United States Department of Agriculture

United States Department of Agriculture

Animal and Plant Health Inspection Service

October 10, 2017

Version **1.0**

Importation of Oha, *Pterocarpus mildbraedii*, Leaves from Nigeria into the Continental United States

A Qualitative, Pathway-Initiated Pest Risk Assessment

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Executive Summary

The Animal and Plant Health Inspection Service (APHIS) of the United States Department of Agriculture (USDA) prepared this risk assessment to examine plant pest risks associated with importing commercially produced leaves of the oha tree, *Pterocarpus mildbraedii* Harms (Fabaceae), for consumption from Nigeria into the continental United States. No pest list was provided for this commodity and very little information is available pertaining to the pests that occur on this species. Therefore, the PRA was developed for the pests that occur in Nigeria on plants in the genus *Pterocarpus*. Based on the market access request submitted by Nigeria, no pest exclusion or mitigation measures were considered in the development of this PRA. The risk ratings in this risk assessment are contingent upon the application of all components of the pathway as described in this document. Oha leaves produced under different conditions were not evaluated in this PRA and may have a different pest risk.

Based on the scientific literature, port-of-entry pest interception data, and information from the government of Nigeria, we developed a list of all potential pests with actionable regulatory status for the continental United States that are known to occur in Nigeria (on any host) and to be associated with the commodity plant species (anywhere in the world). Of these, we found 14 organisms that have a reasonable likelihood of being associated with the commodity following harvesting from the field and prior to any post-harvest processing, and thus are potentially able to follow the pathway.

We analyzed the pest risk potential of these organisms and determined that none of them are candidates for risk management, either because there is no endangered area within the continental United States, they did not meet the threshold to likely cause unacceptable consequences of introduction, or they received a Negligible overall risk rating for likelihood of introduction (i.e., entry plus establishment) into the endangered area via the import pathway: *Acaudaleyrodes africanus* (Dozier) (Aleyrodidae), *Acaudaleyrodes rachipora* (Singh) (Aleyrodidae), *Africaleurodes coffeacola* Dozier (Aleyrodidae), *Andronymus caesar* (Fabricius) (Hesperiidae), *Bemisia afer* (Priesner & Hosny) (Aleyrodidae), *Catalebeda producta* (Walker) (Lasiocampidae), *Charaxes achaemenes* C. Felder & R. Felder (Nymphalidae), *Eutetranychus orientalis* (Klein) (Tetranycidae), *Exosporium pterocarpi* M.B. Ellis (fungi), *Maruca vitrata* (Fabricius) (Crambidae), *Megalurothrips sjostedti* (Trybom) (Thripidae), *Phyllachora pterocarpi* H. Sydow, *Platysphinx phyllis* Rothschild & Jordan (Sphingidae), and *Pleuroptya balteata* (Fabricius) (Crambidae).

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1. Introduction

1.1. Background

This document was prepared by the Plant Epidemiology and Risk Analysis Laboratory of the Center for Plant Health Science and Technology, USDA Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ), to evaluate the pest risk associated with the importation of commercially produced fresh leaves of the oha tree (*Pterocarpus* spp.) for consumption, from the country of Nigeria into the continental United States.

This is a qualitative risk assessment, meaning that the likelihood and consequences of pest introduction are expressed as qualitative ratings rather than in numerical terms. Methodology and rating criteria used are detailed in the *Guidelines for Plant Pest Risk Assessment of Imported Fruit and Vegetable Commodities* (PPQ, 2012a). This methodology is consistent with guidelines provided by the International Plant Protection Convention (IPPC) in the International Standard for Phytosanitary Measures (ISPM) No. 11, "Pest Risk Analysis for Quarantine Pests" (IPPC, 2017a). The use of biological and phytosanitary terms is consistent with ISPM No. 5, "Glossary of Phytosanitary Terms" (IPPC, 2017b).

As defined in ISPM No. 11, this document comprises Stage 1 (Initiation) and Stage 2 (Risk Assessment) of risk analysis. Stage 3 (Risk Management) will be covered in a separate document.

1.2. Initiating event

The importation of fruits and vegetables for consumption into the United States is regulated under Title 7, Part 319.56 of the Code of Federal Regulations (7 CFR §319.56). Currently, under this regulation, the entry of fresh oha leaves from Nigeria into the contenential United States is not authorized. This commodity risk assessment was initiated due to a market access request by the country of Nigeria to change the Federal Regulation to allow entry (Faseyitan, 2015).

1.3. Determination of the necessity of a weed risk assessment for the commodity

In some cases, an imported commodity could become invasive in the pest risk analysis (PRA) area. The likelihood that this may happen is evaluated in a weed risk assessment (WRA), conducted separately from the commodity risk assessment. WRA does not need to be conducted for plant species that are widely established (native or naturalized) or cultivated in the PRA area, for commodities that are already enterable into the PRA area from other countries, or when the plant part(s) cannot easily propagate on their own or be propagated.

We determined that a weed risk assessment is not needed for oha leaves. Leguminous tree species are generally recalcitrant to propagation by tissue culture (Lakshmi Sita et al., 1992) and therefore it is unlikely that *Pterocarpus* leaves could propagate on their own or be propagated. However, a weed risk asscessment should be considered for *Pterocarpus* spp. in any case where propagative material (plants for planting, cuttings or seeds) are being considered for importation.

1.4. Description of the pathway

The IPPC defines a pathway as "any means that allows the entry or spread of a pest" (IPPC, 2017a). In the context of this risk assessment, the *pathway* is the commodity to be imported, together with all the processes the commodity undergoes (from production through importation and distribution) that may have an impact on pest risk. In this risk assessment, the specific pathway of concern is the importation of fresh leaves of the oha tree (*Pterocarpus mildbraedii* Harms) for consumption from Nigeria into the continental United States. The movement of this commodity provides a potential pathway for the introduction and/or spread of plant pests. The following description of this pathway focuses on the conditions that may affect plant pest risk, including morphological and physiological characteristics of the commodity, as well processes that the commodity will undergo from production in Nigeria through importation and distribution in the continental United States. These conditions provided the basis for creating the pest list and assessing the likelihood of introduction of the pests selected for further analysis; we assumed that the pathway would include all components, as they are described below, when we determined the risk ratings for each element.

1.4.1. Description of the commodity

The commodity is fresh oha, *Pterocarpus* spp., leaves. The nature / form of leaf was unclear in the original market access request (Faseyitan, 2015); however, a leaf is believed to be imparipinnate with 7 – 15 leaflets.

1.4.2. Production and harvest procedures in the exporting area

The leaves of oha trees in plantations and retained in cocoa plantations will be plucked by hand and cooled after harvest. The market access request suggested year-round shipping; however, additional production and harvesting procedures in the exporting area have not been specified further and are not being considered as part of the assessment.

1.4.3. Post-harvest procedures in the exporting area

Post-harvest procedures in the exporting area have not been specified and are not being considered as part of the assessment.

1.4.4. Shipping and storage conditions

Oha leaves will be packed in perforated paper cartons (5 kg / carton) and will be air-freighted to the United States. Shipping and storage conditions are not being considered as part of the assessment.

1.4.5. Summary of the pathway

Figure 1 summarizes the pathway of concern: the importation of fresh oha leaves for consumption from Nigeria into the continental United States.

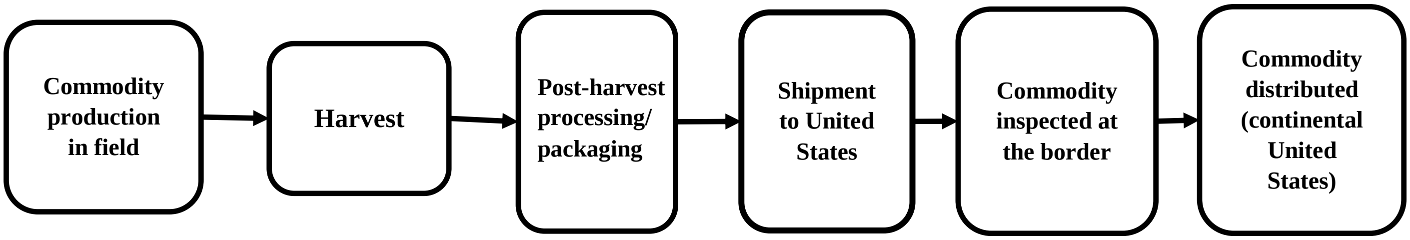

Figure 1. Pathway diagram for imports of oha leaves from Nigeria into the continental United States.

2. Pest List and Pest Categorization

In this section, we identify the plant pests with actionable regulatory status for the continental United States that could potentially become established in the continental United States as a result of the importation of oha leaves from Nigeria, and we determine which of these pests meet the criteria for further analysis. Pests are considered to be of regulatory significance if they are actionable at U.S. ports-of-entry. Actionable pests include quarantine pests, pests considered for, or under, official control, and pests that require evaluation for regulatory action.

2.1. Pests considered but not included on the pest list

2.1.1. Pests with weak evidence for association with the commodity or for presence in the export area

Zonocerus variegatus (Linnaeus) (Orthoptera: Acrididae) is present in Nigeria (Fasoranti and Olagunju, 1985); However, its association with *Pterocarpus erinaceus* Poir. (African-teak) is only by laboratory assay (Fasoranti and Olagunju, 1985), and there is no record of it feeding on *Pterocarpus* spp. in the field. Futher, grasshoppers are large, highly mobile insects that are highly unlikely to remain on the harvested comodity.

2.1.2. Organisms with non-actionable regulatory status

We found evidence of the organisms listed in Appendix A being associated with *Pterocarpus* spp. and being present in Nigeria; however, because these organisms have non-actionable regulatory status for the continential United States, we did not include them in Table 1 of this risk assessment.

2.1.3. Organisms identified only to the genus level

In commodity import risk assessments, the taxonomic unit for pests selected for evaluation beyond the pest categorization stage is usually the species (IPPC, 2016a), as assessments focus on organisms for which biological information is available. Therefore, generally, we do not assess risk for organisms identified only to the genus level, in particular if the genus in question is reported in the import area. Often there are many species within a genus, and we cannot know if the unidentified species occurs in the import area, and consequently, whether it has actionable regulatory status for the import area. On the other hand, if the genus in question is absent from the import area, any unidentified organisms in the genus can have actionable status. However, because such an organism has not been fully identified, we cannot properly analyze its likelihood and consequences of introduction.

In light of these issues, we usually do not include organisms identified only to the genus level in the main pest list. Instead, we address them separately in this sub-section. The information here can be used by risk managers to determine if measures beyond those intended to mitigate fully identified pests are warranted. Often, however, the development of detailed assessments for known pests such as internal fruit feeders or foliage pests, allows effective mitigation measures to eliminate the known organisms as well as similar, but incompletely identified, organisms that inhabit the same niche.

2.2. Pest list

A list of pests for oha leaves was not provided by Nigeria, and very little information is available pertaining to the pests that occur on this species. Therefore, on the assumption that organisms associated with any species of *Pterocarpus* also would be associated with *P. mildbraedii*, the pest list and PRA were developed for the pests that occur in Nigeria, and on any plant in the genus *Pterocarpus* (anywhere in the world).

In Table 1, we list the actionable pests associated with trees in the genus *Pterocarpus* that also occur in Nigeria. The list comprises those actionable pests that occur in Nigeria on any host and are associated with trees in the genus *Pterocarpus* whether in Nigeria or elsewhere in the world. For each pest, we indicate 1) the part of the imported plant species with which the pest is generally associated and 2) whether the pest has a reasonable likelihood of being associated, in viable form, with the commodity following harvesting from the field and prior to any post-harvest processing. We developed this pest list based on the scientific literature, port-of-entry pest interception data, and information provided by the government of Nigeria. Pests in shaded rows are pests identified for further evaluation, as we consider them reasonably likely to be associated with the harvested commodity; and we summarize these pests in a separate table (Table 2).

Table 1. Actionable pests associated with genus *Pterocarpus* (in any country) and present in Nigeria (on any host).

Pest name	Evidence of presence in Nigeria	Association with *Pterocarpus* spp.[1]	Plant part(s) association[2]	On harvested plant part(s)?[3]	Remarks
ACARI: Tetranychidae					
Eutetranychus orientalis (Klein) syn: *Anychus orientalis* Klein	Matthysse, 1980; CABI, 2017	Baker, 1975; Bolland et al., 1998	Leaf *Albizia lebbek* Imani and Shishehbor, (2009); four other non-*Pterocarpus* spp. (Dhoria, 1985)	Yes	Eggs are laid near the midvein of the leaf, and all stages occur on the leaves of *Albizia lebbek* (L.) Benth. (Imani and Shishehbor, 2009). Dhooria (1985) made similar observations on four additional hosts. This pest is present in Hawaii (Heu, 2007).
COLEOPTERA: Brentidae					
Bolbocranius csikii (Bolkay) syn: *Anisognathus csikii* Bolkay	Roberts, 1969; Medler, 1980	Roberts, 1969	Stem (Roberts, 1969)	No	The genus *Bolbocranius* is not listed in PestID (Queried 02/27/2017).
Bolbocranius opacus Kolbe	Roberts, 1969; Medler, 1980	Roberts, 1969	Stem (Roberts, 1969)	No	The genus *Bolbocranius* is not listed in PestID (Queried 02/27/2017).
COLEOPTERA: Curculionidae					
Camptorhinus brunneolateralis Hustache	Roberts, 1969	Roberts, 1969	Stem (Roberts, 1969)	No	

[1] If warranted, the host type (i.e., Type 1, Type 2, or Type 4 host) may be indicated for a pest. Host types are explained in *Guidelines for Plant Pest Risk Assessment of Imported Fruit and Vegetable Commodities, Version 6.0* (PPQ, 2012b).

[2] The plant part(s) listed are those for the plant species under analysis. If the information has been extrapolated, such as from plant part association on other plant species, we note that.

[3] "Yes" indicates simply that the pest has a reasonable likelihood of being associated with the harvested commodity; the level of pest prevalence on the harvested commodity (low, medium, or high) is qualitatively assessed in Risk Element A1 as part of the Likelihood of Introduction assessment (section 3).

Pest name	Evidence of presence in Nigeria	Association with *Pterocarpus* spp.[1]	Plant part(s) association[2]	On harvested plant part(s)?[3]	Remarks
Phaenomerus laevicollis Marshall	Roberts, 1969	Roberts, 1969	Stem (Roberts, 1969)	No	
Phaenomerus strigicollis Faust	Roberts, 1969	Roberts, 1969	Stem (Roberts, 1969)	No	
Scolytoproctus fallax Marshall	Roberts, 1969	Roberts, 1969	Stem (Roberts, 1969)	No	The genus *Scolytoproctus* is not listed in PestID (Queried 02/27/2017).
COLEOPTERA: Lamiidae					
Prosopocera bipunctata (Drury)	Roberts, 1969	Roberts, 1969	Stem (Roberts, 1969)	No	The genus *Prosopocera* is not listed in PestID (Queried 02/27/2017).
COLEOPTERA: Platypodidae					
Chaetastus tuberculatus (Chapuis) syn: *Symmerus tuberculatus* Chapuis	Roberts, 1969; Medler, 1980; Browne, 1971	Roberts, 1969; Browne, 1971	Stem (Roberts, 1969)	No	The genus *Chaetastus* is not listed in PestID (Queried 02/27/2017).
Doliopygus brevis (Strohmeyer)	Roberts, 1969	Roberts, 1969	Stem (Roberts, 1969)	No	The genus *Doliopygus*: Action required in Hawaii, Puerto Rico and the United States Virgin Islands (PestID, Queried 02/27/2017).
Doliopygus conradti (Strohmeyer)	Roberts, 1969	Roberts, 1969	Stem (Roberts, 1969)	No	As for *D. brevis*.
Doliopygus dubius (Sampson)	Roberts, 1969; Medler, 1980; Browne, 1960	Roberts, 1969	Stem (Roberts, 1969)	No	As for *D. brevis*.
Doliopygus interjectus Schedl	Roberts, 1969	Roberts, 1969	Stem (Roberts, 1969)	No	As for *D. brevis*.
Doliopygus pseudoserratus Roberts	Roberts, 1966; Wood and Bright, 1992b	Roberts, 1966; Wood and Bright, 1992b	Stem (Roberts, 1966)	No	As for *D. brevis*.

Pest name	Evidence of presence in Nigeria	Association with *Pterocarpus* spp.[1]	Plant part(s) association[2]	On harvested plant part(s)?[3]	Remarks
Doliopygus serratus (Strohmeyer)	Roberts, 1969; Medler, 1980	Roberts, 1969	Stem (Roberts, 1969)	No	As for *D. brevis*.
Doliopygus subditivus (Schedl)	Roberts, 1969; Medler, 1980	Roberts, 1969	Stem (Roberts, 1969)	No	As for *D. brevis*.
Doliopygus terebrans Schedl	Roberts, 1969	Roberts, 1969	Stem (Roberts, 1969)	No	As for *D. brevis*.
Doliopygus unicornis Schedl	Roberts, 1969; Medler, 1980	Roberts, 1969	Stem (Roberts, 1969)	No	As for *D. brevis*.
Mesoplatypus venustus Schedl syn: *Mesoplatypus nigeriensis* Roberts	Roberts, 1969; Medler, 1980; Wood and Bright, 1992b	Roberts, 1969; Wood and Bright, 1992	Stem (Roberts, 1969)	No	The genus *Mesoplatypus* is not listed in PestID (Queried 02/27/2017).
Periommatus longicollis Chapuis syn: *Periommatus camerunus* Strohmeyer	Roberts, 1969; Wood and Bright, 1992b	Roberts, 1969	Stem (Roberts, 1969)	No	The genus *Periommatus* is not listed in PestID (Queried 02/27/2017).
Trachyostus aterrimus (Schaufuss) syn: *Trachyostus aterrimus minor* Roberts	Roberts, 1969; Roberts, 1968; Medler, 1980	Roberts, 1969; Roberts, 1968	Stem (Roberts, 1969)	No	The genus *Trachyostus* is not listed in PestID (Queried 02/27/2017).
Trachyostus schaufussi (Strohmeyer)	Roberts, 1969; Roberts, 1968; Medler, 1980	Roberts, 1969; Roberts, 1968	Stem (Roberts, 1969)	No	As for *T. aterrimus*.
Triozastus marshalli (Sampson) syn: *Triozastus propatulus* Schedl	Roberts, 1969; Medler, 1980; Wood and Bright, 1992b	Roberts, 1969	Stem (Roberts, 1969)	No	The genus *Triozastus* is not listed in PestID (Queried 02/27/2017).
Triozastus pilosulus (Schedl)	Roberts, 1969; Medler, 1980	Roberts, 1969	Stem (Roberts, 1969)	No	As for *T. marshalli*.
COLEOPTERA: Scolytidae					

Pest name	**Evidence of presence in Nigeria**	**Association with *Pterocarpus* spp.**[1]	**Plant part(s) association**[2]	**On harvested plant part(s)?**[3]	**Remarks**
Acanthotomicus biconicus (Schedl) syn: *Mimips biconicus* Schedl	Roberts, 1969; Medler, 1980; Wood and Bright, 1992a	Roberts, 1969	Stem (Rudinsky, 1962)	No	
Ambrosiodmus albizzianus (Schedl) syn: *Xyleborus albizzianus* Schedl	Roberts, 1969; Medler, 1980; Wood and Bright, 1992a	Roberts, 1969	Stem (Rudinsky, 1962)	No	
Ctonoxylon acuminatum Schedl	Roberts, 1969; Schedl, 1982	Roberts, 1969	Stem (Rudinsky, 1962)	No	The genus *Ctonoxylon* is not listed in PestID (Queried 02/27/2017).
Dactylipalpus camerunus Hagedorn	Roberts, 1969; Medler, 1980	Roberts, 1969	Stem (Rudinsky, 1962)	No	The genus *Dactylipalpus* is not listed in PestID (Queried 02/27/2017).
Dactylipalpus cicatricosus (Blandford)	Roberts, 1969; Medler, 1980	Roberts, 1969	Stem (Rudinsky, 1962)	No	As for *D. camerunus*.
Euwallacea piceus (Motschulsky) syn: *Xyleborus indicus* Eichhoff	Roberts, 1969; Medler, 1980	Roberts, 1969	Stem (Rudinsky, 1962)	No	
Hylesinopsis togonus (Eggers) syn: *Metahylesinus togonus* Eggers; *Pseudohylesinus togonus* Eggers	Roberts, 1969; Medler, 1980; Wood and Bright, 1992a	Roberts, 1969	Stem (Rudinsky, 1962)	No	The genus *Hylesinopsis* is not listed in PestID (Queried 02/27/2017).
Xyleborus alluaudi Schaufuss	Roberts, 1969; Medler, 1980	Roberts, 1969	Stem (Rudinsky, 1962)	No	
HEMIPTERA: Aleyrodidae					

Pest name	**Evidence of presence in Nigeria**	**Association with *Pterocarpus* spp.**[1]	**Plant part(s) association**[2]	**On harvested plant part(s)?**[3]	**Remarks**
Acaudaleyrodes africanus (Dozier) syn: *Aleurotrachelus africanus* Dozier	Evans, 2008; Medler, 1980; Mound and Halsey, 1978	Evans, 2008; Evans, 2007	Leaf (Mound and Halsey, 1978; van Lenteren and Noldus, 1990)	Yes	Whiteflies feed on phloem sap, excrete honeydew and can transmit plant pathogens. Female whiteflies feed and oviposit on the same leaf (Mound and Halsey, 1978; van Lenteren and Noldus, 1990).
Acaudaleyrodes rachipora (Singh) syn: *Aleurotrachelus rachipora* Singh; *Aleurotrachelus citri* (Priesner & Hosny)	Oyelade and Ayansola, 2015; Evans, 2008; Medler, 1980; Mound and Halsey, 1978	Evans, 2008; Evans, 2007	Leaf (Mound and Halsey, 1978; van Lenteren and Noldus, 1990)	Yes	Whiteflies feed on phloem sap, excrete honeydew and can transmit plant pathogens. Female whiteflies feed and oviposit on the same leaf (Mound and Halsey, 1978; van Lenteren and Noldus, 1990).
Africaleurodes coffeacola Dozier	Oyelade and Ayansola, 2015; Evans, 2008; Evans, 2007; Medler, 1980; Mound and Halsey, 1978	Evans, 2008; Evans, 2007	Leaf (Mound and Halsey, 1978; van Lenteren and Noldus, 1990)	Yes	Whiteflies feed on phloem sap, excrete honeydew and can transmit plant pathogens. Female whiteflies feed and oviposit on the same leaf (Mound and Halsey, 1978; van Lenteren and Noldus, 1990).
Bemisia afer (Priesner & Hosny) syn: *Bemisia hancocki* Corbett	Oyelade and Ayansola, 2015; Evans, 2008; Medler, 1980	Evans, 2008; Evans, 2007; Mound and Halsey, 1978	Leaf (Mound and Halsey, 1978; van Lenteren and Noldus, 1990)	Yes	Whiteflies feed on phloem sap, excrete honeydew and can transmit plant pathogens. Female whiteflies feed and oviposit on the same leaf (Mound and Halsey, 1978; van Lenteren and Noldus, 1990).
LEPIDOPTERA: Crambidae					

