problem species. For example, Watson and Chandler (1999) discuss potential mealybug IAS threats from a global perspective, and at the regional level, for species with limited distributions. From an agricultural standpoint, it is unfortunate that there is no reliable list of quarantine pests for the Caribbean. Pollard (1986) attempted to develop a list of the most important pests, but this clearly needs updating. The Caribbean Plant Health Information Network (CARAPHIN) database compiles reports from national programs, but this is not comprehensive. There are even fewer information resources that relate to actual and potential IAS whose principal threat is to the environment (and indigenous biodiversity) rather than agriculture. Efforts are therefore required to develop comprehensive inventories, as well as lists of key potential problem species, in relation to agriculture and the wider environment if predictive tools are to be developed.

CONCLUSIONS

Prevention and control measures are clearly critical to the effective management of IAS threats. However, efforts to develop management strategies require the collation and on-going management of relevant data so that informed decisions can be made. The development of predictive tools requires similar investment in information gathering and analysis. At the national and regional levels, knowledge of the ecological and economic impacts of IAS in the Caribbean is still less than adequate. Indeed, there is a lamentable absence of national or regional pools of information.

Kairo et al. (2003a) provides the first concerted attempt at data gathering on IAS threats in the Caribbean. It is intended that this database should be further developed as the foundation for a regional information resource. There is also good scope for capitalizing on other regional or hemispheric initiatives, for instance the Inter-American Biodiversity Network (http://iabin.ucdavis.edu/index_eng.html), and the US Federal and State Invasive species activities and programs (http://www.invasivespecies.gov/geog/nrthamerica.shtml). Clearly, such efforts will need to be coordinated, as far as possible, to enhance complementary effort and to avoid duplication.

Awareness of the importance of invasive species issues among policy-makers and other stakeholders also needs to be raised. All levels of society need to be made more aware of the importance of the issue, in order that political will to address the problem is generated. At the political level, one of the most useful areas to emphasize will be the benefit of increasing integration between agricultural and environmental sectors. This would serve many aspects of the wider sustainable development agenda, as well as supporting concerted efforts against IAS threats.

Sharing of experience will also be vital, to minimize duplication of effort, enhance co-operation and increase the speed with which effective strategies can be developed and implemented. An informal electronic network, in which resides vast knowledge in all areas of invasive species, has been formed by experts and practitioners from within and outside the region as part of the project described by Kairo et al. (2003a). Such networks provide a means for information gathering and exchange and need to be maintained and enhanced to maximize the benefits of sharing experience in this rapidly developing field.

Invasive species problems are complex and on the increase. Ad hoc reactive interventions no longer provide effective solutions. A coordinated, multi-stakeholder (national, regional, and international) cross-sectoral effort is required.

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Table 1. Examples of pathways for the introduction of IAS (adapted from Wittenberg and Cock, 2001).

Accidental introductions	Deliberate introductions
1. Contaminants in traded commodities including industrial equipment. 2. Hitch-hikers in other consignments including passenger baggage. 3. Ballast material from ships. 4. Hull fouling. 5. Escaped pets, or other captive species.	1. Plants introduced for agriculture/forestry. 2. Animals introduced as livestock or for sport. 3. Ornamental plants. 4. Other aesthetic introductions. 5. Biological control.

Table 2. Broad categorization of alien species by broad habitat type (adapted from Kairo et al., 2003).

Broad habitat type	Exotic	Naturalized and/or invasive*
Terrestrial	479	390 (81%)
Marine	18	16 (89%)
Fresh water	55	10 (18%)
Total	552	416 (75%)

*Naturalized and/or invasive as a percentage of all alien species in each category

Figure 1. Spread of the pink hibiscus mealybug, *Maconellicoccus hirsutus,* in the Caribbean shown as new islands infested each year.