Pest name	**Evidence of presence in Nigeria**	**Association with *Pterocarpus* spp.[1]**	**Plant part(s) association[2]**	**On harvested plant part(s)?[3]**	**Remarks**
Maruca vitrata (Fabricius) syn: *Crochiphora testulalis* Geyer; *Maruca testulalis* (Geyer)	Ogah, 2013; Ogah and Ogah, 2012; Margam et al., 2010; Medler, 1980; Taylor, 1967	Arodokoun et al., 2006	Leaves, flowers, pods of pigeon pea (Gopali et al., 2010) Flowers, flower buds and pods of the African yam bean (Ogah and Ogah, 2012). Inflorescence of *Pterocarpus* (Arodokoun et al., 2006)	Yes The site of ovipostion and incidence of leaf-feeding are not reported for this species on *Pterocarpus* sp.	*Pterocarpus santalinoides* is one of five important wild hosts for *M. vitrata* in Benin (Arodokoun et al., 2006). The eggs are deposited in small batches on the flowers and flower-buds of cowpeas in Nigeria (Taylor, 1967). This species has a restricted distribution in the United States (CABI, 2017) and is established in Hawaii (Passoa and Bean, 2001).
Pleuroptya balteata (Fabricius) syn: *Sylepta balteata* (Fabricius)	Medler, 1980; Roberts, 1969; Golding, 1937	Roberts, 1969	Leaves (Roberts, 1969)	Yes	Larvae of this species live singly inside rolled leaves of *Pterocarpus osun* in Nigeria (Roberts, 1969). *Pleuroptya balteata* is not listed in PestID; however congener *P. ruralis* [with genus name misspelled] is listed as reportable.
LEPIDOPTERA: Hesperiidae					

Pest name	Evidence of presence in Nigeria	Association with *Pterocarpus* spp.[1]	Plant part(s) association[2]	On harvested plant part(s)?[3]	Remarks
Andronymus caesar (F.) syn: *Andronymus caesar philander* (Hopffer)	Williams, 2015; Medler, 1980; Roberts, 1969	Williams, 2015; Roberts, 1969	Leaf, Foliage (Roberts, 1969; Cock and Congdon, 2013)	Yes	This species is associated with *Pterocarpus mildbraedii* in Nigeria. Larvae live singly within rolled leaves and pupate on the foliage (Roberts, 1969). Eggs are laid on the upper surface of the leaf (Cock and Congdon, 2013). The genus *Andronymus* is not listed in PestID (Queried 02/27/2017).
LEPIDOPTERA: Lasiocampidae					
Catalebeda producta (Walker) syn: *Lebeda producta* Walker	Medler, 1980	Hargreaves, 1937	Leaf (Roberts, 1969)	Yes The larvae feed on the leaves; however, the oviposition site for this species is unknown.	Members of the family Lasiocampidae are defoliators (Roberts, 1969). The genus *Catalebeda* is not listed in PestID (Queried 02/27/2017).
LEPIDOPTERA: Nymphalidae					

Pest name	Evidence of presence in Nigeria	Association with *Pterocarpus* spp.[1]	Plant part(s) association[2]	On harvested plant part(s)?[3]	Remarks
Charaxes achaemenes C. Felder & R. Felder syn: *Charaxes achaemenes fasciatus* Suffert	Medler, 1980; Joicey and Talbot, 1925; van Someren, 1970	Lumbile et al., 2007; van Someren, 1970; Venters, 1998	Leaf (Roberts, 1969)	Yes However, the habits of *C. achaemenes* on the *Pterocarpus* tree are unknown.	Roberts (1969) noted that another species of Nigerian *Charaxes* lays eggs singly on young leaves of the host, and single larvae were found on leaflets beneath a flat web of yellow silk. The genus *Charaxes* is not listed in PestID (Queried 02/27/2017).
LEPIDOPTERA: Sphingidae					
Platysphinx phyllis Rothschild & Jordan syn: *Platysphinx stigmatica phyllis* Rothschild & Jordan	De Prins and De Prins, 2016; Akinlosotu, 1983; Medler, 1980; Carcasson, 1967	De Prins and De Prins, 2016; MacNulty, 1970; Vuattoux et al., 1989	Leaf, Stems (Lampe, 2010)	Yes However, no specific information is available on the feeding habits or ovipostion site for this species.	Saturniid females generally lay the eggs in small clusters on leaves, twigs or branches. The larvae feed on the leaves of trees and shrubs (Lampe, 2010). *Pterocarpus angolensis* (MacNulty, 1970) and *P. erinaceus* (Vuattoux et al., 1989) are listed as hosts. The genus *Platysphinx* is not listed in PestID (Queried 02/27/2017).
THYSANOPTERA: Thripidae					

Pest name	Evidence of presence in Nigeria	Association with *Pterocarpus* spp.[1]	Plant part(s) association[2]	On harvested plant part(s)?[3]	Remarks
Megalurothrips sjostedti (Trybom) syn: *Taeniothrips sjostedti* (Trybom)	Amatobi, 1994; Matteson, 1982; Ogah, 2013; Taylor, 1974	Tamó et al., 1993a	Flower and flower buds (Tamó et al., 1993a; 1993b); leaf (Tamó et al., 1993b); vegetative buds (Tamó et al., 1993b)	Yes Possibly, depending on whether leaflets or whole leaves are harvested. The distribution of this species on the *Pterocarpus* tree is not known.	This species has been recorded on both *Pterocarpus erinacaeus* and *P. santalinoides* in the Republic of Benin, West Africa (Tamó et al., 1993a). The eggs of *M. sjostedti* are laid into plant tissues, including the leaf petiole (Lewis, 1973; Tamó et al., 1993b).
Fungi					
Exosporium pterocarpi M.B. Ellis	Calduch et al., 2002	Ellis, 1971	Leaf (Ellis, 1971)	Yes	*Exosporium pterocarpis* is reported in Nigeria associated with unidentified dead fallen leaves (Calduch et al., 2002) and Ellis, 1971) reports *E. pterocarpis* on leaves of *Pterocarpus* in Malaysia. The genus *Exosporium* is not listed in PestID (Queried 07/28/2017).
Ganoderma philippii (Bres. & Henn. ex Sacc.) Bres. ≡*Ganoderma pseudoferreum* (Wakef.) Overeem & B.A. Steinm.	Farr and Rossman, 2017 West, 1938	Farr and Rossman, 2017	Stem (West, 1938; Farr and Rossman, 2017)	No	

Pest name	Evidence of presence in Nigeria	Association with *Pterocarpus* spp.[1]	Plant part(s) association[2]	On harvested plant part(s)?[3]	Remarks
Kretzschmaria cetrarioides (Welw. & Curr.) Sacc.	Minter, 2006	Minter, 2006	Stem (Minter, 2006)	No	
Phellinus noxius (Corner) G. Cunn. =*Fomes noxius* Corner	Farr and Rossman, 2017	Farr and Rossman, 2017	Stem, root (Ann et al., 1999; Chang and Yang, 1998)	No	
Phyllachora pterocarpi H. Sydow	Cannon, 1991; Farr and Rossman, 2017	Cannon, 1991; Farr and Rossman, 2017	Leaf (Cannon, 1991)	Yes	Tar spot on leaves (Cannon, 1991)

[1] If warranted, the host type (i.e., Type 1, Type 2, or Type 4 host) may be indicated for a pest. Host types are explained in *Guidelines for Plant Pest Risk Assessment of Imported Fruit and Vegetable Commodities* (PPQ, 2012).

[2] The plant part(s) listed are those for the plant species under analysis. If the information has been extrapolated, such as from plant part association on other plant species, we note that.

[3] "Yes" indicates simply that the pest has a reasonable likelihood of being associated with the harvested commodity; the level of pest prevalence on the harvested commodity (low, medium, or high) is qualitatively assessed in Risk Element A1 as part of the Likelihood of Introduction assessment (section 3).

2.3. Pests selected for further analysis

We identified 14 pests for further analysis (Table 2). All of these organisms are actionable pests for the continential United States and have a reasonable likelihood of being associated with the commodity plant part at the time of harvest, and remaining with the commodity, in viable form, throughout the harvesting process.

Table 2. Pests selected for further analysis.

Pest type	Taxonomy	Scientific name
Arthropod	Acari: Tetranychidae	*Eutetranychus orientalis* (Klein)
Arthropod	Hemiptera: Aleyrodidae	*Acaudaleyrodes africanus* (Dozier)
		Acaudaleyrodes rachipora (Singh)
		Africaleurodes coffeacola Dozier
		Bemisia afer (Priesner & Hosny)
	Lepidoptera: Crambidae	*Maruca vitrata* (Fabricius)
		Pleuroptya balteata (Fabricius)
	Lepidoptera: Hesperiidae	*Andronymus caesar* (Fabricius.)
	Lepidoptera: Lasiocampidae	*Catalebeda producta* (Walker)
	Lepidoptera: Nymphalidae	*Charaxes achaemenes* C. Felder & R. Felder
	Lepidoptera: Saturniidae	*Platysphinx phyllis* Rothschild & Jordan

	Thysanoptera: Thripidae	*Megalurothrips sjostedti* (Trybom)
Fungi		*Exosporium pterocarpi* M.B. Ellis
		Phyllachora pterocarpi H. Sydow

* Analyst determines if enough information is known to assign a family to viruses/viroids that haven't been approved by the ICTV.

3. Assessing Pest Risk Potential

3.1. Introduction

For each pest selected for further analysis, we estimate its overall pest risk potential. Risk is described by the likelihood of an adverse event, the magnitude of the consequences, and uncertainty. In this risk assessment, we first determine for each pest if there is an endangered area within the PRA area. The endangered area is defined as the portion of the import area where ecological factors favor the establishment of the pest and where the presence of the pest will result in economically important losses. Once an endangered area has been determined, the overall risk of each pest is then determined with two separate components: 1) the likelihood of its introduction into the endangered area on the imported commodity (i.e., the likelihood of an adverse event) and 2) the consequences of its introduction (i.e., the magnitude of the consequences). In general, we assess both of these components for each pest. If we determine that the risk of either component is negligible, however, assessing the other is not necessary, because the overall pest risk potential will be negligible regardless of the result of the second component. For example, if we determine that pest introduction is highly unlikely, we do not assess the consequences of it being introduced.

The likelihood and consequences of introduction are assessed using different approaches. For the consequences of introduction, we determine if the pest meets the threshold (Yes/No) of being likely to cause unacceptable losses. We base that determination on the physical damage the pest is likely to cause and/or the proportion of exports likely to be disrupted, rather than on an absolute value or amount of monetary loss.

The likelihood of introduction is based on the likelihoods of entry and establishment. We qualitatively assess risk using the ratings Negligible, Low, Medium, and High. The risk factors comprising the model for likelihood of introduction are interdependent, and therefore, the model is multiplicative rather than additive. Thus, if any one risk element is rated as Negligible, then the overall likelihood will be Negligible. For the overall likelihood of introduction risk rating, we define the different categories as follows:

High: Pest introduction is highly likely to occur.

Medium: Pest introduction is possible, but for that to happen, the exact combination of required events needs to occur.

Low: Pest introduction is unlikely to occur because one or more of the required events are unlikely to happen, or the full combination of required events is unlikely to align properly in time and space.

Negligible: Pest introduction is highly unlikely to occur given the exact combination of events required for successful introduction.

3.2. Assessment results

3.2.1. *Acaudaleyrodes africanus* (Dozier) (Hemiptera: Aleyrodidae)

We determined that no portion of the continental United States is likely to be endangered by *Acaudaleyrodes africanus* because the pest does not pose a threat to any hosts of economic, environmental, or social importance in the PRA area. Because no endangered area existed, we did not need to analyze the likelihood of introduction or consequences of introduction. We arrived at this conclusion based on the limited distribution and host range data available for this pest, and acknowledge that this lack of information imparts uncertainty on our conclusions.

Addtionally, our conclusion that the state-listed Endangered plant *Desmodium ochroleucum* is not at risk from *A. africanus* is based on the assumption that the distribution of that plant (NRCS, 2017) is outside the areas where the pest could survive (PHZ 11) in Florida. Were the plant more widely distributed, or the pest whitefly more climatically tolerant than indicated by its known distribution, then there is the possibility the plant could be at risk. Additionally, part of our analysis is based upon the fact that plants in the genus *Piliostigma* do not occur in the continental United States. However, this is based on the taxonomic decision to place the originally-named host, *Bauhinia thonningii*, into the genus *Piliostigma.* Therefore, it should be noted that species of *Bauhinia* do occur in the United States in both California and Florida, and if plants in this genus are able to serve as hosts of *A. africanus*, then the Endangered area would have to be expanded to include those portions of California classified as PHZ 11.

Determination of the portion of the continental United States endangered by *Acaudaleyrodes africanus*

Climatic suitability	*Acaudaleyrodes africanus* has the following geographic distribution: **Africa:** Central African Republic, Ivory Coast, Nigeria, and Republic of the Congo (Mound & Halsey, 1978; Ouvrard and Martin, 2017). Evans (2008) also lists Chad. Based on a comparison of the geographic distribution of this species and a map of the global Plant Hardiness Zones (Magarey et al., 2008; Saha et al., 2010), we estimated that *A. africanus* could establish in Plant Hardiness Zones 11-12 in the continental United States.
Potential hosts at risk in PRA Area	*Acaudaleyrodes africanus* has been reported from the following hosts: **Fabaceae:** *Desmodium* sp., *Piliostigma thonningii* (=*Bauhinia thonningii*) (Evans, 2008; Mound & Halsey, 1978; Ouvrard and Martin, 2017). No species in the genus *Piliostigma* occurs in the continental United States; however, several species of *Desmodium* are native to Florida (Kartesz, 2015; NRCS, 2017) and could serve as hosts for *A. africanus*. None of these species are is listed as Federally Threatened or Endangered (50 CFR §17.12), and only one species, *D. ochroleucum,* is listed as Endangered by the state of Florida (NRCS, 2017).
Economically important hosts at risk[a]	None of the hosts identified above are economically important; therefore, there are no economically important hosts at risk. Only one native species, *D. ochroleucum*, is listed as Endangered by the state of Florida, and this species is not present in the area climatically suitable for the establishment of *A. africanus* (NRCS, 2017).

Pest potential on economically important hosts at risk	There are no economically important hosts at risk; therefore, the pest potential on economically important hosts in the endangered area is negligible.
Defined Endangered Area	We determined that no portion of the continental United States is likely to be endangered by *Acaudaleyrodes africanus* because the pest does not pose a threat to any hosts of economic, environmental, or social importance in the PRA area.

[a] As defined by ISPM No. 11, supplement 2, "economically" important hosts refers to both commercial and non-market (environmental) plants (IPPC, 2017b).

3.2.2. *Acaudaleyrodes rachipora* (Singh) (Hemiptera: Aleyrodidae)

We determined the overall likelihood of introduction of *A. rachipora* to be Medium. We present the results of this assessment in the table below. Although we conclude that there is very Low risk of this species coming into contact with host material, the lack of information about post-harvest processing, shipping and storage conditions, and the ultimate destinations for distribution in the United States required us to rate all these components High, resulting in an overall rating of High. Therefore, additional information on these factors is more likely to lower the overall likelihood of introduction, rather than raise it. Uncertainty is rated High for many factors, but perhaps the greatest uncertainty is the host status of the commodity. *Acaudaleyrodes rachipora* has been reported from *Pterocarpus lucens* (Evans, 2007; 2008), and is presumed to be associated with *P. mildbraedii* by the fact that they are in the same genus.

We determined that establishment of *A. rachipora* in the continental United States is unlikely to cause unacceptable impacts. We present the results of this assessment in the table below. We conclude that there is no evidence of this whitefly transmitting plant pathogens or causing direct economic damage. It is also unlikely that the establishment of this pest would impact export markets.

Our conclusion that *A. rachipora* is not likely to be a pest of economic significance is based on the absence of evidence that it transmits any plant pathogen or that infestations result in significant economic damage to any crop. If it is found to be capable of transmitting plant pathogens of economic significance, the probability of economically significant damage would increase. Additionally, although Abd-Rabou (1999) did not list this species as a major pest of citrus in Egypt, the study of parasitoids collected from the field showed mean parasitism rates of 25.6 and 39.4 percent in the two years studied, with peak parasitism rates as high as 65 percent. Hence, this species could prove to be more problematic if it were introduced into the United States without these effective parasitoids.

Determination of the portion of the continental United States endangered by *Acaudaleyrodes rachipora*

Climatic suitability	*Acaudaleyrodes rachipora* has the following geographic distribution: **Asia:** Cyprus, India (Martin and Mound, 2007), Iran, Iraq, Israel, Jordan (Ghahari et al., 2009), Lebanon (Kfoury et al., 2003), Pakistan, Saudi Arabia, Turkey (Özturk and Ulusoy, 2009; Mound & Halsey, 1978; Ouvrard and Martin, 2017) **Africa:** Cameroon, Canary Islands (Ghahari et al., 2009), Chad, Egypt, Kenya, Liberia (Ghahari et al., 2009), Madagascar (Ghahari et al., 2009), Niger, Nigeria, Sierra Leone, South Africa (Transvaal), Sudan (Evans, 2008; Mound & Halsey, 1978; Ouvrard and Martin, 2017). Panis et al. (2009) also reported this species from Algeria, Mauritania and Tunisia. Based on a comparison of the geographic distribution of this species and a map of the global Plant Hardiness Zones (Magarey et al., 2008; Saha et al., 2010), we estimated that *Acaudaleyrodes rachipora* could establish in Plant Hardiness Zones 9-13. Plant Hardiness Zones 9-12 exist in the continental United States. Pandey et al. (2012), Sunqararaj and Murugesan (1996) and other authors noted this species as a pest in arid and semi-arid areas, suggesting that hosts in these types of climates may be more likely to harbor this species.
Potential hosts at risk in PRA Area	*Acaudaleyrodes rachipora* is considered to be moderately polyphagous on woody dicots (CABI, 2017; Panis, 2009) and has been reported from the following hosts: **Adoxaceae:** *Sambucus nigra* (elderberry); **Anacardiaceae:** *Rhus* sp. (sumac); **Euphorbiaceae:** *Chamaesyce hirta* (= *Euphorbia pilulifera*) (spurge), *Ricinus communis* (castorbean); **Fabaceae:** *Abrus precatorius*, *Acacia* sp. (all introduced), *Albezia* sp., *Alhagi maurorum*, *Alhagi* sp., *Bauhinia* sp., *Cassia fistula*, *Cassia* sp. (cassias), *Dalbergia sissoo* (rosewood), *Delonix* sp., *Lablab purpureus* (= *Dolichos lablab*), *Pithecellobium dulce* (extensively naturalized in FL), *Prosopis* sp. (mesquite), *Tamarindus indica* (tamarind), *Tephrosia* sp.; **Lythraceae:** *Punica granatum* (pomegranate); **Moraceae:** *Ficus* sp. (fig); **Myrtaceae:** *Psidium guajava* (guava); **Rhamnaceae:** *Ziziphus mauritiana* (Indian jujube), *Ziziphus* sp.; **Rutaceae:** *Citrus aurantifolia*, *C. limon*, *C. sinensis*, *Citrus* sp. (citrus); **Sapindaceae:** *Dodonaea viscosa* (hopbush) (Evans, 2008; Mound & Halsey, 1978; Ouvrard and Martin, 2017). Many other hosts were documented in India by Guar et al. (1999), including *Albizia lebbeck*, *Helianthus annuus*, *Morus alba* and *Rosa* sp. One or more of these hosts are found throughout the areas of the continental United States suitable for the survival of *Acaudaleyrodes rachipora* (Kartesz, 2015; NRCS, 2017).

Economically important hosts at risk[a]	Economically important agricultural hosts present in the areas of the continental United States suitable for the survival of *A. rachipora* include citrus (*Citrus* spp.), fig (*Ficus* sp.) and pomegranate (*Punica granatum*) (Kartesz, 2015; NRCS, 2017). Examples of potential hosts listed by the Federal government as Threatened or Endangered (50 CFR §17.12) that occur in areas of the continental United States suitable for the survival of *A. rachipora* include: *Chamaesyce deltoidea, C. garberi* (T), *C. hooveri*, *Helianthus paradoxus*, *H. schweinitzii*, *H. verticillatus*, *Rhus michauxii* and *Ziziphus celata*.
Pest potential on economically important hosts at risk	*Acaudaleyrodes rachipora* has been reported as a minor pest of citrus in Egypt (Abd-Rabou, 1999), Pakistan (Khan et al., 1991), and Lebanon (Kfouri et al., 2004). Most other hosts are reported without any damage observations. For example, Özturk and Ulusoy (2009) record this species as a pest of pomegranate in Turkey, but do not list it among the major pests or report its damage, stating that many pests have not caused damage in recent years due to 'improved agricultural technology'. Similarly, Martin et al., (2000) report this species as an occasional minor pest of citrus, pomegranate and guava, without a description of specific damage. Pandey et al. (2012) reported a variable range of infestation among nursery seedlings of forest trees, with chlorotic leaf spots, leaf drop, reduced growth and the production of honeydew as the primary problems. No evidence of the transmission of plant pathogens was found in the literature, and the reported symptoms are similar to those reported for other whiteflies that already occur in the United States. Infestation is not likely to result in the death of the plant, or to cause a significant loss of yield. However, the honeydew produced by this species is likely to foster the growth of sooty mold that could reduce the value of fruit, or increase the cost of post-harvest handling.
Defined Endangered Area	We estimated that *A. rachipora* could establish in Plant Hardiness Zones 9-12 in the southern third of the continental United States and host plants for this species occur throughout this region (Kartesz, 2015; NRCS, 2017). Economically important hosts of *A. rachipora* present in these areas include citrus (*Citrus* spp.), fig (*Ficus* sp.) and pomegranate (*Punica granatum*). Potential hosts that occur in these areas and that are listed by the Federal government as Threatened or Endangered (50 CFR §17.12) include *Chamaesyce deltoidea, C. garberi*, *C. hooveri*, *Helianthus paradoxus*, *H. schweinitzii*, *H. verticillatus*, *Rhus michauxii* and *Ziziphus celata*.

[a] As defined by ISPM No. 11, supplement 2, "economically" important hosts refers to both commercial and non-market (environmental) plants (IPPC, 2017b).

Assessment of the likelihood of introduction of *Acaudaleyrodes rachipora* into the endangered area via the importation of oha leaves from Nigeria

Risk Element	Risk Rating	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Likelihood of Entry			
Risk Element A1: Pest prevalence on the harvested commodity (= the baseline rating for entry)	High	U	This species of whitefly have been reported from *Pterocarpus lucens* (Evans, 2007; 2008), and not *P. mildbraedii*. Therefore, the host status of *P. mildbraedii* is uncertain, and the pest population levels that might be encountered on the commodity are unknown. Adult whiteflies are likely to take flight during harvesting, and would not be found on the harvested product. However, the eggs, nymphs and puparia of whiteflies are sessile and intimately associated with leaves. They are often difficult to detect, and could be on the harvested commodity. Therefore, we rate this risk element (A1) as High, with High Uncertainty due to the unknown host status of *P. mildbraedii*.
Risk Element A2: Likelihood of surviving post-harvest processing before shipment	High	MC	No details about post-harvest processing were provided by Nigeria; therefore, this analysis assumes the leaves are harvested and packed in shipping cartons, and that no post-harvest processing has occurred (see section 1.4). Based on this assumption, the rating for the previous risk element (A1) remains unchanged.
Risk Element A3: Likelihood of surviving transport and storage conditions of the consignment	High	MC	The leaves will be transported by air-freight one day after harvest and will be refrigerated at an unspecified temperature. There is no evidence to suggest that the

			transport and storage conditions of the consignment will increase or decrease the pest population. Based on this evidence, the rating for the previous risk element (A2) remains the same.
Risk Element A: Overall risk rating for likelihood of entry	High	N/A	The overall risk rating is High with Moderate Uncertainty due to the substantial lack of detailed information for all of the elements in Risk Element A.
Likelihood of Establishment			
Risk Element B1: Likelihood of coming into contact with host material in the endangered area	Low	MC	Successful establishment can occur only when the imported leaves are placed in close proximity to a susceptible host. This is highly unlikely to occur. The oha leaves are intended for consumption as a cooked vegetable (Faseyitan, 2015), and are likely to be consumed. Oha leaves are primarily used in soups, and are likely to be purchased in small quantities with little waste material requiring disposal, and only a small possibility that disposal would occur outdoors where hosts are available. *Acaudaleyrodes rachipora* females produce 38-60 eggs per female, and development from egg to adult can take place in as little as 24 days (Pandey et al., 2012). The adults can fly, but are unlikely to be found on the commodity (see above). Eggs on the leaves hatch into ‘crawlers’ with a limited ability to disperse, and they soon become nymphs that are sessile and incapable of dispersing to find new host material (van Lenteren and Noldus, 1990). Additionally, both crawlers and nymphs require living leaves to complete their life cycle, and harvested leaves are

			likely to become unsuitable for these stages before further development can occur. Whiteflies arriving as puparia (which do not need to feed) and then transforming to adults represent the only real possibility of dispersing and coming into contact with host material in the endangered area. *Acaudaleyrodes rachipora* puparia require 5-10 days for adults to emerge (Pandey et al., 2012); however, refrigeration would extend the time required. Emerging adults would then have to find both mates and hosts in order to reproduce. According to Pandey et al. (2012) mate-finding usually occurs on the emergence leaf, meaning that both male and female puparia would have to be present on the commodity, and adults would have to emerge at the same time, further decreasing the probability of successful mating. Addtionally, whiteflies are considered poor fliers with very limited migratory capacity (Byrne & Bellows, 1991). Based on this evidence, we rated this risk element (B1) as Low with Moderate Certainty that there is little likelihood that eggs or nymphs could become adults, and any adults emerging from puparia could find both mates and hosts.
Risk Element B2: Likelihood of arriving in the endangered area	High	MU	We do not have specific information on where the commodity (and therefore any pests associated with it) will be moved in the PRA area. In the absence of this information, we

			assume that the commodity will move throughout the PRA area in proportion to consumer population size, with more populous areas getting more of the commodity than less populous areas. Following guidance in PPQ (2012), we rated this risk as High, as more than 25 percent (27.7%) of the U.S. population lives in the endangered area (PERAL, 2015).
Risk Element B: Combined likelihood of establishment	Medium	N/A	We rated the combined likelihood of establishment for *A. rachipora* as Medium because the ratings for B1 was Low and B2 was High. There is Moderate Certainty due to the low combined probability of adults emerging, finding mates and then finding acceptable host material on which to reproduce.
Overall Likelihood of Introduction			
Combined likelihoods of entry and establishment	Medium	N/A	

[a]C=Certain, MC=Moderately Certain, MU=Moderately Uncertain, U=Uncertain

Assessment of the consequences of introduction of *Acaudaleyrodes rachipora* into the continental United States (i.e., the PRA area)

Criteria	Meets criteria? (Y/N)	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Direct Impacts			
Risk Element C1: Damage potential in the endangered area	No	MC	Citrus, figs and pomegranates are all listed as hosts, and are cultivated within the Endangered Area. However, with the exception of damage to the seedlings of forest trees in India (Gaur et al., 1999), reports of economic damage on the cultivated species above were not found in the literature. *Acaudaleyrodes rachipora* has been reported at very low levels on citrus, and is at most a minor pest (Khan et al., 1991; Kfouri et al., 2004). Typical effects of infestation include decreased growth, premature leaf drop and the production of honeydew (Pandey et al., 2012). This species is not known to transmit plant pathogens, and the evidence seems to indicate the damage is no more severe than that caused by whiteflies that already occur in the United States, and would be managed in the same way. This pest has been known for some time, and has been documented on cultivated hosts in several countries without any reports of significant damage or evidence of pathogen transmission. Therefore, we conclude that the introduction of this pest would likely result in less than 10 percent yield loss in any commercially cultivated host.

Criteria	Meets criteria? (Y/N)	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Risk Element C2: Spread potential	N/A	MC	This species has a regional distribution and does not appear to spread rapidly by natural means. However, the major means of whitefly spread is probably through human agency (Byrne & Bellows, 1991).
Risk Element C: Pest introduction is likely to cause unacceptable direct impacts	No	N/A	
Trade Impacts			

Criteria	**Meets criteria? (Y/N)**	**Uncertainty Rating[a]**	**Justification for rating and explanation of uncertainty (and other notes as necessary)**
Risk Element D1: Export markets at risk	No	MC	The United States exports of citrus were valued at over one billion dollars in 2016, and 22.5 percent of the exports went to Korea (FAS, 2017), which lists this whitefly as a harmful organism (APHIS, 2017a). However, whiteflies occur primarily on the leaves and not on the fruit. Additionally, any stages that occurred incidentally on the fruit would be eliminated by normal post-harvest production practices, and not put this citrus export market at risk. Pomegranate exports are below reportable levels (FAS, 2017). Figs are exported as both fresh and dried fruit; however, most are exported to countries that do not consider *A. rachipora* a Harmful Organism, and exports to Korea are below reportable levels (FAS, 2017). Based on this evidence, we conclude that no export markets are at risk because this insect does not occur on the plant parts exported, and any incidental occurrence on the fruits would be eliminated by normal post-harvest handling procedures.

Criteria	**Meets criteria? (Y/N)**	**Uncertainty Rating[a]**	**Justification for rating and explanation of uncertainty (and other notes as necessary)**
Risk Element D2: Likelihood of trading partners imposing additional phytosanitary requirements	N/A	MC	*Acaudaleyrodes rachipora* is not listed as a Harmful Organism by any country; however, its synonyms *Acaudaleyrodes citri* and *Aleurotrachelus citri* are listed as a Harmful Organism by the Republic of Korea and the Syrian Arab Republic, respectively (APHIS, 2017a). This suggests that the major trading partners of the United States would not impose additional phytosanitary requirements over what is already required for the listed commodities. Additionally, all the cultivated hosts are marketed as fruit, and this species is associated with the leaves of the plants, not the fruit, further suggesting that it is unlikely that any trading partners would impose additional phytosanitary requirements.
Risk Element D: Pest is likely to cause significant trade impacts	No	N/A	
Conclusion			
Is the pest likely to cause unacceptable consequences in the PRA area?	No	N/A	

[a]C=Certain, MC=Moderately Certain, MU=Moderately Uncertain, U=Uncertain

3.2.3. *Africaleurodes coffeacola* Dozier (Hemiptera: Aleyrodidae)

We determined the overall likelihood of introduction of *A. coffeacola* to be Medium. We present the results of this assessment in the table below. We arrived at this conclusion based on the limited distribution and host range data available for this pest, and acknowledge that this lack of information imparts uncertainty to our conclusions.

We determined that establishment of *A. coffeacola* in the continental United States is unlikely to cause unacceptable impacts. We present the results of this assessment in the table below. We arrived at this conclusion based on the absence of damage reports for this species, and because the reported hosts are not economically important plant species. Additionally, there is no evidence that this species transmits plant pathogens, and no other country lists this species as a Harmful Organism. We acknowledge that there is little information available for this species, and the lack of information imparts uncertainty to our conclusions.

Although the absence of host and damage reports for this species supports our conclusion that this is not a pest of economic importance, this conclusion is based on very little species-specific information, the assumption that this species does not transmit plant pathogens, and that it behaves like other whiteflies. Additionally, the presumed association of this and the other three whitefly species with *P. mildbraedii* is based on their association with another *Pterocarpus* species, and therefore very uncertain.

Determination of the portion of the continental United States endangered by *Africaleurodes coffeacola*

Climatic suitability	*Africaleurodes coffeacola* has the following geographic distribution: **Africa:** Aldabra, Cameroon, Ivory Coast, Nigeria, Republic of the Congo, Sierra Leone, Sudan (Evans, 2008; Mound & Halsey, 1978; Ouvrard and Martin, 2017). Based on a comparison of the geographic distribution of this species and a map of the global Plant Hardiness Zones (Magarey et al., 2008; Saha et al., 2010), we estimated that *Africaleurodes coffeacola* could establish in Zones 11-12 in the continental United States. Therefore, the western coast and southern counties of California, and the southern tip and western coast of Florida have both an acceptable climate and potential hosts for this species.
Potential hosts at risk in PRA Area	*Africaleurodes coffeacola* has been reported from the following hosts: **Annonaceae:** *Annona* sp.; **Rhamnaceae:** *Ziziphus* sp.; **Rubiaceae:** *Gardenia* sp. (Mound & Halsey, 1978; Ouvrard and Martin, 2017). Species in these genera occur sporadically throughout global Plant Hardiness Zones 11-12, in California and Florida (Kartesz, 2015; NRCS, 2017).
Economically important hosts at risk[a]	There is only one economically important host at risk. One species, *Ziziphus celata* (Florida jujube) is listed as Federally Endangered and it is also listed as Endangered by the state of Florida (NRCS, 2017). Jujube (*Ziziphus jujube*) and Indian Jujube (*Ziziphus mauritiana*) are potential hosts; however, there is little commercial cultivation and both are essentially rare backyard fruits. Several species of native *Annona* occur in Florida, and, like jujube, some of these species are grown for fruit; however, whiteflies are generally considered minor or insignificant pests of *Annona* sp. (CIPM, 2009; Peña and Crane, 2013). Gardinias are grown by the nursery industry for use as ornamental landscape plants, and also not of significant economic importance.

Pest potential on economically important hosts at risk	The plant *Ziziphus celata* (listed as Federally Endangered and Endangered by the state of Florida) occurs three counties in central Florida, and a portion of its range is in Hillsborough County, which is climatically suitable for this pest (Kartesz, 2015; NRCS, 2017). *Africaleurodes coffeacola* is not known to transmit any plant pathogen, and we assume that this whitefly is similar to other non-pathogen-transmitting whiteflies. Feeding on phloem sap may reduce plant vigor and cause premature leaf-drop, and it may produce honeydew that would foster the growth of sooty mold and reduce photosynthesis (Mound and Halsey, 1978; Van Lenteren and Noldus, 1990), all without causing mortality. Hence, we believe this species may cause similar damage to *Z. celata* in a limited portion of its range. Therefore, we conclude that it does not present a threat to the existence of *Z. celata*, suggesting the impact on economically important hosts in the endangered area is minimal.
Defined Endangered Area	Based on the evidence above, we conclude that the area endangered by *A. coffeacola* in the PRA area is limited to the portion of Hillsborough County, Florida that is classified as global Plant Hardiness Zone 11, and which has populations of the federally Endangered plant, *Ziziphus celata*.

[a] As defined by ISPM No. 11, supplement 2, "economically" important hosts refers to both commercial and non-market (environmental) plants (IPPC, 2017b).

Assessment of the likelihood of introduction of *Africaleurodes coffeacola* into the endangered area via the importation of oha leaves from Nigeria

Risk Element	Risk Rating	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Likelihood of Entry			
Risk Element A1: Pest prevalence on the harvested commodity (= the baseline rating for entry)	High	U	This species has been reported from *Pterocarpus lucens* (Evans, 2007; 2008), and the nature of the association was not reported. Therefore, the host association of *A. coffeacola* with *P. mildbraedii* is uncertain, and the pest population levels that might be encountered are unknown. Adult whiteflies are capable of flight, are likely to take flight during harvesting, and likely would not be found on the harvested commodity. However, the eggs, nymphs and puparia of whiteflies are sessile and

			intimately associated with leaves, are often difficult to detect, and could be found on the harvested commodity. Therefore, we rate this risk element (A1) as High, with High Uncertainty due to the unknown host status of *P. mildbraedii*.
Risk Element A2: Likelihood of surviving post-harvest processing before shipment	High	MC	No details about post-harvest processing were provided by Nigeria; therefore, this analysis assumes the leaves are harvested and packed in shipping cartons, and that no post-harvest processing has occurred (see section 1.4). Based on this assumption, the rating for the previous risk element (A1) remains unchanged.
Risk Element A3: Likelihood of surviving transport and storage conditions of the consignment	High	MC	The leaves will be transported by air-freight one day after harvest, and will be refrigerated at an unspecified temperature. There is no evidence to suggest that the transport and storage conditions of the consignment will decrease the pest population. Based on this evidence, the rating for the previous risk element (A2) remains the same.
Risk Element A: Overall risk rating for likelihood of entry	High	N/A	The overall risk rating is High with uncertainty due to the substantial lack of detailed information for all of the elements in Risk Element A.
Likelihood of Establishment			
Risk Element B1: Likelihood of coming into contact with host material in the endangered area	Low	U	Successful establishment in a new environment can occur only when the imported leaves are placed in close proximity to a susceptible host. This is highly unlikely to occur. Hosts for this species are relatively rare in the continental United States. The oha leaves are intended for consumption as a cooked vegetable (Faseyitan,

		2015), and are likely to be consumed. Oha leaves are primarily used in soups, and are likely to be purchased in small quantities with little waste material requiring disposal, and only a small possibility that disposal would occur outdoors. No details about the biology of this species were found in the literature. The adults of this species can probably fly, but are unlikely to be found on the commodity (see above). Whiteflies require living leaves to complete their life cycle. Eggs laid on the leaves would not have time to develop to adults before the leaves senesced, and would hatch into 'crawlers' with a very limited ability to disperse. The nymphs that follow are sessile and incapable of dispersing to find new host material (van Lenteren and Noldus, 1990), and also cannot survive on senesced leaves. Whiteflies arriving as non-feeding puparia could survive and transform into adults, and this represents the only real possibility for dispersal and coming into contact with host material. Adult whiteflies are weak flyers, but are readily transported by wind (van Lenteren and Noldus, 1990); however, these adults would then have to find mates and host plants in order to propagate, and hosts for this species are relatively rare. These factors make it unlikely that whiteflies arriving on the commodity will come into contact with suitable host material. Based on this evidence, we rated this risk element (B1) as Low with a high level of uncertainty due to the lack

			of species-specific information and lack of a clear association of this species with *P. mildbraedii*.
Risk Element B2: Likelihood of arriving in the endangered area	Low	U	We do not have specific information on where the commodity (and therefore any pests associated with it) will be moved in the PRA area. In the absence of this information, we assume that the commodity will move throughout the PRA area in proportion to consumer population size, with more populous areas getting more of the commodity than less populous areas. Following guidance in PPQ (2012), we rated this risk for *A. coffeacola* as Low, as less than 10 percent (3.7%) of the U.S. population lives in the endangered area (PERAL, 2015).
Risk Element B: Combined likelihood of establishment	Low	N/A	We rated the combined likelihood of establishment for *A. coffeacola* as Low because the ratings for both risk elements (B1 and B2) were Low. There is fairly high uncertainty due to the lack of information about the biology, distribution and host range of this species.
Overall Likelihood of Introduction			
Combined likelihoods of entry and establishment	Medium	N/A	We rated Risk Element A as High, and Risk Element B as Low to give a risk rating of Medium for the overall likelihood of introduction for *Africaleurodes coffeacola*.

[a]C=Certain, MC=Moderately Certain, MU=Moderately Uncertain, U=Uncertain

Assessment of the consequences of introduction of *Africaleurodes coffeacola* into the continental United States (i.e., the PRA area)

Criteria	Meets criteria? (Y/N)	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Direct Impacts			
Risk Element C1: Damage potential in the endangered area	No	MU	We found no reports of damage or evidence for the transmission of plant pathogens by this pest in the literature. The damage caused by *A. coffeacola* is likely to be similar to that reported for other whiteflies, and may include a reduction of plant vigor, premature leaf-drop, and the production of honeydew that would foster the growth of sooty mold and reduce photosynthesis (van Lenteren and Noldus, 1990), all without causing mortality. There are already many species of whiteflies in the United States and they rarely cause economic damage (Flint, 2015). Where whiteflies transmit plant pathogens or cause damage that is unacceptable, there are many methods available to control them in the landscape (Flint, 2015), greenhouse (White, 2013), and field crops. Additionally, there is no evidence that this species has developed resistance to any insecticide; therefore, it is likely be controlled by the same insecticides and biological controls used to mitigate other species of whiteflies. Therefore, the introduction of this pest would not be likely to result in significant crop losses or increase the cost of production. We also conclude that the damage potential on the federally

			Endangered plant, *Ziziphus celata*, would be less than 10 percent based on the small portion of this plant's range that would be potentially impacted, and also because it is unlikely that an infestation would have lethal effects. Based on this evidence we believe that the potential damage level in the endangered area is not significant, with Moderate Uncertainty based on the lack of damage reports and unknown efficacy of various management stratagies for this species.
Risk Element C2: Spread potential	N/A	N/A	
Risk Element C: Pest introduction is likely to cause unacceptable direct impacts	No	N/A	The pest is unlikely to cause unacceptable direct impacts to either crop production or the one Federally Endangered plant that occurs in the Endangered Area.
Trade Impacts			
Risk Element D1: Export markets at risk	No	MC	*Africaleurodes coffeacola* is not listed as a Harmful Organism by any country (APHIS, 2017a). Additionally, none of the hosts are considered economically important with regard to trade, and it is likely this species will not do economic damage to its hosts. The nursery plant industry exports some potential hosts; however, these markets are likely to be very small. For example, *Annona* spp. plant exports from Florida amounted to fewer than 1900 plants in 2015, and fewer than 4400 plants in 2016 (PCIT, 2017).
Risk Element D2: Likelihood of trading partners imposing additional phytosanitary requirements	N/A	N/A	

Risk Element D: Pest is likely to cause significant trade impacts	No	N/A	
Conclusion			
Is the pest likely to cause unacceptable consequences in the PRA area?	No	N/A	

[a]C=Certain, MC=Moderately Certain, MU=Moderately Uncertain, U=Uncertain

3.2.4. *Andronymus caesar* (Fabricius) (Lepidoptera: Hesperidae)

We determined that none of the plant genera listed as hosts for *A. caesar* occur within the continental United States. Therefore, we conclude that there are no potential hosts at risk in the PRA area. Because no endangered area existed, we did not need to analyze the likelihood of introduction or consequences of introduction.

The main uncertainty surrounding our assessment pertains to the possibility that this species may have a wider host range than suggested in the literature. Additionally, a limited portion of the known range for this species occurs in global Plant Hardiness Zone 10. This is primarily where the subspecies *A. caesar philander* (not the subspecies in Nigeria) occurs, suggesting a slight chance that this species may be able to establish in Zone 10.

Determination of the portion of the continental United States endangered by *Andronymus caesar*

Climatic suitability	This species has two recognized subspecies (Cock and Congdon, 2013). *Andronymus caesar caesar* Fabricius is distributed in West Africa, and is the subspecies observed on *P. mildbraedii* in Nigeria (Roberts, 1969); however the distribution of the other subspecies, *A. caesar philander* Hopffer was also included in determining the distribution of the species. The species has the following geographic distribution, as compiled by Cock and Cogdon (2013) and Ackery et al. (1995): **Africa:** Angola, Côte d'Ivoire, Ghana, Guinea, eastern Kenya, Liberia, Malawi, Mozambique, Nigeria, Tanzania, Uganda, Zambia and Zaire. Williams (2015) includes the countries above as well as Cameroon, Central African Republic, Democratic Republic of Congo, Gabon, Sierra Leone, South Africa, Sudan, Togo and Zimbabwe. Based on a comparison of the geographic distribution of this species and a map of Plant Hardiness Zones (Magarey et al., 2008; Saha et al., 2010), we estimated that *Andronymus caesar* could establish in Plant Hardiness Zones 10-13. Plant Hardiness Zones 10-12 exist in the continental United States; however, no host plants for this species occur in these Zones.