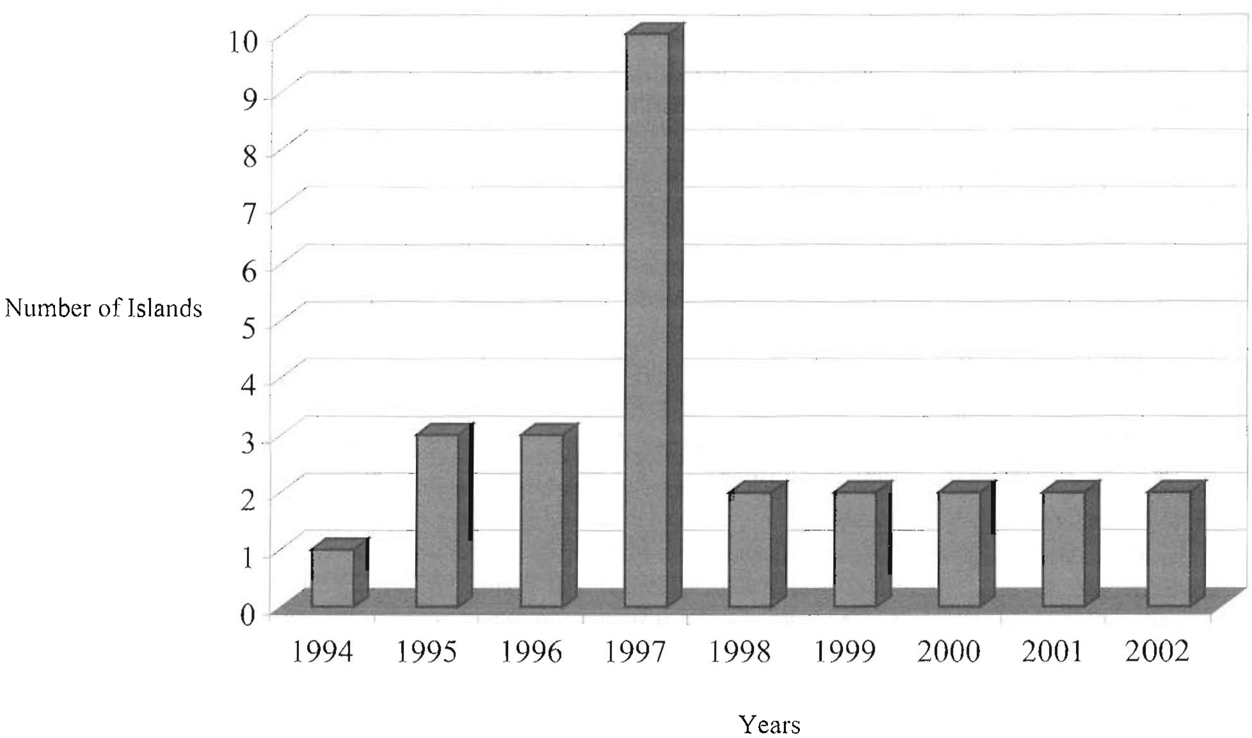

Table 3. Agricultural invertebrate IAS problems which have become introduced or expanded their range in the Caribbean since 1990 (distribution data based on CABI-CPC, 2003 unless otherwise stated).