Potential hosts at risk in PRA Area	This species has two recognized subspecies (Cock and Congdon, 2013). *Andronymus caesar caesar* Fabricius is distributed in West Africa, and is the subspecies observed on *P. mildbraedii* in Nigeria (Roberts, 1969); however the host plants for the other subspecies, *A. caesar philander* Hopffer were also included in determining the potential host range. Based on the host list compiled from multiple sources by Cock and Congdon (2013), we found that none of the plant genera listed occur within the continental United States. Therefore, we conclude that there are no potential hosts at risk in the PRA area.
Economically important hosts at risk[a]	None of the host genera listed by Cock and Congdon (2013) occur within the continental United States, and none of the plant species listed were found to be economically important. Therefore we conclude that there are no economically important hosts at risk.
Pest potential on economically important hosts at risk	There are no economically important hosts at risk; therefore, the pest potential on economic hosts at risk is negligible.
Defined Endangered Area	We determined that no portion of the continental United States is likely to be endangered by A*ndronymus caesar* because potential hosts are not present in the portion of the PRA area climatically suitable for the pest's continued survival.

[a] As defined by ISPM No. 11, supplement 2, "economically" important hosts refers to both commercial and non-market (environmental) plants (IPPC, 2017b).

3.2.5. *Bemisia afer* (Priesner & Hosny) (Hemiptera: Aleyrodidae)

We determined the overall likelihood of introduction of *B. afer* to be Medium. We present the results of this assessment in the table below. We concluded that this species could possibly establish in global Plan Hardiness Zones 9-12 in the continental United States. However, Malumphy (2003) reported that this species survived outdoors at near freezing temperatures in Britain, suggesting that it may be more cold tolerant than many tropical whiteflies. Therefore, there is some uncertainty in limiting its possible establishment to Zone 9 and higher.

We determined that establishment of *B. afer* in the continental United States is unlikely to cause unacceptable impacts. We present the results of this assessment in the table below. We did not find reports of significant damage to economically important plants in the literature. Although *B. afer* has recently been shown to be a vector of sweet potato chlorotic stunt virus (Gammara et al., 2010), both the virus and primary vector, *B. tabaci* (Gennadius) (Gamarra et al., 2010), are already present in the United States (Abad et al., 2007; CABI, 2017). Therefore, we conclude that no economically important hosts are significantly at risk in the PRA area.

There is some uncertainty regarding the taxonomy of this species, and several authors have noted significant regional variation in the puparia that are key to identification. This species is referred to as the *B. afer* complex (or *B. afer sensu lato*) by Anderson and Hernández-Suarez, (2001), Gammara et al. (2010) and Malumphy et al. (2015); and Martin et al. (2000) state "Future studies using modern taxonomic techniques may clarify the status of several existing species names in this complex." It is probable that further synonymy or separation of species in this complex would significantly change both the distribution and host range of *B. afer*, as outlined below, and possibly the ability to transmit viruses, which adds additional uncertainty to our conclusions.

Determination of the portion of the continental United States endangered by *Bemisia afer*

Climatic suitability	*Bemisia afer* has the following geographic distribution: **Asia:** China (Fujian, Shaanxi), India, Indonesia (Comoro Islands, Sulawesi) (Malumphy, 2003), Israel, Korea, Pakistan, Turkey, Yemen (CABI, 2017; (Ghahari et al., 2009; Mound & Halsey, 1978; Ouvrard and Martin, 2017); **Africa:** Cameroon, Chad, Democratic Republic of the Congo, Egypt, Ivory Coast, Kenya, Madagascar, Malawi, Niger, Nigeria, Sierra Leone, South Africa, Sudan, Uganda, Zimbabwe (CABI, 2017; Evans, 2008; Ghahari et al., 2009; Mound & Halsey, 1978; Ouvrard and Martin, 2017); **Central America:** Belize, Honduras, Mexico, El Salvador (Anderson et al., 2001); **Europe:** Croatia, France, Greece, Italy (Sicily), Malta, Spain, United Kingdom (CABI, 2017; Mound & Halsey, 1978; Ouvrard and Martin, 2017); **Oceania:** Australia (CABI, 2017), Fiji and Tonga (Malumphy, 2003), New Guinea (Ghahari et al., 2009); **South America:** Brazil (Ghahari et al., 2009), Peru (CABI, 2017). Based on a comparison of the geographic distribution of this species and a map of the global Plant Hardiness Zones (Magarey et al., 2008; Saha et al., 2010), we estimated that *Bemisia afer* could establish in Plant Hardiness Zones 9-13. Plant Hardiness Zones 9-12 exist in the continental United States, and host plants for this species occur throughout these Zones. Additionally, Malumphy (2003) reported that this species survived outdoors at near freezing temperatures in Britain, suggesting that it may be more cold tolerant than many tropical whiteflies.
Potential hosts at risk in PRA Area	*Bemisia afer* has been reported from the following hosts: **Annonaceae:** *Annona* sp. (Evans, 2008); **Apocynaceae:** *Cynanchum* sp.; **Convolvulaceae:** *Ipomoea batatas* (sweetpotato) (Gamarra et al., 2010); **Euphorbiaceae:** *Flueggea* sp., *Manihot esculenta* (cassava), *Ricinus communis* (castorbean); **Fabaceae:** *Acacia* sp., *Albizia* sp., (Evans, 2008), *Arachis hypogaea* (groundnut), *Cassia javanica* (introduced in FL), *Bauhinia* sp., *Cassia* sp., *Dalbergia sissoo* (rosewood), *Dalbergia* sp., *Erythrina* sp., *Lonchocarpus* sp. (all introduced in the continental United States), *Millettia pinnata*, *Phaseolus vulgaris* (Bean) (Thindwa and Khonje, 2005), *Robinia pseudoacacia* (black locust), *Senna siamea*, *Senna* sp., *Tamarindus indica* (tamarind), *Tephrosia* sp.; **Lauraceae:** *Laurus nobilis* (bay laurel); **Malvaceae:** *Gossypium hirsutum* (cotton) (Ghahari, et al., 2009), *Gossypium* sp. (Abd-Rabou, 2008); **Moraceae:** *Ficus* sp. (fig), *Morus alba* (mulberry) (Mound & Halsey, 1978; Ouvrard and Martin, 2017); **Myrtaceae:** *Psidium guajava* (guava) (Anderson et al., 2001);

	Rosaceae: *Rosa multiflora*, *Rosa* sp. (Evans, 2008);**Rutaceae:** *Citrus aurantium* (sour orange, bitter orange) (Abd-Rabou and Ahmed, 2008), *Citrus limon*, *Citrus limonia*, *Citrus sinensis* (Evans, 2008). *Citrus* sp. (Luo & Zhou, 2001). Addtionally, Fu et al. (1998) reported *B. afer* as a pest of *Glycine max* (soybean) in Fuzhou Province, China. One or more of these hosts are found throughout the climatic zones of the continental United States suitable for the survival of *Bemisia afer* (Kartesz, 2015; NRCS, 2017).
Economically important hosts at risk[a]	Economically important agricultural hosts present in the areas of the continental United States suitable for the survival of *B. afer* include bean (*Phaseolus vulgaris*), cassava (*Manihot esculenta*), citrus (*Citrus* sp.), cotton (*Gossypium hirsutum*), groundnut (*Arachis hypogaea*), fig (*Ficus* sp.) soybean (*Glycine max*) and sweetpotato (*Ipomoea batatas*) (Kartesz, 2015; NRCS, 2017). One potential host listed by the Federal government as Threatened or Endangered (50 CFR §17.12) that occurs in areas of the continental United States suitable for the survival of *Bemisia afer* is *Manihot walkerae* (Texas); and *Dalbergia brownei* is listed as Endangered by the state of Florida (NRCS, 2017).

Pest potential on economically important hosts at risk	*Bemisia afer* is considered to be highly polyphagous and has been reported to feed on species in over 50 plant families (Evans, 2008); however, we found only one account of any significant damage to economically important plants in the literature. Fu et al. (1998) reported serious damage to soybean in Fujian Province, China; however, there were no subsequent reports of such damage, suggesting that this is not a widespread phenomenon. Malumphy (2003) reported that heavy infestations can reduce crop yield and plant vigor, cause premature leaf drop, and the production of honeydew can lower the marketability of ornamental plants. However, these are all effects that are typically reported for whiteflies. Malumphy et al. (2015) concluded that the *B. afer* complex was not likely to have a significant impact on cultivated plants in Montenegro, and Malumphy (2003) made similar statements about damage to outdoor plants in the United Kingdom. Thindwa and Khonje (2005) found *B. afer* on cassava, common bean and unidentified weeds in Malawi, but not on other vegetable crops, and no mention was made of specific damage caused by this species. Because we found only one report of significant economic damage, we conclude that *B. afer* does not regularly cause economic damage to crops. *Bemisia afer sensu lato* has recently been shown to be a vector of sweet potato chlorotic stunt virus, the most important virus affecting sweetpotato (Gammara et al., 2010). This pathogen only affects sweetpotato, and both the virus and primary vector, *B. tabaci* (Gamarra et al., 2010), are already present in the United States (CABI, 2017). Given that there is little evidence of crop damage, and that this species is only known to transmit one virus, which already occurs in the United States along with its primary whitefly vector, we conclude that no economically important hosts are significantly at risk from *B. afer*.
Defined Endangered Area	We estimated that *B. afer* could establish in Plant Hardiness Zones 9-12 in the continental United States and host plants for this species occur throughout these areas. Economically important hosts of *B. afer* present in these areas include bean (*Phaseolus vulgaris*), cassava (*Manihot esculenta*), citrus (*Citrus* sp.), cotton (*Gossypium hirsutum*), groundnut (*Arachis hypogaea*), fig (*Ficus* sp.) and sweetpotato (*Ipomoea batatas*). *Manihot walkerae* is a potential host for this species, occurs in areas where *B. afer* could establish, and is listed by the Federal government as Threatened or Endangered (50 CFR §17.12). Additionally, *Dalbergia brownei* is listed as Endangered by the state of Florida (NRCS, 2017).

Assessment of the likelihood of introduction of *Bemisia afer* into the endangered area via the importation of oha leaves from Nigeria

Risk Element	Risk Rating	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Likelihood of Entry			
Risk Element A1: Pest prevalence on the harvested commodity (= the baseline rating for entry)	High	U	*Bemisia afer* has been reported from *Pterocarpus lucens* (Evans, 2007; 2008), and not *P. mildbraedii*. Therefore, its association with *P. mildbraedii* is uncertain, and the pest population levels that might be encountered are unknown. Adult whiteflies are capable of flight and likely to take flight during harvesting; therefore, they would not be found on the harvested product. However, the eggs, nymphs and puparia of whiteflies are sessile and intimately associated with leaves, are often difficult to detect, and could be on the harvested commodity. Therefore, we rate this risk element (A1) as High, with High uncertainty due to the unknown host status of *P. mildbraedii*.
Risk Element A2: Likelihood of surviving post-harvest processing before shipment	High	MC	No details about post-harvest processing were provided by Nigeria; therefore, this analysis assumes the leaves are harvested and packed in shipping cartons, and that no post-harvest processing has occurred (see section 1.4). Based on this assumption, the rating for the previous risk element (A1) remains unchanged.
Risk Element A3: Likelihood of surviving transport and storage conditions of the consignment	High	MC	The leaves will be transported by air-freight one day after harvest and will be refrigerated at an unspecified temperature. Caciagli (2008) notes that whitefly eggs

			and nymphs are more resistant to cold than adults, and the puparia can survive on desiccated leaves. Additionally, Malumphy (2003) reported that this species survived outdoors at near freezing temperatures in Britain. Hence, there is no evidence to suggest that the transport and storage conditions of the consignment will increase or decrease the pest population. Based on this evidence, the rating for the previous risk element (A2) remains the same.
Risk Element A: Overall risk rating for likelihood of entry	High	N/A	The overall risk rating is High with uncertainty due to the substantial lack of detailed information for all of the elements in Risk Element A.
Likelihood of Establishment			
Risk Element B1: Likelihood of coming into contact with host material in the endangered area	Low	MC	Successful establishment can occur only when the imported leaves are placed in close proximity to a susceptible host. This is highly unlikely to occur. The oha leaves are intended for consumption as a cooked vegetable (Faseyitan, 2015), and are likely to be consumed. Oha leaves are primarily used in soups, and are likely to be purchased in small quantities with little waste material requiring disposal, and only a small possibility that disposal would occur outdoors. Munthali (1992) studied *B. afer* in the field on cassava under field conditions in Malawi. Development time varied from 27 days (at 25°C) to 59.5 days (20°C), and females lived 4-22 days producing 0.9-5.4 eggs per day.

			The adults can fly, and live up to 22 days, but are unlikely to be found on the commodity (see above). Eggs on the leaves hatch into 'crawlers' with a limited ability to disperse (van Lenteren and Noldus, 1990). The nymphs that follow are sessile and incapable of dispersing to find new host material (van Lenteren and Noldus, 1990). Additionally, crawlers and older nymphs require living leaves to complete their life cycle, and harvested leaves are likely to degrade quickly and become unsuitable for these instars. Whiteflies arriving as puparia and then transforming to flying adults represent the only real possibility of dispersing and coming into contact with host material in the endangered area. Puparia can survive desiccation of the leaves and emerge as adults in a few days; however, adult whiteflies are generally weak fliers (Caciagli, 2008). Based on this evidence, we rated this risk element (B1) as Low with Moderate Certainty that this species has a limited ability to disperse and come into contact with host material in the endangered area.
Risk Element B2: Likelihood of arriving in the endangered area	High	MU	We do not have specific information on where the commodity (and therefore any pests associated with it) will be moved in the PRA area. In the absence of this information, we assume that the commodity will move throughout the PRA area in proportion to consumer

			population size, with more populous areas getting more of the commodity than less populous areas. Following guidance in PPQ (2012), we rated this risk as High, as more than 25 percent (27.7%) of the U.S. population lives in the endangered area (PERAL, 2015).
Risk Element B: Combined likelihood of establishment	Medium	N/A	We rated the combined likelihood of establishment for *Bemisia afer* as Medium because the ratings for risk element (B1) was Low and risk element (B2) was High. There is fairly high uncertainty surrounding the potential cold hardiness of this species.
Overall Likelihood of Introduction			
Combined likelihoods of entry and establishment	Medium	N/A	

[a]C=Certain, MC=Moderately Certain, MU=Moderately Uncertain, U=Uncertain

Assessment of the consequences of introduction of *Bemisa afer* into the continental United States (i.e., the PRA area)

Criteria	Meets criteria? (Y/N)	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Direct Impacts			
Risk Element C1: Damage potential in the endangered area	No	U	Malumphy (2003) reported that heavy infestations of *B. afer* can reduce crop yield and plant vigor, cause premature leaf drop, and that the production of honeydew can lower the marketability of ornamental plants, all symptoms that are typically reported for whiteflies. Most of the literature on this species does not mention damage, and Malumphy (2003; 2015) stated that there should be little impact from this pest in the United Kingdom and Montenegro, respectively. *Bemisia afer* has recently been shown to be a vector of sweet potato chlorotic stunt virus, the most important virus affecting sweetpotato (Gammara et al., 2010). This pathogen only affects sweetpotato, and both the virus and primary vector, *B. tabaci* (Gammara et al., 2010), are already present in the United States (CABI, 2017). Given that there is little evidence of crop damage and that this species is only known to transmit one virus which already occurs in the United States along with its primary vector, we conclude that no economically important hosts are at risk from *B. afer*.
Risk Element C2: Spread potential	N/A	N/A	
Risk Element C: Pest introduction is likely to	No	N/A	This species appears to be similar to other whiteflies already in the United States. It is

cause unacceptable direct impacts			likely that it does not cause significant damage, and it is likely to be controlled by the methods used for other whiteflies. Although the transmission of sweet potato chlorotic stunt virus is potentially a serious consideration, this virus already occurs in the United States (Abad et al., 2007), and is transmitted by another species of whitefly already widespread in the United States (CABI, 2017).
Trade Impacts			
Risk Element D1: Export markets at risk	Yes	C	The United States exports bean, citrus, cotton, groundnut (peanut), fig, and sweetpotato (FAS, 2017). The United States exported peanuts (groundnut) valued at 393 million dollars in 2016. The majority of these went to China, Mexico and other countries where *B. afer* is present; however, almost 20 percent of the peanuts were exported to Canada, were the pest is not present (FAS, 2017). U.S. exports of cotton were valued at almost four billion dollars in 2016, and almost 20 percent of this total was exported to Vietnam, a country where this pest is not known to be present (FAS, 2017). U.S. exports of citrus were valued at over one billion dollars in 2016, and almost 25 percent of the citrus went to Canada, a country where *B. afer* is not present (FAS, 2017). Over 10 percent of the total value of each of the three export commodities listed above are

			exported to countries where the pest is not present. Therefore, we conclude that export markets are potentially at risk. However, we note that the establishment of *B. afer* would be unlikely in Canada, and many countries in northern Europe. Additionally, whiteflies are primarily found on leaves, and those occurring incidentally on fruit or vegetables would be unlikely to remain after normal post-harvest handling procedures. Whiteflies would not be found on the harvested cotton boll, which is generally dry and unsuitable for whiteflies at harvest, and the hull is removed in post-harvest handling to retrieve the marketable fiber.
Risk Element D2: Likelihood of trading partners imposing additional phytosanitary requirements	No	MC	*Bemisia afer* is not listed as a Harmful Organism by any country; however, its synonym, *Bemisia citricola* Gomez-Menor, is listed as a Harmful Organism by Australia, Nauru and the Republic of Korea (APHIS, 2017a). *Bemisia afer* is present in both Australia and Korea (Evans, 2008), so it is likely that this synonym is an artifact that has not been removed from the lists of these countries. Therefore we conclude that it is unlikely that trading partners would impose additional phytosanitary requirements.
Risk Element D: Pest is likely to cause significant trade impacts	No	N/A	It is unlikely that any trading partners would impose additional phytosanitary requirements. Therefore, *B. afer* is not a threshold pest.

Conclusion		
Is the pest likely to cause unacceptable consequences in the PRA area?	No	N/A

[a]C=Certain, MC=Moderately Certain, MU=Moderately Uncertain, U=Uncertain

3.2.6. *Catalebeda producta* (Walker) (Lepidoptera: Lasiocampidae)

We determined that no members of the genus, to which the only recorded host of *C. producta* belongs, occur within the continental United States. Therefore, we conclude that there are no potential hosts at risk in the PRA area. Because no endangered area existed, we did not need to analyze the likelihood of introduction or consequences of introduction. Additionally, as with the other species of Lepidoptera analysed in this PRA, we conclude that the primary risk is that eggs of this species would arrive on the commodity, and that the imported oha leaves would not remain a viable food sourse for the duration of time necessary for these eggs to develop into pupae or reproductive adults.

We found very little literature regarding this species. The lack of information on geographic distribution and host range imparts some uncertainty on our analysis of this species. However, no damage has been reported for this species in Africa, and it is likely that typical management strategies used for Lepidoptera would also control this species, were it to occur.

Determination of the portion of the continental United States endangered by *Catalebeda producta*

Climatic suitability	*Catalebeda producta* has the following geographic distribution: Africa: Angola (Goff, 2017; Tams, 1936), Gabon (Goff, 2017), Nigeria (Medler, 1980), Sierra Leone (Hargreaves, 1937). Based on a comparison of the geographic distribution of this species and a map of the global Plant Hardiness Zones (Magarey et al., 2008; Saha et al., 2010), we estimated that *C. producta* could establish in Plant Hardiness Zones 11-13. Plant Hardiness Zones 11-12 exist in the continental United States; however, no host plants for this species occur in these Zones.
Potential hosts at risk in PRA Area	The only host of record is *Pterocarpus indicus*, and no species of *Pterocarpus* occur in the continental United States. Therefore, we conclude that no suitable host material is found in the portion of the PRA area climatically suitable for the establishment of this species.
Economically important hosts at risk[a]	There are no economically important hosts at risk in the PRA area.
Pest potential on economically important hosts at risk	Members of the Lasiocampidae are defoliators (Roberts, 1969); however; no reports of damage by this species were found in the literature. There are no economically important hosts at risk in the PRA area; therefore, we conclude that the pest potential on economic hosts at risk is negligible.
Defined Endangered Area	We determined that no portion of the continental United States is likely to be endangered by *Catalebeda producta* because potential hosts are

	not present in the portion of the PRA area climatically suitable for the pest's continued survival.

[a] As defined by ISPM No. 11, supplement 2, "economically" important hosts refers to both commercial and non-market (environmental) plants (IPPC, 2017b).

3.2.7. *Charaxes achaemenes* C. Felder & R. Felder (Lepidoptera: Nymphalidae)

We determined the overall likelihood of introduction of *C. achaemenes* to be Negligible because the likelihood of establishment is Negligible. We present the results of this assessment in the table below. We determined that adults, larvae and pupae of this species would not follow the pathway, and that eggs would be the only stage that might be on the shipped commodity. Were eggs to survive harvest, shipping and transport, they would have to hatch, the larvae feed and develop into flying adults, and these adults would then have to find both mates and hosts. This is highly unlikely to occur. There are only three potential hosts, and these hosts are only available in two states (Kartesz, 2015; NRCS, 2017), limiting the opportunity to find host material, and the potentially endangered area consists of only two counties in Florida. Additionally, Roberts (1969) observed that larvae of the related species, *Charaxes jasius* (L.), feed for at least 34 days before pupating. If *C. achaemenes* has a similar developmental time, it is highly unlikely that any oha leaves discarded after arrival in the United States would remain viable as a larval food source for this length of time. Therefore, we concluded that there is little likelihood of this species coming into contact with host material in the endangered area, and determined that a full pest analysis is not needed.

The primary uncertainty regarding our analysis of *C. achaemenes* on economically important hosts is the limited information available on the host range. However, no damage has been reported for this species in Africa, and it is likely that typical management strategies used for Lepidoptera would also control damage from this species, were it to occur.

Determination of the portion of the continental United States endangered by *Charaxes achaemenes*

Climatic suitability	*Charaxes achaemenes* has the following distribution: **Africa:** Angola, Botswana, Burkina Faso, Cameroon, Central African Republic, Ethiopia, Gambia, Ghana, Guinea, Ivory Coast, Kenya, Malawi, Mozambique, Namibia, Nigeria, Senegal, South Africa, Sudan, Tanzania, Uganda, Zaire, Zambia and Zimbabwe (van Someren, 1970; Venters, 1998). Based on a comparison of the geographic distribution of *C. achaemenes* and a map of the global Plant Hardiness Zones (Magarey et al., 2008; Saha et al., 2010), we estimated that this species could establish in Plant Hardiness Zones 10-13. Plant Hardiness Zones 10-12 occur in the southern United States.
Potential hosts at risk in PRA Area	Venters (1998) lists eight hosts for this species, including two plants in the genus *Dalbergia*. None of the other host genera occur in the United States; however, three species of *Dalbergia* occur in the state of Florida, and one occurs in Arizona (Kartesz, 2015; NRCS, 2017), representing potential hosts in the PRA area where climatic conditions are suitable for the pest's survival.

Economically important hosts at risk[a]	None of the reported hosts are agriculturally important in the United States. One species, *Dalbergia brownei*, is listed as Endangered by the state of Florida and occurs at the southern tip of Florida in Miami-Dade and Monroe counties (Kartesz, 2015; NRCS, 2017). This plant is not listed as Federally Threatened or Endangered (USFWS, 2017)
Pest potential on economically important hosts at risk	No reports of economic damage for *C. achaemenes* were found; however, Roberts (1969) reported that the larvae of *Charaxes jasius epijasius* strip most of the leaves off young trees two to four meters high, but did not report any plant mortality from the defoliation. Therefore, although the larvae may defoliate smaller plants, it is unlikely that this species represents a significant threat to *Dalbergia brownei* in Florida, and we conclude that the pest potential on economic hosts at risk is minimal.
Defined Endangered Area	The Endangered Area is confined to Miami-Dade and Monroe counties in Florida where *Dalbergia brownei*, a plant listed as Endangered by the state of Florida, occurs. We determined that this is the only area in the continental United States where both an economically important plant and climatic conditions suitable for the pest's survival exist.

Assessment of the likelihood of introduction of *Charaxes achaemenes* into the endangered area via the importation of oha leaves from Nigeria

Risk Element	**Risk Rating**	**Uncertainty Rating[a]**	**Justification for rating and explanation of uncertainty (and other notes as necessary)**
Likelihood of Establishment			
Risk Element B1: Likelihood of coming into contact with host material in the endangered area	Negligible	C	There is little likelihood of this species coming into contact with host material in the endangered area. Were eggs to survive harvest, shipping and transport, they would have to hatch, the larvae feed and develop into flying adults. These adults would then have to find both mates and hosts. This is highly unlikely to occur. Roberts (1969) observed that the larvae of the related species, *Charaxes jasius epijasius*, feed for at least 34 days before pupating. If *C. achaemenes* has a similar developmental time, it is highly unlikely that any oha leaves discarded after arrival would remain viable as a larval food source for this length of time.

Risk Element	**Risk Rating**	**Uncertainty Rating**[a]	**Justification for rating and explanation of uncertainty (and other notes as necessary)**
Risk Element B2: Likelihood of arriving in the endangered area	N/A		
Risk Element B: Combined likelihood of establishment	Negligible	N/A	

[a]C=Certain, MC=Moderately Certain, MU=Moderately Uncertain, U=Uncertain

3.2.8. *Eutetranychus orientalis* (Klein) (Prostigmata: Tetranychidae)

We determined the overall likelihood of introduction of *Eutetranychus orientalis* to be Medium. We present the results of this assessment in the table below. We conclude that if the pest arrives on imported oha leaves for consumption, it is likely to encounter a suitable climate; however, due to its limited ability to disperse, it is unlikely to find suitable hosts. Additionally, the assumed host association with *P. mildbradeii* is based solely on *E. orientalis* having been found on another species of *Pterocarpus*.

We determined that establishment of *E. orientalis* in the continental United States is unlikely to cause unacceptable impacts. We present the results of this assessment in the table below. Although this species is recorded from many hosts, it is unlikely to cause crop losses of over 10 percent in any crop, and severe damage to citrus appears to be very rare and occurs only in limited circumstances (Smith Meyer, 1998). This mite is also likely to be controlled by practices already in place for the control of other mites.

Determination of the portion of the continental United States endangered by *Eutetranychus orientalis*

Climatic suitability	*Eutetranychus orientalis* has the following geographic distribution: **Asia:** Afghanistan, Bangladesh, China, Cyprus, Hong Kong, India, Indonesia, Iran, Iraq, Japan, Jordan, Kuwait, Lebanon, Malaysia, Pakistan, Saudi Arabia, Taiwan, Thailand, Turkey, United Arab Emirates, Vietnam, Yemen (Bolland et al., 1998; CABI, 2016); **Africa:** Cape Verde, Egypt, Ethiopia, Kenya, Libya, Malawi, Mali, Mauritania, Morocco (Mazih, 2015) Mozambique, Nigeria, Senegal, South Africa, Sudan, Swaziland, Tunisia, (Bolland et al., 1998; CABI, 2016); **Europe:** Greece (Anagnou-Veroniki et al., 2008), Spain (Bolland et al., 1998; CABI, 2016); **Oceania:** Australia, (Bolland et al., 1998; CABI, 2016). Based on a comparison of the current distribution of *E. orientalis* and a map of the global Plant Hardiness Zones (Magarey et al., 2008; Saha et al., 2010), we estimated that this spider mite could establish in Plant Hardiness Zones 8-13. Zones 8-12 occur in the continental United States and one or more of its potential hosts occur in these zones (Kartesz, 2015; NRCS, 2017).

Potential hosts at risk in PRA Area	*Eutetranychus orientalis* is primarily a pest of citrus (Jeppson et al., 1975), but has been reported on 214 host plants belonging to 60 families including: **Euphorbiaceae**: *Euphorbia* spp.; **Fabaceae**: *Acacia* spp., *Albizia* spp., *Bauhinia* spp., *Cassia* spp., *Erythrina* spp., *Glycine max* (soybeans); **Lauraceae:** *Persea americana* (avocado), *P. borbonia* (red bay), **Malvaceae:** *Gossypium* sp. (cotton); **Moraceae:** *Ficus* spp. (fig), *Morus alba* (mulberry); **Myrtaceae:** *Psidium guajava* (guava); **Punicaceae:** *Punica granatum*; **Rosaceae:** *Prunus* spp., *Rosa* spp., *Pyrus* spp.; **Rutaceae:** *Citrus* spp., and **Vitaceae:** *Vitis vinifera* (grape) (Bolland et al., 1998; Migeon and Dorkeld, 2016). One or more potential hosts occurs throughout global Plant Hardiness Zones 8-12 in the continental United States (Kartesz, 2017; NRCS, 2017).
Economically important hosts at risk[a]	Economically important agricultural hosts present in the area of concern include *Citrus* spp., *Prunus* spp., *Glycine max* (soybean) and *Vitis vinifera* (grape). Examples of potential hosts listed by the Federal government as Threatened or Endangered (50 CFR §17.12) that occur in areas of the continental United States suitable for the survival of *E. orientalis* include *Euphorbia telephioides*, *Cucurbita okeechobeensis* ssp. *okeechobeensis* and *Prunus geniculata* (Florida), *Manihot walkerae* (Texas), *Helianthus eggertii* (Alabama), *H. paradoxus* (New Mexico, Texas), *H. schweinitzii* (North Carolina, South Carolina), and *Ziziphus celata* (Florida). These plants are closely related to other plants known to be attacked by *E. orientalis* (Bolland et al., 1998).
Pest potential on economically important hosts at risk	*Eutetranychus orientalis* is an important agricultural pest. It is included on the ranked list of potentially invasive Tetranychoidea by the Acarological Society of America (Childers et al., 2006) and it is listed as a high priority pest (A list) on the Prioritized Offshore Pest List (APHIS, 2012). The species is often a minor pest of citrus that generally feeds on the upper leaf surface. It generally causes a chlorotic stippling of the leaf and fruit, premature leaf drop and dieback of shoots and twigs (Dhooria and Butani, 1984; Smith Meyer, 1998). Heavy economic losses can occur under specific conditions, such as drought or when secondary outbreaks occur due to the use of insecticides in orchards (Walter et al., 1995; Smith Meyer, 1998).
Defined Endangered Area	Based on its current distribution and the distribution of its host plants in the continental United States, we define the area endangered by *Eutetranychus orientalis* to be global Plant Hardiness Zones 8-12 which occur in the southern continental United States.

[a] As defined by ISPM No. 11, supplement 2, “economically” important hosts refers to both commercial and non-market (environmental) plants (IPPC, 2017b).

Assessment of the likelihood of introduction of *Eutetranychus orientalis* into the endangered area via the importation of oha leaves from Nigeria.

Risk Element	Risk Rating	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Likelihood of Entry			
Risk Element A1: Pest prevalence on the harvested commodity	Medium	U	*Pterocarpus macrocarpus* is reported as a host of *E. orientalis* (Baker, 1975); however, the mite's association with this plant is unclear and the status of *P. mildbraedii* as a host is unknown, as are the population levels that might be expected. High population densities have been observed on citrus, and all life stages occur on the leaves (Jeppson et al, 1975; Smith Meyer, 1998). Feeding damage on citrus includes a chlorotic stippling of the leaf (Smith Meyer, 1998). If this mite caused similar damage on *P. mildbraedii*, it would make it less likely that heavily-infested leaves would be harvested. Due to the complete lack of data regarding the true host status of congener *P. macrocarpus*, and the presumed association with *P. mildbraedii*, we rated this risk element (A1) as Medium with a High level of uncertainty.
Risk Element A2: Likelihood of surviving post-harvest processing before shipment	Medium	MC	No details about post-harvest processing were provided by Nigeria; therefore, this analysis assumes the leaves are harvested and packed in shipping cartons, and that no post-harvest processing has occurred (see section 1.4). Based on this assumption, the rating for the previous risk element (A1) remains unchanged.

Risk Element A3: Likelihood of surviving transport and storage conditions of the consignment	Medium	MC	The leaves will be transported by air-freight one day after harvest and will be refrigerated at an unspecified temperature. There is no evidence to suggest that the transport and storage conditions of the consignment will increase or decrease the pest population. Based on this evidence, the rating for the previous risk element (A2) remains the same. There are no approved quarantine treatments available for this species (PPQ, 2016).
Risk Element A: Overall risk rating for likelihood of entry	Medium	N/A	The overall risk rating is Medium with high uncertainty due to the substantial lack of detailed information for all of the elements included in Risk Element A.
Likelihood of Establishment			
Risk Element B1: Likelihood of coming into contact with host material in the endangered area	Low	MC	The fecundity of female spider mites generally ranges between 30 and 50 eggs per female (Jeppson et al., 1975), and under optimal conditions, *E. orientalis* can have up to 27 generations per year (CABI, 2016; Smith Meyer, 1981). Although spider mites have a high biotic potential, they would also have to find susceptable hosts in the new environment. This is highly unlikely to occur. The oha leaves are intended for consumption as a cooked vegetable (Faseyitan, 2015), and are likely to be consumed. Oha leaves are primarily used in soups, and are likely to be purchased in small quantities with little waste material requiring disposal, and only a small possibility that disposal would occur outdoors. “Ballooning” on wind currents is spider mites main means of

			natural dispersal and long-distance dispersal is accomplished via infested plant material and by ballooning (CABI, 2016; Jeppson et al., 1975). Spider mites are common components of the so-called "aerial plankton" (e.g., Thomas & Zeh, 1984; Margolies, 1993; Flø & Hågvar, 2013), the assemblage of small animals, particularly arthropods, transported on high-altitude winds. However, *E. orientalis* is reported not to produce much silk, and ballooning has not been observed in the species (EFSA, 2013). Therefore, although *E. orientalis* has a high biotic potential and wide host range, it is unlikely to be able to disperse and find suseptable hosts. Therefore, we rated this risk element (B1) as Low.
Risk Element B2: Likelihood of arriving in the endangered area	High	MU	No information was provided about the ultimate distribution of the oha leaves imported into the United States; however, approximately 46 percent of the U.S. population lives in Plant Hardiness Zones 8-11 (PERAL, 2015) suggesting a high probability the commodity would arrive in the endangered area. Therefore, we rate the risk as High with Moderate Uncertainty due to the lack of shipping information.
Risk Element B: Combined likelihood of establishment	Medium	N/A	The combined likelihood of establishment of *Eutetranychus orientalis* in the continental United States is Medium with moderate uncertainty. If the pest arrives on imported oha leaves for consumption, although it is likely to encounter a suitable climate, it is unlikely to find suitable hosts.

Overall Likelihood of Introduction			
Combined likelihoods of entry and establishment	Medium	N/A	The combined likelihood of entry and establishment of *Eutetranychus orientalis* in the continental United States is Medium. If the pest arrives on imported oha leaves for consumption, it is likely to encounter a suitable climate; however, it is unlikely to find suitable hosts.

[a]C=Certain, MC=Moderately Certain, MU=Moderately Uncertain, U=Uncertain

Assessment of the consequences of introduction of *Eutetranychus orientalis* into the continental United States (i.e., the PRA area)

Criteria	Meets criteria? (Y/N)	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Direct Impacts			
Risk Element C1: Damage potential in the endangered area	No	MC	As mentioned above, *E. orientalis* is an important pest of citrus. However, severe damage, such as defoliation and twig dieback, appears to be very rare and occurs only in severe infestations and when environmental conditions are dry (Smith Meyer, 1998). Typical damage includes leaf feeding, resulting in gray spots and a chlorotic appearance (Jeppson et al., 1975). This damage is minor and is very similar to damage caused by other mites already present in the United States (eg. *Tetranychus urticae*), which shares many of the same hosts (Migeon and Dorkeld, 2016). Additionally, this mite is likely to be controlled by practices already in place for other mites in the United States. Although resistance to pesticides is quite common in other tetranychid mites, it has never been reported in *E. orientalis* (APRD, 2013). We conclude that the introduction of *E. orientalis* in the endangered area is unlikely to result in 10 percent or greater yield losses in any commodity, including *Citrus*. Its presence in the United States is not likely to cause significant increases in costs of production.
Risk Element C2: Spread potential	N/A	N/A	
Risk Element C: Pest introduction is likely to cause unacceptable direct impacts	No	N/A	

Criteria	Meets criteria? (Y/N)	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Trade Impacts			
Risk Element D1: Export markets at risk	No	MC	*Eutetranychus orientalis* is listed as a harmful organism by 15 countries and the European Union (APHIS, 2017), suggesting that its introduction could lead to restrictions on its primary host, *Citrus* spp. However, it is already distributed in many of the countries where U.S. citrus is exported (see distribution above), and unlikely to be able to establish in many others countries (eg. Canada) with colder climates (USDA-FAS, 2017). Although some commodities have the potential to host this mite on their leaves, U. S. export products including citrus, and most fruits and vegetables are usually considered mite-free after normal post-harvest practices. Therefore, although a report of this mite's introduction could cause a temporary loss of foreign markets, it is unlikely to have a long-term effect on trade. Addtionally, we determined that the value of exported commodities likely to have this pest, ship to countries free from the pest, and in which the pest is likely to be able to establish is less than 10 percent of the total export value of the commodity (USDA-FAS, 2016).

Criteria	**Meets criteria? (Y/N)**	**Uncertainty Rating[a]**	**Justification for rating and explanation of uncertainty (and other notes as necessary)**
Risk Element D2: Likelihood of trading partners imposing additional phytosanitary requirements	No	MC	Countries that import *Citrus* from the United States, such as Chile, already require an additional declaration that *Citrus* be free from mites such as *Brevipalpus lewisi* and *B. phoenicis* (APHIS, 2017a). Therefore, trading partners that are currently free from the pest do not seem likely to impose an export ban on host commodities, or require the implementation of additional phytosanitary measures, beyond what is already required for other mites present in the United States as a condition of export. However, because imposition of additional phytosanitary requirements would depend on the export market, uncertainty was increased because additional measures might be required in some cases.
Risk Element D: Pest is likely to cause significant trade impact	No	N/A	We determined that the value of exported commodities likely to have this pest, ship to countries free from the pest, and in which the pest is likely to be able to establish is less than 10 percent of the total export value of the commodity (USDA-FAS, 2016).
Conclusion			
Is the pest likely to cause unacceptable consequences in the PRA area?	No	N/A	

[a]C=Certain, MC=Moderately Certain, MU=Moderately Uncertain, U=Uncertain

3.2.9. *Maruca vitrata* (Fabricius) (Lepidoptera: Crambiidae)

We determined the overall likelihood of introduction of *M. vitrata* to be Negligible because the likelihood of establishment was Negligible. We present the results of this assessment in the table below. We determined that the most likely life stage that may be imported with oha leaves from Nigeria would be eggs. However, the entry of eggs on the commodity would not necessarily lead to establishment. In order for establishment to occur, multiple eggs must successfully hatch into larvae, and these larvae must feed on enough host leaves to mature through pupation, and become adults. Female moths would then have to mate successfully and find host plants for oviposition. We conclude that this scenario is unlikely, primarily because it is highly unlikely that the oha leaves would remain viable as a food source for the length of time it takes for the larvae to complete development. It is also highly unlikely that any females that completed development would find both mates and host plants.

Because the likelihood of introduction is Negligible, we did not need to analyze the consequences of introduction. However, the establishment of *M. vitrata* in the continental United States would be likely to cause unacceptable impacts. *Maruca vitrata* is a significant pest that has spread to many countries (see distribution below). Ganapathy (2010) reported that damage worldwide was about 25-40 percent in cowpea and 9-84 percent in pigeonpea, suggesting that some pest control measures would be necessary if this pest became established in the United States. Although there is potential for economic loss on crops grown in the United States, this species is likely to be controlled by standard IPM practices. Amatobi (1994) reported on insecticide field trials conducted in cowpeas for *M. vitrata* and the thrips, *Megalurothrips sjostedti* [also analyzed in this PRA], and found that all of the insecticides tested effectively controlled both species. Sonune et al. (2010) tested newer insecticides, and also successfully controlled damage caused by *M. vitrata*. However, it should be noted that this pest is documented as having developed resistance to some insecticides used to control it (Ekesi, 1999). Inspection of oha leaves for *M. vitrata* should not prove as challenging as the inspection of leguminous pods, where the larvae may be feeding internally.

Determination of the portion of the continental United States endangered by *Maruca vitrata*

Climatic suitability	*Maruca vitrata* is found throughout the tropics. It is often exported with legumes to other areas of the world, but is unable to survive in temperate climates (CABI, 2017). *Maruca vitrata* has the following geographic distribution: **Asia:** Bangladesh, Bhutan, Brunei, Cambodia, China (at least 19 provinces), India, Indonesia, Iran, Japan, Korea DPR, Republic of Korea, Laos, Malaysia, Maldives, Myanmar, Nepal, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam (CABI, 2017); **Africa:** Angola, Benin, Burkina Faso, Burundi, Cameroon, Cape Verde, Chad, Côte d'Ivoire, Democratic Republic of the Congo, Ethiopia, Gabon, Ghana, Kenya, Liberia, Madagascar, Malawi, Mali. Mauritius, Mozambique, Niger, Nigeria, Réunion, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe (CABI, 2017); **North America:** Mexico (CABI, 2017); **Central America and Caribbean:** Belize, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Panama, Puerto Rico, Trinidad, Tobago (CABI, 2017); **South America:** Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guyana, Guyana, Paraguay, Perú, Surinam, Uruguay, Venezuela (CABI, 2017); **Europe:** Belgium (few occurences), Denmark (few occurences), France, United Kingdom (CABI, 2017); **Oceania:** American Samoa, Australia, Fiji, French Polynesia, Guam, New Caledonia, Northern Mariana Islands, Papua New Guinea, Samoa, Solomon Islands, Tonga, United States (Hawaii), Vanuatu (CABI, 2017). This species has a restricted distribution in the United States (CABI, 2017) and is established in Hawaii (Passoa and Bean, 2001) and Puerto Rico (Wolcott, 1951), Guam, and American Samoa (CABI, 2017). Based on a comparison of the geographic distribution of this species and a map of the global Plant Hardiness Zones (Magarey et al., 2008; Saha et al., 2010), we estimated that *M. vitrata* could establish in global Plant Hardiness Zones 9-12 in the continental United States. Host plants for this species are present throughout this region.