Genus species	Family	Origin	Year*	Notes on distribution in countries bordering the Caribbean Sea
Aleurocanthus woglumi Ashby	Aleyrodidae	Asia	1913	Antigua and Barbuda, Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, French Guiana, Guatemala, Guyana, Haiti, Jamaica, Mexico, Netherlands Antilles, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Suriname, Trinidad and Tobago, USA, Venezuela (Serious problem in Dominica in the mid 1990s. Expanded its distribution to include, St Kitts and Nevis, Trinidad and Tobago)
Aleurodicus pulvinatus (Maskell)	Aleyrodidae	Neotropical		Belize, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Guyana, Honduras, Mexico, Nicaragua, Panama, Saint Kitts and Nevis, Suriname, Trinidad and Tobago, Venezuela (Currently extending its range.)
Toxoptera citricidus (Kirkaldy)	Aphididae	Asia	1985-86	Antigua and Barbuda, Aruba, Belize, Bermuda, Brazil, British Virgin Islands, Cayman Islands, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, French Guiana, Grenada, Guadeloupe, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Netherlands Antilles, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, USA, Venezuela
Achatina fulica Bowdich	Archatinidae	Africa	1989	Present in Barbados, Brazil, Guadeloupe, Martinique and Saint Lucia. Eradicated in Florida by 1975 after having been introduced in 1966.
Sternochetus mangiferae (Fabricius	Curculionidae	Asia	1984	Barbados, British Virgin Islands, Dominica, French Guiana, Grenada, Guadeloupe, Martinique, Montserrat, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States Virgin Islands
Solenopsis invicta Buren	Formicidae	South American	1918	Antigua and Barbuda, Bahamas, British Virgin Islands, Florida, Turks and Caicos, United States Virgin Islands, Trinidad and Tobago, Venezuela (Still expanding its range with many new islands becoming infested in last 10 years (Davies et al., 2001))
Phyllocnistis citrella Stainton	Gracillariidae	Asia	1993	Antigua and Barbuda, Bahamas, Barbados, Belize, Bermuda, Brazil, British Virgin Islands, Cayman Islands, Chile, Colombia, Costa Rica, Cuba: present, Dominica, Dominican Republic, French Guiana, Grenada, Guyana, Honduras, Jamaica, Martinique, Mexico, Netherlands Antilles, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Trinidad and Tobago, USA
Amblyomma variegatum (Fabricius)	Ixodidae	Africa	1828	Anguilla, Antigua and Barbuda, Barbados, Dominica, Guadeloupe, Martinique, Marie Galante, Montserrat, Saint Kitts and Nevis, Saint Martin, Saint Vincent (Barre et al., 1995)
Maconellicoccus hirsutus (Green)	Pseudococcidae	Asia	1994	Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, British Virgin Islands, Curacao, Dominica, Dominican Republic, French Guiana,

				Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Jamaica, Martinique, Montserrat, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, St. Martin, Suriname, Trinidad and Tobago, United States Virgin Islands, Venezuela
Paracoccus marginatus Williams & Granara de Willink	Pseudococcidae	Mexico or Central America	1995	Antigua and Barbuda, Barbados, Belize, British Virgin Islands, Cayman Islands, Costa Rica, Cuba, Dominican Republic, French Guiana, Grenada, Guadeloupe, Guatemala, Haiti, Montserrat, Netherlands Antilles, Puerto Rico, Saint Kitts and Nevis, St. Martin, USA (Florida and Montana), United States Virgin Islands
Hypothenemus hampei Ferrari	Scolytidae	Africa		Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Puerto Rico, Suriname
Stenotarsonemus spinki Smiley	Tarsonemidae	Asia	1990s	Central America, Colombia, Cuba, Dominican Republic – potential to increase its range
Anastrepha obliqua (Macquart)	Tephritidae	Tropical Americas		Bahamas, Barbados, Belize, Bermuda, Brazil, British Virgin Islands, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Suriname, Trinidad and Tobago, United States Virgin Islands, Venezuela (In recent years it has expanded its range to Barbados, and Grenada.)
Bactrocera carambolae Drew & Hancock	Tephritidae	South East Asia	1975	Brazil, French Guiana, Guyana and Suriname. This pest is the target of an eradication program.
Thrips palmi Karny	Thripidae	Asia	1985	Antigua and Barbuda, Bahamas, Barbados, Bermuda, Brazil, British Virgin Islands, Colombia, Cuba, Dominica, Dominican Republic, French Guiana, Grenada, Guadeloupe, Guyana, Haiti, Jamaica, Martinique, Netherlands Antilles, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, USA, Venezuela countries

*First reported in the region