Potential hosts at risk in PRA Area	*Maruca vitrata* feeds nearly exclusively on plants in the family Fabaceae, which are believed to be the true hosts for this species (Arodokoun et al., 2003). The list of potential hosts at risk includes: **Fabaceae:** *Arachis hypogaea* (groundnuts), *Caesalpinia* sp., *Cajanus cajan* (pigeon pea), *Cajanus* sp., *Canavalia ensiformis* (jack bean), *Canavalia* spp., *Crotalaria* spp., *Delonix regia*, *Gliricidia sepium*, *Glycine max* (soybeans), *Lablab purpureus*, *Mucuna* spp., *Phaseolus lunatus* (lima bean), *P. vulgaris* (common bean), *Pisum sativum* (garden pea), *Pueraria* sp. (Kudzu), *Sesbania* spp., *Tephrosia* spp., *Vigna* spp., *V. radiata*, *V. unguiculata* (cowpea) (CABI, 2017; Ferguson, 1983); **Euphorbiaceae:** *Ricinus* sp. (Robinson et al., 2017). Taylor (1978) and Ferguson (1983) also report plants from other families as hosts; however, Ferguson (1983) states that at least some of them need further verification. One or more of these potential hosts occur throughout global Plant Hardiness Zones 9-12 in the continental United States (Kartesz, 2017; NRCS, 2017).
Economically important hosts at risk[a]	*Maruca vitrata* is one of a group of Lepidoptera with pod-boring larvae. It is widespread in tropical areas, especially Africa and India, and most injurious to beans (*Cajanus cajan, Phaseolus vulgaris, Vigna unguiculata,* and *V. radiata*) (CABI, 2017). If introduced into the continental United States, it would be likely to attack these and other crops in the Fabaceae (e.g., peas, other types of beans). *Maruca vitrata* may also have direct or indirect impacts on *Crotalaria avonensis*, which is listed as Federally Endangered in the United States (50 CFR § 17.12). This plant occurs in three counties in southern Florida, and is listed as Endangered by the state of Florida (NCRS, 2017). Additionally, *Caesalpinia major* (3 counties in southern Florida), *Caesalpinia pauciflora* (2 counties in southern Florida) and *Tephrosia angustissima* (8 counties in southern and eastern Florida) are all listed as Endangered by the state of Florida (NRCS, 2017).
Pest potential on economically important hosts at risk	*Maruca vitrata* has the potential to damage economically important hosts or increase pest management costs. Although the larvae may feed on other parts of the plant, they do the greatest damage by feeding on the flowers and boring into the pods (Ferguson, 1983; Sharma et al., 1999). Karel (1985) indicated that *M. vitrata* larvae in Tanzania cause an average of 31 percent pod damage on beans. Loss of yield (of seed) due to the complex of pod-borer larvae (including *M. vitrata*) was 9 percent for pigeon pea in India (Patnaik et al., 1986), 33-53 percent for beans in Tanzania (Karel, 1985) and 63 percent for pigeon pea in Kenya (Okeyo-Owour and Khamala, 1980). Ganapathy (2010) reported that damage worldwide from this species was about 25-40 percent in cowpea and 9-84 percent in pigeonpea.

Defined Endangered Area	We estimated that *Maruca vitrata* could establish in Plant Hardiness Zones 9-12 in the southern continental United States and economically important host plants for this species occur throughout these areas. Economically important crop hosts present in the southern United States include bean (*Phaseolus vulgaris*), groundnut (*Arachis hypogaea*), pigeon pea (*Cajanus cajan*), and soybeans (*Glycine max*) (Kartesz, 2015; NRCS, 2017). There are also native species of concern in southern Florida that may serve as hosts.

[a] As defined by ISPM No. 11, supplement 2, "economically" important hosts refers to both commercial and non-market (environmental) plants (IPPC, 2017b).

Assessment of the likelihood of introduction of *Maruca vitrata* into the endangered area via the importation of oha leaves from Nigeria

Risk Element	Risk Rating	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Likelihood of Entry			
Risk Element A1: Pest prevalence on the harvested commodity (= the baseline rating for entry)	Low	MU	*Maruca vitrata* has been reported from the inflorescences of *Pterocarpus erinaceus* and *Pterocarpus santalinoides*, (Arodokoun et al., 2003), but not *Pterocarpus mildbraedii*; therefore, an association with *P. mildbraedii* is uncertain, and the potential pest prevalence on the commodity is unknown. Adult Lepidoptera are highly mobile insects and unlikely to remain on the harvested commodity after hand-harvesting and culling. Pupation occurs on the ground (Taylor, 1978), so this stage is also not likely to be on the harvested commodity. The larvae feed primarily on leguminous flowers and pods (Arodokoun et al., 2003; Karel, 1985; Taylor, 1978). An average of up to 0.8 larva per inflorescence was found on *P. santalinoides* (Arodokoun et al., 2003). In pigeon pea, the larvae roll the leaf, secure it with

			webbing, and feed within the rolled leaves (Ganapthy, 2010), and larvae on the leaves of the oha tree may behave similarly. Leaves that are rolled or those damaged by larval feeding would not be likely to be harvested. *Maruca vitrata* females normally deposit single eggs or batches of 2-16 eggs on flowers and flower buds in cowpeas; however, oviposition on leaves, terminal shoots and pods has also been reported (Taylor, 1978). From this evidence, we conclude that the eggs are the only stage that is likely to be on the harvested commodity. Further, although oviposition could occur on the leaves of oha, leaves are not be the preferred oviposition site, and the incidence of oviposition is likely to be very low. Therfore, we rated this element (A1) as Low with Moderate Uncertainty due to the lack of a verified association with *P. mildbraedii.*
Risk Element A2: Likelihood of surviving post-harvest processing before shipment	Low	MC	No details about post-harvest processing were provided by Nigeria; therefore, this analysis assumes that the leaves are harvested and packed in shipping cartons, and that no post-harvest processing has occurred (see section 1.4). Based on this assumption, the rating for the previous risk element (A1) remains unchanged.
Risk Element A3: Likelihood of surviving transport and storage conditions of the consignment	Low	U	The leaves will be transported by air-freight one day after harvest, and will be refrigerated at an unspecified temperature. There is no evidence to suggest that the transport and storage conditions of the consignment will decrease the pest population. Based on this

			evidence, the rating for the previous risk element (A2) remains the same. Uncertainty on this Risk Element (A3) rating is high, as further details about transport and storage conditions of the consignment would be likely to decrease the rating.
Risk Element A: Overall risk rating for likelihood of entry	Low	N/A	
Likelihood of Establishment			
Risk Element B1: Likelihood of coming into contact with host material in the endangered area	Negligible	C	There is little likelihood of this species coming into contact with host material in the endangered area. Were eggs to survive harvest, shipping and transport, they would have to hatch, the larvae feed and develop into flying adults. These adults would then have to find both mates and hosts. This is highly unlikely to occur. This species prefers flowers and pods, and shows the least preference for leaves (Karel, 1985); therefore, it is likely that the initial numbers of eggs would be low. Jackai and Singh (1983) reported larval development times ranging from a mean of 7.3 days on *Vigna unguiculata* to 21.0 days on *Crotalaria juncea*. Similar larval development periods are reported by other authors, and it is highly unlikely that the shipped leaves would remain viable as a larval food source for this length of time. Therefore, we conclude that any larvae resulting from the eggs laid on oha leaves would not have sufficient food to complete development, and that the likelihood of *M. vitrata* coming into contact with host material in the endangered area is Negligible.

Risk Element B2: Likelihood of arriving in the endangered area	N/A	N/A	
Risk Element B: Combined likelihood of establishment	Negligible	N/A	
Overall Likelihood of Introduction			
Combined likelihoods of entry and establishment	Negligible	N/A	

[a]C=Certain, MC=Moderately Certain, MU=Moderately Uncertain, U=Uncertain

3.2.10. *Megalurothrips sjostedti* (Trybom) (Thysanoptera: Thripidae)

We determined the overall likelihood of introduction of *M. sjostedti* to be Medium. We present the results of this assessment in the table below. This conclusion is based on the assumption that *M. sjostedti* cannot survive temperatures lower than those found in Zone 9. If this species can survive in cooler temperatures, the likelihood of introduction would increase.

We determined that establishment of *M. sjostedti* in the continental United States is unlikely to cause unacceptable impacts. We present the results of this assessment in the table below. Our conclusion is based on the assumption that the primary hosts of concern are plants in the family Fabaceae, and that *M. sjostedti* does not transmit any plant pathogens. If the species does transmit plant pathogens or has a broader host range which includes additional economically important plants, then the risk of unacceptable impacts would potentially increase.

There is a high level of uncertainty regarding the host range and potential for economic loss on crops grown in the United States; however, this species is likely to be controlled by standard IPM practices.

Determination of the portion of the continental United States endangered by *Megalurothrips sjostedti* (Trybom)

Climatic suitability	*Megalurothrips sjostedti* has the following geographic distribution: **Asia:** Saudi Arabia, Yemen (CABI, 2016; Moritz et al., 2013); **Africa:** Angola, Benin, Burundi, Cameroon, Central African Republic, Cape Verde, Chad, Comoros, Congo, Côte d'Ivoire (Ivory Coast), Ethiopia, Gabon, Gambia, Ghana, Kenya, Malawi, Mauritius, Mozambique, Namibia, Niger, Nigeria, Senegal, Seychelles, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe (CABI, 2016; Moritz et al., 2013). Based on a comparison of the geographic distribution of *M. sjostedti* and a map of the global Plant Hardiness Zones (Magarey et al., 2008; Saha et al., 2010), we estimated that this species could establish in Plant Hardiness Zones 9-13.
Potential hosts at risk in PRA Area	Most host records are from taxonomic surveys or online databases, not damage records. Plants in the family Fabaceae are the most frequently reported hosts, and *M. sjostedti* can reproduce on at least some

	members of this family. Potential hosts at risk in the PRA area include: **Fabaceae:** *Albizia lebbeck* (Indian siris), *Arachis hypogaea* (groundnut), *Caesalpinia pulcherrima* (peacock flower), *Cajanus cajan* (pigeon pea), *Cassia* spp. (sennas), *Centrosema* spp., *Clitoria ternatea* (Butterfly-pea), *Crotalaria ochroleuca*, *Crotalaria pallida* (smooth crotalaria), *Crotalaria* sp., *Delonix regia* (flamboyant), *Desmodium* sp. (tick clovers), *Dichrostachys cinerea* (sickle bush), *Glycine max* (soybean), *Indigofera hirsuta* (hairy indigo), *Indigofera tinctoria* (true indigo), *Lablab purpureus* (hyacinth bean), *Lens culinaris* (lentil), *Medicago sativa* (alfalfa), *Phaseolus lunatus* (lima bean), *Phaseolus vulgaris* (common bean), *Pisum sativum* (pea), *Senna didymobotrya*, *Vigna unguiculata* (cowpea) (CABI, 2016; Moritz et al., 2013). Hosts from other families are reported by Moritz et al. (2013); however, the status of these plants as reporoductive hosts has not been verified. Potential hosts at risk in the PRA area include: **Amaranthaceae:** *Amaranthus* sp.; **Anacardiaceae:** *Anacardium occidentale* (cashew), *Mangifera indica (*mango); **Asteraceae:** *Acanthospermum hispidum, Bidens pilosa, Helianthus* sp. (sunflower), *Sonchus oleraceus, Schkuhria pinnata, Tagetes minuta, Tithonia diversifolia*; **Brassicaceae:** *Brassica oleracea* (kale); **Chenopodiaceae:** *Spinacia oleracea* (spinach); **Convolvulaceae:** *Ipomoea batatas* (sweet potato); **Cucurbitaceae:** *Citrullus lanatus* (watermelon), *Cucurbita pepo* (pumpkin); **Euphorbiaceae:** *Manihot esculenta* (cassava); **Lamiaceae:** *Leonotis nepetifolia*; **Lauraceae:** *Persea americana* (avocado); **Liliaceae:** *Allium cepa* (onion); **Malvaceae:** *Abelmoschus esculentus* **(**okra), *Gossypium* sp. (cotton), *Sida acuata;* **Meliaceae:** *Melia azadirach* (chinaberry tree); **Moraceae:** *Ficus benjamina* (fig), *Morus alba* (mulberry); **Musaceae:** *Musa sp.* (banana); **Poaceae:** *Sorghum bicolor* (sorghum), *Zea mays* (maize); **Rutaceae:** *Citrus* spp. (lemon, orange); **Solanaceae:** *Capsicum* spp. (peppers), *Nicandra physalodes*, *Solanum lycopersicum* (tomato), *Solanum tuberosum* (potato), *Solanum* spp.; **Verbenaceae:** *Lantana camara* (Moritz et al., 2013). One or more potential hosts (e.g. *Albezia* sp., *Centrosema* spp., *Phaseolus* spp.) occur throughout the area delineated by global Plant Hardiness Zones 9-12 in the continental United States (Kartesz, 2017; NRCS, 2017).

Economically important hosts at risk[a]	Economically important hosts at risk include leguminous crops, such as cowpea (Ezueh, 1981; Salifu, 1992; Taylor, 1974; 1978), groundnut (Moulton, 1930; Nonveiller, 1973), pigeon pea (Singh and Taylor, 1978; Okwakpam and Youdeowei, 1980), soybeans (Taylor, 1978), common beans (Cardona and Karel, 1990) and lima bean (Singh et al., 1978) as well as other types of peas and beans. Alternative cultivated hosts include avocado (Hill, 1983). Examples of potential hosts listed by the Federal government as Threatened or Endangered (50 CFR §17.12) that occur in areas of the continental United States suitable for the survival of *M. sjostedti* include *Clitoria fragrans* and *Crotalaria avonensis*, which are both native to Florida and listed as Threatened and Endangered, respectively. Genera where the host association with this thrips is not verified were not considered.
Pest potential on economically important hosts at risk	*Megalurothrips sjostedti* is a major pest of cowpea and other leguminous crops in Africa (Singh and van Emden, 1979; Taylor, 1974), and would be likely to attack the crops listed above and other crops in the Fabaceae (e.g. other types of beans) if introduced into the United States. This species feeds on legume flowers and flower buds causing abscission (Salifu, 1992), and can cause a loss of yield in some situations. Studies in cowpea show yield loss estimates ranging from 40 percent in Nigeria (Ezueh, 1981), 30-90 percent in Sengal (Bal, 1991), and 100 percent in Ghana (Agyen-Sampong, 1978) when no control measures are taken. Ezueh (1981) found that a significant reduction in cowpea yield only occurs when the thrips infestation extends past 35 days from planting. This species can also cause up to 100 percent yield loss in African yam bean (Ogah, 2011). The capacity of this pest to cause economic damage on many crops has not been investigated. The damage reported above suggests that this species could have a significant impact on leguminous crops grown in the United States; however, this is unlikely to occur. Studies have shown *Megalurothrips sjostedti* can be controlled with insecticides (Amatobi, 1994), and there is no evidence indicating it has developed pesticide resistance. Additionally, studies on African yam bean show that earlier planting dates and resistant cultivars can significantly reduce the impact of this pest (Ogah, 2011), and there is no evidence this species transmits any plant pathogen.
Defined Endangered Area	Based on its current global distribution and the distribution of its host plants in the continental United States, we define the area endangered by *Megalurothrips sjostedti* to be global Plant Hardiness Zones 9-12 which occur in the southern portion of the continental United States.

Risk Element	Risk Rating	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Likelihood of Entry			
Risk Element A1: Pest prevalence on the harvested commodity (= the baseline rating for entry)	Medium	U	The host status of *Pterocarpus mildbraedii* is unknown; however, *M. sjostedti* has been collected in high numbers from the flowers of both *P. erinacaeus* and *P. santalinoides* in the Republic of Benin, West Africa, and both plants are considered to be important alternative hosts during the dry season (Tamó et al., 1993a; Tamó et al., 2002). The life cycle of *M. sjostedti* has been studied in cowpeas. The prepupal and pupal stages live in the soil and only the eggs, larvae, and adults occur on the plant (Tamó et al., 1993b). This species is usually associated with the flowers; however it will feed on the leaves of cowpea (Ezueh, 1981), and groundnut (Nonveiller, 1973). It will oviposit on leaves when flowers are unavailable, and the eggs are inserted into the plant tissues (Salifu, 1992), including the leaf petiole (Tamó et al., 1993b). Because the leaves are generally not the preferred feeding site for this species, we assigned a risk rating of Medium. There is a High level of uncertainty regarding the status of *P. mildbraedii* as a host.
Risk Element A2: Likelihood of surviving post-harvest processing before shipment	Medium	MC	No details about post-harvest processing were provided by Nigeria; therefore, this analysis assumes the leaves are harvested and packed in shipping cartons, and that no post-harvest processing has occurred (see

			section 1.4). Based on this assumption, the rating for the previous risk element (A1) remains unchanged.
Risk Element A3: Likelihood of surviving transport and storage conditions of the consignment	Medium	MC	The leaves will be transported by air-freight one day after harvest and will be refrigerated at an unspecified temperature. There is no evidence to suggest that the transport and storage conditions of the consignment will increase or decrease the pest population. Based on this evidence, the rating for the previous risk element (A2) remains the same. Fumigation treatments are available for some species of thrips in fruit and vegetable shipments (PPQ, 2016).
Risk Element A: Overall risk rating for likelihood of entry	Medium	N/A	The overall risk rating is Medium with High uncertainty due to the substantial lack of detailed information for all of the elements included in Risk Element A.
Likelihood of Establishment			
Risk Element B1: Likelihood of coming into contact with host material in the endangered area	Medium	MC	*Megalurothrips sjostedti* can reproduce through parthenogenesis (Gahukar, 2004) where females can produce offspring without mating, leading to a rapid increase in the population. Ekesi et al. (1999) reported that the total fecundity of *M. sojostedti* could be as high as 168 eggs per female, and that reproduction could be continuous throughout the year. Additionally, adult thrips are weak flyers, but are readily transported by wind, and all stages can be transported by the movement of infested plant material (Lewis, 1973; 1997). However, flowers are the preferred feeding site, suggesting there would be low numbers of individuals on the leaves.

			Addtionally, the imported leaves are intended for consumption as a cooked vegetable (Faseyitan, 2015), and are likely to be consumed. Oha leaves are primarily used in soups, and are likely to be purchased in small quantities with little waste material requiring disposal, and only a small possibility that disposal would occur outdoors where new hosts could be encountered. Further, eggs laid on the leaves hatch into immature stages that have a limited capacity to disperse on their own. It takes approximately 19 days for development from eggs to adults (Salifu, 1992), and it is likely that the harvested leaf tissue would become unsuitable for larval development before the adult stage could be reached. This species has a high biotic potential, any adults on the leaves could be dispersed by wind, and hosts include some weedy species, such as *Amaranthus* and *Sonchus oleraceus*, which are are common in the United States. Although we consider this unlikely, we rated this risk element (B1) as Medium with a Moderate level of uncertainty.
Risk Element B2: Likelihood of arriving in the endangered area	High	MU	No information was provided about the ultimate distribution of the oha leaves in the United States; however, approximately 27.7 percent of the U.S. population lives in Plant Hardiness Zones 9-11 (PERAL, 2015), suggesting a High likelihood that the commodity would arrive in the endangered area. Therefore, we rate the risk

			as High with Moderate Uncertainty due to the lack of commodity distribution information.

Assessment of the likelihood of introduction of *Megalurothrips sjostedti* into the endangered area via the importation of oha leaves from Nigeria

Risk Element B: Combined likelihood of establishment	Medium	N/A	The likelihood of coming into contact with host material in the endangered area was Medium, and the likelihood of arriving in the endangered area was High; therefore we assigned the combined likelihood of establishment as Medium.
Overall Likelihood of Introduction			
Combined likelihoods of entry and establishment	Medium	N/A	The likelihood of entry (A) was rated as High, and the likelihood of establishment (B) was rated as Medium resulting in an overall rating for the likelihood of introduction as Medium.

[a]C=Certain, MC=Moderately Certain, MU=Moderately Uncertain, U=Uncertain

Assessment of the consequences of introduction of *Megalurothrips sjostedti* into the continental United States.

Criteria	Meets criteria? (Y/N)	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Direct Impacts			
Risk Element C1: Damage potential in the endangered area	No	MC	The damage caused by *M. sjostedti* is similar to that reported for other flower thrips and the introduction of this pest would not be likely to result in significant crop losses or increases in costs of production. There are already many species of thrips in the United States. Although they rarely cause economic damage, they can cause yield loss in some situations (Krupke et al., 2016). Where thrips transmit plant pathogens or cause damage that is unacceptable, there are many methods available to control them in the landscape (Bethke et al., 2014), greenhouse (Cloyd and Sadof, 2016), and leguminous crops (Krupke et al., 2016). Additionally, there is no evidence that this species transmits any plant pathogen, or that it has developed resistance to any insecticide. Therefore, it is likely be controlled by the same methods and products used to mitigate the damage caused by other established species of thrips. Based on this evidence, we believe that the potential damage level in the endangered area is not significant, with Moderate Certainty based on the damage reports and control studies in African legume crops.

Criteria	Meets criteria? (Y/N)	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Risk Element C2: Spread potential	Yes	MU	This species is widely distributed in Africa (see distribution), but has not spread to other parts of the world. Adult thrips are weak flyers, but are readily transported by wind, and all stages can be transported by the movement of infested plant material (Lewis, 1973; 1997).
Risk Element C: Pest introduction is likely to cause unacceptable direct impacts	No	N/A	This pest is not likely to cause unacceptable direct impacts in the endangered area.
Trade Impacts			
Risk Element D1: Export markets at risk	No	MC	Only Japan and the Republic of Korea list *Megalurothrips sjostedti* as a Harmful Organism (APHIS, 2017a). In general, most of the legume commodities reported as hosts are only exported as dried beans and grains (FAS, 2017), and these products would not be likely to harbor live thrips.
Risk Element D2: Likelihood of trading partners imposing additional phytosanitary requirements	No	MC	
Risk Element D: Pest is likely to cause significant trade impacts	No	N/A	
Conclusion			
Is the pest likely to cause unacceptable consequences in the PRA area?	No	N/A	

[a]C=Certain, MC=Moderately Certain, MU=Moderately Uncertain, U=Uncertain

3.2.11. *Pleuroptya balteata* (Fabricius) (Lepidoptera: Crambidae)

We determined the overall likelihood of introduction of *P. balteata* to be Negligible because we determined that the likelihood of establishment was Negligible. We present the results of this assessment in the table below. Because we determined that the likelihood of introduction was negligible we did not need to analyze the consequences of introduction.

It should be noted that this species has been placed in both the family Pyralidae (subfamily Crambinae) and the family Crambidae by various authors. Additionally, both species synonyms are commonly used in the literature, with the synonym *Sylepta balteata* being used as recently as 2015 (Oke, 2015). Although we believe the likelihood of introduction to be Negligible, and the Endangered Area to be limited to global Plant Hardiness Zones 10-12, *Rhus michauxii* is listed as Federally Endangered (50 CFR § 17.12, 2016) and is also listed as Endangered by the state of Florida (NRCS, 2017). Its range in Florida is limited to Alachua County (NRCS, 2017), which is in global Plant Hardiness Zone 9, and could be endangered if *Pleuroptya balteata* were more cold-tolerant than the analysis of its range indicates.

Determination of the portion of the continental United States endangered by *Pleuroptya balteata*

Climatic suitability	*Pleuroptya balteata* has the following distribution: **Africa:** Benin, Cameroon, Comoros, Congo, Democratic Republic of the Congo, Gambia, Ghana, Ivory Coast, La Reunion, Madagascar, Mozambique, Niger, Nigeria, Réunion, Senegal, Sierra Leone, South Africa, Sudan, Zambia (De Prins and De Prins, 2016); **Asia:** China (Hong Kong) (Robinson et al., 2017), India (Meshram and Ghude, 1996; Sharma, 1978), Japan (Watanabe, 1940; Robinson et al., 2017), Malaysia (Robinson et al., 2017), Thailand (Robinson et al., 2017); **Oceania:** Solomon Islands (Bigger, 1982; Robinson et al., 2017). Based on a comparison of the geographic distribution of this species and a map of the global Plant Hardiness Zones (Magarey et al., 2008; Saha et al., 2010), we estimated that *P. balteata* could establish in Plant Hardiness Zones 10-13. Plant Hardiness Zones 10-12 exist in the continental United States, and host plants for this species occur in these Zones.
Potential hosts at risk in PRA Area	Many of the hosts for *P. balteata* do not occur in the continental United States; however, the following plants or plant genera are potential hosts at risk in the PRA Area (Kartesz, 2017; NRCS, 2017): **Amaranthaceae:** *Amaranthus* spp. (Oke et al., 2015); **Anacardiaceae:** *Pistacia* sp. (De Prins and De Prins, 2016), *Rhus* sp. (De Prins and De Prins, 2016), *Spondias* sp. (Golding, 1937), *Toxicodendron vernicfluum* (poison oak / sumac) (De Prins and De Prins, 2016); **Fagaceae:** *Quercus* spp. (Robinson et al., 2017); **Malvaceae:** *Gossypium* sp. (Robinson et al., 2017), *Hibiscus* sp. (Goff, 2017), *Thespesia* sp. (Goff, 2017); **Myrtaceae:** *Corymbia citridora* (syn. *E. citriodora*) (Roberts, 1969), *Eucalyptus camaldulensis* (Roberts, 1969), *Eucalyptus* sp. (Goff, 2017); **Moraceae:** *Ficus* sp. (fig) (Goff, 2017); **Theaceae:** *Camellia sinensis* (Goff, 2017), *C. japonica*, *C. sasanqua* (all introduced); **Urticaceae:** *Boehmeria* sp. (false nettle) (DePrins and De Prins, 2016; Goff, 2017); **Verbenaceae:** *Vitex* sp.

Economically important hosts at risk[a]	Examples of economically important plants at risk include: camellias (*Camellia* sp.) (Goff, 2017), cotton (*Gossypium* sp.) (Robinson et al., 2017), fig (*Ficus* sp.), and eucalyptus (*Eucalyptus* spp.). Roberts (1969) noted this insect on four species of eucalyptus. *Quercus* spp. (oak) are important components of forest ecosystems and important to the lumber/timber industry. The plant *Hibiscus poeppigii* is listed as Endangered by the state of Florida and occurs within the endangered Area (NRCS, 2017). *Quercus hinckleyi* is listed as Federally Threatened (50 CFR § 17.12) and is also listed as Threatened by the state of Texas (NRCS, 2017).
Pest potential on economically important hosts at risk	*Pleuroptya balteata* feeds on leaves (Roberts, 1969), and has been reported to be a peston plants not grown in the United States, e.g., *Sterculia urens* (Amin and Upadhyaya 1977) and *S. foetida* (Meshram and Ghude 1996). However, no reports of economic damage to crops grown in the United States were found, and it has been suggested that this species be studied as a potential biological control agent for poison ivy (Habeck, 1989).
Defined Endangered Area	We estimated that *P. balteata* could establish in global Plant Hardiness Zones 10-12 in the continental United States, and one or more host plants occur in these areas, which include southern Florida and the coastal regions of the Gulf Coast states, southern Texas and southern Arizona, as well as southern California and a narrow band of Zone 10 along the West Coast northward to the state of Washington. Although one or more hosts are found throughout this area, we estimate that the Endangered Area is limited to areas where figs are produced commercially, to plant nurseries that produce camellias, and to areas where eucalyptus are considered a socially and aesthetically important part of the landscape. The majority of fig production acreage (95.8%) is located in California (NASS, 2014). The Endangered area for eucalyptus includes California and Florida; however, it should be noted that all species of eucalyptus in the United States are introduced species (NRCS, 2017).

[a] As defined by ISPM No. 11, supplement 2, “economically” important hosts refers to both commercial and non-market (environmental) plants (IPPC, 2017b).

Assessment of the likelihood of introduction of *Pleuroptya balteata* into the endangered area via the importation of oha leaves from Nigeria

Risk Element	Risk Rating	Uncertainty Rating[a]	Justification for rating and explanation of uncertainty (and other notes as necessary)
Likelihood of Entry			
Risk Element A1: Pest prevalence on the harvested	Low	U	This species has been reported from *Pterocarpus osun* (Roberts, 1969), therefore, the association

commodity (= the baseline rating for entry)			of *Pleuroptya balteata* with *P. mildbraedii* is uncertain, and the pest population levels that might be encountered are unknown. Adult Lepidoptera are highly mobile, and unlikely to remain on the hand-harvested leaves. Little is known about the biology of this species; however, the larvae live singly inside rolled leaves (Meshram and Ghude, 1996; Roberts, 1969), and rolled leaves or leaves with obvious feeding damage by larvae are not likely to be harvested. From this evidence we conclude that leaves with the obvious larvae, pupae and feeding damage would not be harvested, and that the eggs are the only stage that might be present on the harvested leaves. The level of uncertainty is High because of the lack of good evidence for the association with *P. mildbraedii*.
Risk Element A2: Likelihood of surviving post-harvest processing before shipment	Low	U	No details about post-harvest processing were provided by Nigeria; therefore, this analysis assumes the leaves are harvested and packed in shipping cartons, and that no post-harvest processing has occurred (see section 1.4). Based on this assumption, the rating for the previous risk element (A1) remains unchanged. Due to the lack of information on post-harvest processing the uncertainty on this Risk Element (A2) is High, as further details about post-harvest processing before shipment of the consignment would be likely to decrease the rating for this Risk Element (A2).

Risk Element A3: Likelihood of surviving transport and storage conditions of the consignment	Low	MC	The leaves will be transported by air-freight one day after harvest, and will be refrigerated at an unspecified temperature. There is no evidence to suggest that the transport and storage conditions of the consignment will decrease the pest population. Based on this evidence, the rating for the previous risk element (A2) remains the same. Further details about transport and storage conditions of the consignment would be likely to decrease the rating.
Risk Element A: Overall risk rating for likelihood of entry	Low	N/A	
Likelihood of Establishment			
Risk Element B1: Likelihood of coming into contact with host material in the endangered area	Negligible	C	There is little likelihood of this species coming into contact with host material in the endangered area. Were eggs to survive harvest, shipping and transport, they would have to hatch, the larvae feed and develop into flying adults. These adults would then have to find both mates and hosts. This is highly unlikely to occur. Roberts (1969) observed that the larvae of *P. balteata* feed for at least 14 days before pupating, and Amin and Upadhyaya (1977) similarly reported that the larval stage took 14-16 days to develop into pupae on *Sterculia urens* in India. It is highly unlikely that the shipped leaves would remain viable as a larval food source for this length of time, and that any larvae hatching from eggs would have sufficient food to complete development. Therefore we conclude that the likelihood of coming into contact with host

			material in the endangered area is Negligible.
Risk Element B2: Likelihood of arriving in the endangered area	N/A	N/A	
Risk Element B: Combined likelihood of establishment	Negligible	N/A	
Overall Likelihood of Introduction			
Combined likelihoods of entry and establishment	Negligible	N/A	

[a]C=Certain, MC=Moderately Certain, MU=Moderately Uncertain, U=Uncertain

3.2.12. *Platysphinx phyllis* Rothschild & Jordan (Lepidotera: Sphingidae)

We determined that the area endangered by *P. phyllis* is Negligible. We present the results of this assessment in the table below. Because no endangered area existed, we did not need to analyze the likelihood of introduction or consequences of introduction.

We found very little information on this species. Were the species to have a wider geographic distribution, or a broader host range, or to cause greater damage than indicated, the pest potential on this species might increase.

Determination of the portion of the continental United States endangered by *Platysphinx phyllis*

Climatic suitability	*Platysphinx phyllis* has the following distribution: **Africa:** Burkina Faso, Cameroon, Central African Republic, Ghana, Guinea, Ivory Coast, Nigeria, Senegal, Sierra Leone (De Prins and De Prins, 2016; Kitching, 2017). Carcasson (1967) gives the distribution as Sierra Leone to Nigeria. Based on a comparison of the geographic distribution of this species and a map of the global Plant Hardiness Zones (Magarey et al., 2008; Saha et al., 2010), we estimated that *Platysphinx phyllis* could establish in Plant Hardiness Zones 11-13. Plant Hardiness Zones 11-12 exist in the continental United States, and host plants for this species occur in these Zones.
Potential hosts at risk in PRA Area	**Fabaceae:** *Glycine max* (soybean) (Robinson et al., 2017), *Lonchocarpus* spp. (Florida) and *Millettia* sp. (Florida) (De Prins and De Prins, 2016;). *Lonchocarpus* spp. and *Millettia* sp. occur only in Florida, and both are introduced species (NRCS, 2017).
Economically important hosts at risk[a]	Soybean (*Glycine max*) (Robinson et al., 2017) is the only economically important host in the PRA area (FAS, 2017).
Pest potential on economically important hosts at risk	We found no literature reporting any damage caused by *Platysphinx phyllis* on any plant species, and there are no damage reports from its home range in Africa. We conclude that there is no evidence of substantial damage to economically important species, and conclude that the pest potential on economic hosts at risk is negligible.

Defined Endangered Area	Soybean is the only economically important host of record for this species, and only a very few counties in Alabama, Florida, Louisiana and Texas have both soybean production and conditions that are climatically suitable for the pest's continued survival. This area represents only a small fraction of U.S. soybean production (NRCS, 2017). Further, there is no evidence that this species causes economic damage on any crop. Therefore, we determined that the pest does not pose a threat to any hosts of economic, environmental, or social importance in the PRA area.

[a] As defined by ISPM No. 11, supplement 2, "economically" important hosts refers to both commercial and non-market (environmental) plants (IPPC, 2017b).

3.2.13. *Exosporium pterocarpi* M.B. Ellis (Fungus)

We determined that the genus of plants containing hosts for *E. pterocarpi* does not occur within the continental United States. Therefore, we conclude that there are no potential hosts at risk in the PRA area. Because no endangered area existed, we did not need to analyze the likelihood of introduction or consequences of introduction.

We found very little literature regarding this species. However, all species in the genus show a marked degree of host specificity (Ing, 1998); therefore spread to other hosts is not likely. It is likely that typical management strategies used for *Exosporium* spp. in general would also control damage from this species, were it to occur.

Determination of the portion of the continental United States endangered by *Exosporium pterocarpi*

Climatic suitability	*Exosporium pterocarpi* has the following geographic distribution: **Africa:** Nigeria (Calduch et al., 2002) and **Asia:** Malaysia (Ellis, 1971). Based on a comparison of the geographic distribution of this species and a map of the global Plant Hardiness Zones (Magarey et al., 2008; Saha et al., 2010), we estimated that *E. pterocarpi* could establish in Plant Hardiness Zones 11-13. Plant Hardiness Zones 11-12 exist in the continental United States; however, no host plants for this species occur in these Zones.
Potential hosts at risk in PRA Area	The only host of record is *Pterocarpus*, and no species of the genus *Pterocarpus* occur in the continental United States. Therefore, we conclude that no suitable host material is found in the portion of the PRA climatically suitable for the establishment of *E. pterocarpi*.
Economically important hosts at risk[a]	There are no economically important hosts at risk in the PRA area.

Pest potential on economically important hosts at risk	Members of the genus *Exosporium* show a marked degree of host specificity (Ing, 1998); therefore, spread to other hosts is not likely. There are no economically important hosts at risk in the PRA area; therefore, we conclude that the pest potential on economic hosts at risk is negligible.
Defined Endangered Area	We determined that no portion of the continental United States is likely to be endangered by *Exosporium pterocarpi* because potential hosts are not present in the portion of the PRA area climatically suitable for the pest's continued survival.

[a] As defined by ISPM No. 11, supplement 2, "economically" important hosts refers to both commercial and non-market (environmental) plants (IPPC, 2017b).

3.2.14 *Phyllachora pterocarpi* H. Sydow (Fungus)

We determined that the genus of plants containing hosts for *P. pterocarpi* does not occur within the continental United States. Therefore, we conclude that there are no potential hosts at risk in the PRA area. Because no endangered area existed, we did not need to analyze the likelihood of introduction or consequences of introduction.

We found very little literature regarding this species. It is likely that typical management strategies used for *Phyllachora* would also control damage from this species, were it to occur.

Determination of the portion of the continental United States endangered by *Phyllachora pterocarpi*

Climatic suitability	*Phyllachora pterocarpi* has the following geographic distribution: **Asia:** Indonesia, Malaysia, Philippines, Singapore; **Africa:** Malawi, Sierra Leone, South Africa, Tanzania, Togo, Zambia, and Zimbabwe; **Oceania:** New Caledonia, Papua New Guinea, Solomon Islands. Based on a comparison of the geographic distribution of this species and a map of the global Plant Hardiness Zones (Magarey et al., 2008; Saha et al., 2010), we estimated that *Phyllachora pterocarpi* could establish in Plant Hardiness Zones 10-13. Plant Hardiness Zones 10-12 exist in the continental United States; however, no host plants for this species occur in these Zones.
Potential hosts at risk in PRA Area	The only host of record is *Pterocarpus* and no species of the genus *Pterocarpus* occur in the United States. Therefore, we conclude that no suitable host material is found in the portion of the PRA climatically suitable for the establishment of *P. pterocarpi*.
Economically important hosts at risk[a]	There are no economically important hosts at risk in the PRA area.
Pest potential on economically important hosts at risk	There are no economically important hosts at risk in the PRA area; therefore, we conclude that the pest potential on economic hosts at risk is negligible.

Defined Endangered Area	We determined that no portion of the continental United States is likely to be endangered by *P. pterocarpi* because potential hosts are not present in the portion of the PRA area climatically suitable for the pest's continued survival.

[a] As defined by ISPM No. 11, supplement 2, "economically" important hosts refers to both commercial and non-market (environmental) plants (IPPC, 2017b).

4. Summary and Conclusions of Risk Assessment

Of the organisms associated with the genus *Pterocarpus* worldwide and present in Nigeria, we identified organisms that are actionable pests for the continental United States and have a reasonable likelihood of being associated with the commodity following harvesting from the field and prior to any post-harvest processing. If warranted, we further evaluated these organisms for their likelihood of introduction (i.e., entry plus establishment) and their potential consequences of introduction. Pests that are likely to cause unacceptable consequences of introduction with an overall likelihood of introduction risk rating above Negligible are candidates for risk management. These results represent a baseline estimate of the risks associated with the import commodity pathway as described in section 1.4.

Of the pests selected for further analysis, we determined that those identified in Table 3 are *not* candidates for risk management, either because no portion of the continenial United States is likely to be endangered by the pest, they are unlikely to cause unacceptable consequences of introduction, and/or because they received a Negligible risk rating for likelihood of introduction into the endangered area via the import pathway. We summarize the results for each pest below (Table 3).

Detailed examination and choice of appropriate phytosanitary measures to mitigate pest risk are part of the pest risk management phase within APHIS and are not addressed in this document.

Table 3. Summary for pests selected for further evaluation and determined *not* to be candidates for risk management.

Pest	Reason the pest is *not* a candidate for risk management	Uncertainty statement (optional)[a]
Acaudaleyrodes africanus	Does not meet unacceptable consequences of introduction threshold	
Acaudaleyrodes rachipora	Does not meet unacceptable consequences of introduction threshold	
Africaleurodes coffeacola	Does not meet unacceptable consequences of introduction threshold	
Andronymus caesar	No endangered area within the PRA area	
Bemisia afer	Does not meet unacceptable consequences of introduction threshold	
Catalebeda producta	No endangered area within the PRA area	
Charaxes achaemenes	Negligible likelihood of introduction	

Pest	Reason the pest is *not* a candidate for risk management	Uncertainty statement (optional)[a]
Eutetranychus orientalis	Does not meet unacceptable consequences of introduction threshold	
Maruca vitrata	Negligible likelihood of introduction	
Megalurothrips sjostedti	Does not meet unacceptable consequences of introduction threshold	
Pleuroptya balteata	Negligible likelihood of introduction	
Platysphinx phyllis	No endangered area within the PRA area	
Exosporium pterocarpi	No endangered area within the PRA area	
Phyllachora pterocarpi	No endangered area within the PRA area	

[a]The uncertainty statement, if included, identifies the most important source(s) of uncertainty.

5. Acknowledgements

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Reviewers Thomas W. Culliney[a]
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6. Literature Cited

50 CFR § 17.12. 2016. US Code of Federal Regulations, Title 50, Part 17 (50 CFR § 17.12- Endangered And Threatened Wildlife and Plants)

Abad, J. A., E. J. Parks, and S. L. New. 2007. First report of Sweet potato chlorotic stunt virus, a component of sweetpotato virus disease, in North Carolina. Plant Disease 91(3):327.

Abd-Rabou, S. 1999. Parasitoids attacking the whiteflies (Homoptera: Aleyrodidae) infesting citrus trees in Egypt. Bollettino-Laboratorio di Entomologia Agraria Filippo Silvestri Portici 55:33-38.

Abd-Rabou, S. 2008. Fourth International *Bemisia* Workshop, International Whitefly Genomics Workshop: Host plants, geographical distribution and natural enemies of the sycamore whitefly, *Bemisia afer* (Priesner & Hosny), a new economic pest in Egypt [abstract]. Journal of Insect Science 8(4):2.

Abd-Rabou, S., and N. Ahmed. 2008. Bionomics of *Bemisia afer* (Hemiptera: Aleyrodidiae): a new pest of *Citrus aurantium* var. *amara* in Egypt [Abstract]. Egyptian Journal of Agricultural Research 86(5):1783.

Ackery, P. R., C. R. Smith, and R. Vane-Wright (eds.). 1995. Carcasson's African Butterflies: An Annotated Catalogue of the Papilionoidea and Hesperioidea of the Afrotropical Region. Csiro Australia, East Melbourne, Victoria.

Agyen-Sampong, M. 1978. Pests of cowpea and their control in Ghana. Pages 85-92 in S. R. Singh, H. F. Van Emden, and T. A. Taylor, (eds.). Pests of Grain Legumes: Ecology and Control. Academic Press, New York. 454 pp.

Akinlosotu, T. A. 1983. Destructive and beneficial insects associated with vegetables in southwestern Nigeria. Acta Horticulturae (123): 217-230.

Amatobi, C. I. 1994. Field evaluation of some insecticides for the control of insect pests of cowpea (*Vigna unguiculata* (L.) Walp.) in the Sudan Savanna of Nigeria. International Journal of Pest Management 40(1):13-17.

Amin, P., and A. Upadhyaya. 1977. *Sylepta balteata* F. (Pyralidae, Lepidoptera), an important pest of Kullu, *Sterculia urens* Roxb., (Sterculiaceae). Indian Forester 103(7):480-482.

Anderson, P. K., J. H. Martin, P. Hernandez, and A. Lagnaoui. 2001. *Bemisia afer* sens. lat. (Homoptera: Aleyrodidae) outbreak in the Americas. Florida Entomologist 84(2):316-317.

Ann, P. J., H. L. Lee, and J. N. Tsai. 1999. Survey of brown root disease of fruit and ornamental trees caused by *Phellinus noxius* in Taiwan. Plant Pathology Bulletin 8:51-60.

APRD. 2017. Arthropod Pesticide Resistance Database (APRD). Michigan State University. http://www.pesticideresistance.com/index.php. (Archived at PERAL).

APHIS. 2012. The 2012 Prioritized Offshore Pest List. United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) (accessed 02/16/2017) https://www.aphis.usda.gov/plant_health/plant_pest_info/pest_detection/downloads/farmbill/PrioritizedOffshorePestList.pdf. (Archived at PERAL).

APHIS. 2017a. Phytosanitary Export Database. United States Department of Agriculture, Animal and Plant Inspection Service (APHIS), Phytosanitary Certificate Issuance & Tracking System https://pcit.aphis.usda.gov/PExD/faces/ViewPExD.jsp. (Archived at PERAL).

APHIS. 2017b. Pests not known to occur in the United States or of limited distribution. United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ), [1983-] (accessed 02/16/2017) http://www.invasive.org/species/list.cfm?id=3. (Archived at PERAL).

Arodokoun, D. Y., M. Tamò, C. Cloutier, and J. Brodeur. 2006. Larval parasitoids occurring on *Maruca vitrata* Fabricius (Lepidoptera: Pyralidae) in Benin, West Africa. Agriculture, Ecosystems and Environment 113(1-4):320–325.

Atkinson, T. H. 2017. Bark and ambrosia beetles website. (accessed 02/23/2017). http://www.barkbeetles.info/about.php. (Archived at PERAL).

Atu, U., T. Enyinnia, and C. Chinaka. 1988. Grass and sedge weed hosts of *Meloidogyne incognita*. Nigerian Journal of Weed Science 1(1):17-20.

Baker, E. W. 1975. Spider mites (Tetranychidae: Acarina) from Southeast Asia and Japan. U. S. Department of Agriculture Cooperative Economic Insect Report 25(49-52): 911-921.

Bal, A. B. 1991. Action threshold for flower thrips on cowpea (*Vigna unguiculata* (L.) Walp.) in Senegal. Tropical Pest Management 37(4):363-367.

Bea, C. H., A. L. Szalanski, and R. T. Robbins. 2008. Molecular analysis of the lance nematode, *Hoplolaimus* spp., using the first internal transcribed spacer and the D1-D3 expansion segments of 28S ribosomal DNA. Journal of Nematology 40(3):201-209.

Ben-Dov, Y. 1993. A Systematic Catalogue of the Soft Scale Insects of the World. (Homoptera: Coccoidea: Coccidae) With Data on Geographical Distribution, Host Plants, Biology and Economic Importance. Sandhill Crane Press, Inc., Gainesville, Florida. 536 pp.

Bethke, J. A., S. H. Dreistadt, and L. G. Varela. 2014. Thrips. Pest Notes. University of California Agriculture and Natural Resources Publication No. 7429. University of California Agriculture & Natural Resources, Statewide Integrated Pest Management Program.

Bigger, M. 1982. Insect pests associated with forestry plantations in the Solomon Islands. Commonwealth Forestry Review 61(4):249-257.

Boa, E., and J. M. Lenné. 1994. Diseases of Nitrogen Fixing Trees in Developing Countries. Natural Resources Institute, Overseas Development Administration, London.

Bolland, H. R., J. Gutierrez, and C. H. W. Flechtmann. 1998. World Catalogue of the Spider Mite Family (Acari: Tetranychidae). Brill, Leiden, Netherlands. 392 pp.

Bridge, J. 1973. *Hoplolaimus seinhorsti*, an endoparasitic nematode of cowpea in Nigeria. Plant Disease Reporter 57(9):798-799.

Bright, D. 2014. A catalog of Scolytidae and Platypodidae (Coleoptera), supplement 3 (2000-2010), with notes on subfamily and tribal reclassifications. Insecta Mundi (0356):1-336.

Browne, F. G. 1960. Preliminary observations on *Doliopygus dubius* (Samps.) (Coleoptera: Platypodidae) [Abstract]. Pages 15-30 in 4th Report West African Timber Borer Research Unit. London, Crown Agents.

Browne, F.G. 1971. The genus *Chaetastus* Nunberg (Coleoptera : Platypodidae). Journal of Entomology (B) 40(1): 7-20.

Byrne, D.N. and T.S. Bellows, Jr. 1991. Whitefly biology. Annual Review of Entomology 36: 431-457.

CABI. 2017. Crop Protection Compendium. Centre for Agriculture and Biosciences International (CABI), Wallingford, UK. (Archived at PERAL).

Caciagli, P. 2007. Survival of whiteflies during long-distance transportation of agricultural products. Journal of Insect Science 8(4):11. Also published by the author as a more detailed book chapter.

Calduch, M., J. Gené, J. Guarro, Á. Mercado-Sierra, and R. F. Castañeda-Ruíz. 2002. Hyphomycetes from Nigerian rain forests. Mycologia 94(1):127-135.

Cannon, P. 1991. *Phyllachora pterocarpi* H. Sydow. IMI Descriptions of Fungi and Bacteria: Set 103, No. 1028.

CAPS. 2016. Priority pest list for 2017. Cooperative Agricultural Pest Survey (CAPS), United States Department of Agriculture, Animal Plant Inspection Service (APHIS) (accessed 02/16/2017). http://caps.ceris.purdue.edu/pest-lists. (Archived at PERAL).

Carcasson, R. H. 1967. Revised catalogue of the African Sphingidae (Lepidoptera) with descriptions of the East African species. Journal of the East Africa Natural History Society and National Museum 26(3):1-148.

Cardona, C., and A. K. Karel. 1990. Key insects and other invertebrate pests of beans. Pages 157-191 in S. R. Singh, (ed.). Insect Pests of Tropical Food Legumes. John Wiley & Sons, New York, 451 pp.

Chang, T. T., and W. W. Yang. 1998. *Phellinus noxius* in Taiwan: distribution, host plants and the pH and texture of the rhizosphere soils of infected hosts. Mycological Research 102(9):1085-1088.

Childers, C. C., W. C. Welbourn, and N. J. Fashing. 2006. Ranking model and list to identify foreign Tetranychoidea pests of agricultural and environmental significance to the United States. Acaralogical Society of America; USDA-APHIS. 509 pp.

Cibrián-Llanderal, V. C., H. González-Hernandez, D. Cibrián-Tovar, M. Campos-Figueroa, H. de los Santos-Posadas, J. C. Rodríguez-Maciel, and A. Aldrete. 2015. Incidence of *Hyblaea puera* (Lepidoptera: Hyblaeidae) in Mexico. Southwestern Entomologist 40(2):441-444.

CIPM. 2009. Crop profile for atemoya and sugar apple in Florida. NSF Center for Integrated Pest Managment (CIPM), North Carolina State University. https://ipmdata.ipmcenters.org/documents/cropprofiles/FLatemoyaandsugarapple2009.pdf. (Archived at PERAL).

Cloyd, R. A., and C. S. Sadof. 2016. Western flower thrips. E-110-W. Department of Entomology, Purdue University Cooperative Extension Service, Perdue University.

Cock, M. J. W., and T. C. E. Congdon. 2013. Observations on the biology of Afrotropical Hesperiidae (Lepidoptera). Part 5. Hesperiinae *incertae sedis*: dicotyledon feeders. Zootaxa 3724(1):1-85.

Deighton, F. 1936. Preliminary list of fungi and diseases of plants in Sierra Leone. Bulletin of Miscellaneous Information (Royal Botanic Gardens, Kew) 1936(7):397-424.

Delahaye, N., and G. L. Tavakilian. 2009. Note sur *Mallodon downesii* Hope, 1843, et mise en synonymie de *M. plagiatum* Thomson, 1867 (Coleoptera, Cerambycidae). Bulletin de la Société Entomologique de France 114(1):39-45.

De Prins, J., and W. De Prins. 2016. Afromoths, online database of Afrotropical moth species (Lepidoptera). World Wide Web electronic publication (www.afromoths.net) [accessed 02/14/2017]. (Archived at PERAL).

Dhooria, M. S. 1985. Development of citrus mite, *Eutetranychus orientalis* (Acari: Tetranychidae) as influenced by age and surface of leaves of different hosts. Indian Journal of Acarology 9:82-88.

Dhooria, M. S., and D. K. Butani. 1984. Citrus mite, *Eutetranychus orientalis* (Klein) and its control. Pesticides 18(10):35-38.

EFSA (Panel on Plant Health). 2013. Scientific opinion on the risk to plant health posed by *Eutetranychus orientalis* Klein in the EU territory, with the identification and evaluation of risk reduction options. EFSA Journal 11(7):3317, 1-81; doi: 10.2903/j.efsa.2013.3317.

Eichelbaum, F. 1913. Käferlarven und Käferpuppen aus Deutsch - Ostafrika. Zeitschrift für Wissenschaftliche Insektenbiologie 9(4): 114-116.

Ekesi, S. 1999. Insecticide resistance in field populations of the legume pod-borer, *Maruca vitrata* Fabricius (Lepidoptera: Pyralidae), on cowpea, *Vigna unguiculata* (L.), Walp in Nigeria. International Journal of Pest Management 45(1):57-59.

Ekesi, S., N. Maniania, and I. Onu. 1999. Effects of temperature and photoperiod on development and oviposition of the legume flower thrips, *Megalurothrips sjostedti*. Entomologia Experimentalis et Applicata 93(2):149-155.

Ellis, M. B. 1971. Dematiaceous Hyphomycetes. Kew: Commonwealth Mycological Institute. 608 pp.

Evans, G. A. 2007. Host plant list of the whiteflies (Aleyrodidae) of the world (v. 070611 June 11, 2007). United States Department of Agriculture (USDA), Animal Plant Health Inspection Service (APHIS). 290 pp.

Evans, G. A. 2008. The whiteflies (Hemiptera: Aleyrodidae) of the world and their host plants and natural enemies (v. 2008-09-23). United States Department of Agriculture (USDA), Animal Plant Health Inspection Service (APHIS). 715 pp.

Ezueh, M. 1981. Nature and significance of preflowering damage by thrips to cowpea. Entomologia Experimentalis et Applicata 29(3):305-312.

Fajola, A. 1979. The post-harvest fruit rots of tomato (*Lycopersicum esculentum*) in Nigeria. Molecular Nutrition & Food Research 23(2):105-109.

Farr, D. F., and A. Y. Rossman. 2017. Fungal Databases. United States Department of Agriculture, Agricultural Research Service, Systematic Mycology and Microbiology Laboratory ARS Last accessed August, 2017, http://nt.ars-grin.gov/fungaldatabases/.

FAS. 2017. Global Agricultural Trade System (GATS Online). United States Department of Agriculture, Foreign Agricultural Service (FAS). https://apps.fas.usda.gov/gats/default.aspx. (Archived at PERAL).

Faseyitan, C. K. 2015. Formal letter to request safe import of fresh plant produce into the United States (Market Access Request). Personal communication to Alan Dowdy Assistant deputy administrator Phytosanitary Issue Management (PIM). Commodity Import Analysis and Operations (APHIS-PPQ) on January 20, 2015, from Clement Kola Faseyitan, Director Plant Quarantine, Nigerian Agricultural Quarantine Service (NAQS) requesting market access.

Fasoranti, J. O., and O. M. Olagunju. 1985. Food selection by the variegated grasshopper, *Zonocerus variegatus* L.: Feeding bioassay using crops and weeds. Insect Science and Its Application 6(6):681-685.

Ferguson, D. C. 1983. Bean pod borer, *Maruca testulalis* (Geyer). Pests Not Known to Occur in the United States or of Limited Distribution No. 40. Animal and Plant Health Inspection Service, United States Department of Agriculture. 6 pp.

Ferragut, F., D. Navia, and R. Ochoa. 2013. New mite invasions in citrus in the early years of the 21st century. Experimental and Applied Acarology 59(1-2):145-164.

Flint, M. L. 2015. Whiteflies. Pest Notes. University of California Agriculture and Natural Resources Publication No. 7401. University of California Intergrated Pest Management (UCIPM), University of California Agriculture & Natural Resources, Statewide Integrated Pest Management Program. http://ipm.ucanr.edu/PMG/PESTNOTES/pn7401.html. (Archived at PERAL).

Flø, D. and S. Hågvar. 2013. Aerial dispersal of invertebrates and mosses close to a receding alpine glacier in southern Norway. Arctic, Antarctic, and Alpine Research 45(4): 481-490.

Fu, J. W., J. Huang, and Q. H. Zhen. 1998. Occurrence and damage caused by *Bemisia afer* (Homoptera: Aleyrodidae) on soybean in Fuzhou. [Translated title] [In Chinese.]. Wuyi Science Journal 14:68-72.

Gahukar, R. T. 2004. Bionomics and management of major thrips species on agricultural crops in Africa. Outlook on Agriculture 33(3):191-199.

Gamarra, H. A., S. Fuentes, F. J. Morales, R. Glover, C. Malumphy, and I. Barker. 2010. *Bemisia afer* sensu lato, a vector of sweet potato chlorotic stunt virus. Plant Disease 94(5):510-514.

Ganapathy, N. 2010. Spotted pod borer, *Maruca vitrata* Geyer in legumes: ecology and management. Madras Agricultural Journal 97(7-9):199-211.

Gaur, M., R. Sundararaj, and S. Murugesan. 1999. Host range and distribution of the babul whitefly *Acaudaleyrodes rachipora* (Singh) (Aleyrodidae: Homoptera) in Indian arid zone. Pages 397-400 in A. S. Faroda, N. L. Joshi, S. Kathju, and A. Kar, (eds.).

Management of Arid Ecosystem. Arid Zone Research Association of India and Scientific Publishers, Jodhpur, India.

Ghahari, H., S. Abd-Rabou, J. Zahradnik, and H. Ostovan. 2009. Annotated catalogue of whiteflies (Hemiptera: Sternorrhyncha: Aleyrodidae) from Arasbaran, Northwestern Iran. Journal of Entomology and Nematology 1(1):7-18.

Goff, R. 2017. *Catalebeda producta*. African Moths webpage. http://www.africanmoths.com/ [accessed 07/14/2017]. http://www.africanmoths.com/pages/LASIOCAMPIDAE/catalebeda%20producta.html. (Archived at PERAL).

Golding, F. D. 1937. Further notes on the food-plants of Nigerian insects. IV. Bulletin of Entomological Research 28(1):5-9.

Golding, F. D. 1940. Further notes on the food-plants of Nigerian insects. V. Bulletin of Entomological Research 31(2):127-130.

Gopali, J. B., R. Teggelli, D. M. Mannur, and S. Yelshetty. 2010. Web-forming lepidopteran, *Maruca vitrata* (Geyer): an emerging and destructive pest in pigeonpea. Karnataka Journal of Agricultural Sciences 23(1):35-38.

Habeck, D. H. 1988. Insects associated with poison ivy and their potential as biological control agents. Pages 329-337 *in* Proceedings of the VII international symposium on biological control of weeds.

Hargreaves, E. 1937. Some insects and their food-plants in Sierra Leone. Bulletin of Entomological Research 28(3):505-520.

Heu, R. 2007. Distribution and host records of agricultural pests and other organisms in Hawaii. State of Hawaii Department of Agriculture, Plant Industry Division, Plant Pest Control Branch, Survey Program, Honolulu, HI. 71 pp.

Hill, D. S. 1983. Agricultural Insect Pests of the Tropics and their Control (2nd ed.). Cambridge University Press, Cambridge, U.K. 746 pp.

Hodges, G. S., and G. A. Evans. 2005. An identification guide to the whiteflies (Hemiptera: Aleyrodidae) of the Southeastern United States. Florida Entomologist 88(4):518-534.

Imani, Z., and P. Shishehbor. 2009. Effect of temperature on life history and life tables of *Eutetranychus orientalis* (Klein) (Acari: Tetranychidae). Systematic and Applied Acarology 14(1):11-18.

Ing, B. 1998. *Exobasidium* in the British Isles. Mycologist 12(2):80-82.

IPPC. 2017a. International Standards For Phytosanitary Measures, Publication No. 11: Pest Risk Analysis for Quarantine Pests. Food and Agriculture Organization of the United Nations, Secretariat of the International Plant Protection Convention (IPPC), Rome, Italy. 40 pp.

IPPC. 2017b. International Standards For Phytosanitary Measures, Publication No. 5: Glossary of Phytosanitary Terms. Food and Agriculture Organization of the United Nations, Secretariat of the International Plant Protection Convention (IPPC), Rome, Italy. 38 pp.

Jackai, L. E. N., and S. R. Singh. 1983. Suitability of selected leguminous plants for development of *Maruca testulalis* larvae. Entomologia Experimentalis et Applicata 34(2):174-178.

Jeppson, L. R., H. H. Keifer, and E. W. Baker. 1975. Mites Injurious to Economic Plants. University of California Press, Berkeley and Los Angeles, CA. 614 pp.

Joicey, J. J., and G. Talbot. 1925. Notes on some Lepidoptera, with descriptions of new forms. Annals and Magazine of Natural History 16(96):633-653.

Johnson, A. W., C. C. Dowler, N. C. Glaze, and Z. A. Handoo. 1996. Role of nematodes, nematicides, and crop rotation on the productivity and quality of potato, sweet potato, peanut, and grain sorghum. Journal of Nematology 28(3):389-399.

Karel, A. 1985. Yield losses from and control of bean pod borers, *Maruca testulalis* (Lepidoptera: Pyralidae) and *Heliothis armigera* (Lepidoptera: Noctuidae). Journal of Economic Entomology 78(6):1323-1326.

Kartesz, J. T. 2015. The Biota of North America Program (BONAP). 2015. North American Plant Atlas. Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2015. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). (in press)] http://bonap.net/napa. (Archived at PERAL).

Kfouri, L., H. Abdul-Nour, and R. El-Amil. 2004. The Aleurodes on citrus in Lebanon: rational survey and new introduced species (Hemiptera, Sternorrhyncha) [translated title]. Nouvelle Revue d'Entomologie 20(4):345-351.

Khan, A. G., A. I. Mohyuddin, and A. A. Goraya. 1991. Studies on citrus whiteflies and their natural enemies in Pakistan. Pakistan Journal of Zoology 23(2):127-132.

Kimball, C. P. 1965. Lepidoptera of Florida (Arthropods of Florida and Neighboring Land Areas Vol. 1). Division of Plant Industry, Florida Department of Agriculture, Gainsville, Florida. 363 pp.

Kitching, I. J. 2017. *Platysphinx phyllis*. Sphingidae Taxonomic Inventory, http://sphingidae.myspecies.info/ [accessed on July 20, 2017]. (Archived at PERAL).

Kobayashi, T. 2007. Index of Fungi Inhabiting Woody Plants in Japan: Host, Distribution and Literature. Zenkoku-Noson-Kyoiku Kyokai Publishing, Tokyo.

Krupke, C. H., J. L. Obermeyer, and L. W. Bledso. 2016. Soybean insect control recommendations - 2016. Department of Entomology, Purdue University Cooperative Extension Service, Perdue University.

Lakshmi Sita, G., K. Sreenatha, and S. Sujata. 1992. Plantlet production from shoot tip cultures of red sandalwood (*Pterocarpus santalinus* L.). Current Science 62(7):532-535.

Lampe, R.E.J. 2010. Saturniidae of the World: Their Life Stages from the Eggs to the Adults. Verlag Dr. Friedrich Pfeil, Munich, Germany. 368 pp.

Lehman, P. S. 2002. Phytoparasitic Nematodes Reported from Florida. Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Bureau of Entomology, Nematology & Plant Pathology.

Lenné, J. M. 1990. A world list of fungal diseases of tropical pasture species. IMI Phytopathological Paper (31):1-162.

Lewis, T. 1973. Thrips: Their Biology, Ecology and Economic Importance. Academic Press, London. 349 pp.

Lewis, T. (ed.). 1997. Thrips as Crop Pests. CAB International, Wallingford, UK. 740 pp.

Lewis, T. 1997. Flight and dispersal. Pages 175-196 in T. Lewis, (ed.). Thrips as Crop Pests. CAB International, Wallingford, UK. 740 pp.

Luo, Z. Y., and C. M. Zhou. 2001. Record of the citrus whiteflies in China. [Translated title] [In Chinese]. South China Fruits 30(1):14-16.

Lumbile, A. U., B. C. Kwerepe, and M. Kelatlhilwe. 2007. The characteristics and economic importance of *Pterocarpus angolensis* in D.C. Botswana. Pakistan Journal of Biological Sciences 10(4):627-631.

MacNulty, B. J. 1970. Outline life histories of some West African Lepidoptera. Part III. Sphingidae. Proceedings and Transactions of the British Entomological and Natural History Society 3(4):95-122.

Magarey, R., D. Borchert, and W. Schlegel. 2008. Global plant hardiness zones for phytosanitary risk analysis. Scientia Agricola 65(Special):54-59.

Malumphy, C. 2003. The status of *Bemisia afer* (Priesner & Hosny) in Britain (Homoptera: Aleyrodidae). Entomologist's Gazette 54(3):191-196.

Malumphy, C. 2015. New data on the whiteflies (Insecta: Hemiptera: Aleyrodidae) of Montenegro, including three species new for the country. Acta Entomologica Serbica 20(1):29-40.

Margam, V. M., B. S. Coates, M. N. Ba, W. Sun, C. L. Binso-Dabire, I. Baoua, M. F. Ishiyaku, J. T. Shukle, R. L. Hellmich, and F. G. Covas. 2011. Geographic distribution of phylogenetically-distinct legume pod borer, *Maruca vitrata* (Lepidoptera: Pyraloidea: Crambidae). Molecular Biology Reports 38(2):893-903.

Margolies, D.C. 1993. Genetic variation for aerial dispersal behavior in the Banks grass mite. Experimental & Applied Acarology 17(6): 461-471.

Martorell, L. F. 1976. Annotated food plant catalog of the insects of Puerto Rico. University of Puerto Rico, Department of Entomology. 303 pp.

Martin, J. H., D. Mifsud, and C. Rapisarda. 2000. The whiteflies (Hemiptera: Aleyrodidae) of Europe and the Mediterranean Basin. Bulletin of Entomological Research 90(5):407-448.

Martin, J. H., and L. A. Mound. 2007. An annotated check list of the world's whiteflies (Insecta: Hemiptera: Aleyrodidae). Zootaxa 1492:1-84.

Matteson, P. C. 1982. The effects of intercropping with cereals and minimal permethrin applications on insect pests of cowpea and their natural enemies in Nigeria. International Journal of Pest Management 28(4):372-380.

Matthysse, J. G. 1980. Preliminary report on mites collected from plants and animals in Nigeria. I. Mites from plants. Nigerian Journal of Entomology 1(3):57-70.

Mazih, A. 2015. Status of citrus IPM in the southern Mediterranean Basin Morocco, North Africa. Acta Horticulturae (1065): 1097-1103.

McKenzie, L. M., G. Hodges, L. S. Osborne, F. J. Byrne, and R. G. J. Shatters. 2009. Distribution of *Bemisia tabaci* (Hemiptera: Aleyrodidae) biotypes in Florida–investigating the Q invasion. Journal of Economic Entomology 102(2):670-676.

Medler, J. T. 1980. Insects of Nigeria: Check List and Bibliography. American Entomological Institute, Ann Arbor, MI. 919 pp.

Meshram, P. B., and D. B. Ghude. 1996. A new report of *Sylepta balteata* Fab. (Lepidoptera: Pyralidae) as a pest on *Sterculia foetida* Linn. Indian Forester 122(9):856-857.

Migeon, A., and F. Dorkeld. 2016. Spider Mites Web: a comprehensive database for the Tetranychidae. http://www1.montpellier.inra.fr/CBGP/spmweb/index.php. (Archived at PERAL).

Minter, D. 2006. *Kretzschmaria cetrarioides*. IMI Descriptions of Fungi and Bacteria No. 1697. CAB International, Egham, Surrey, U.K.

Mmolotsi, R. M., M. Obopile, B. C. Kwerepe, B. Sebolai, M. P. Rampart, A. T. Segwagwe, G. Ramolemana, T. M. Maphane, L. Lekorwe, and I. Kopong. 2012. Studies on Mukwa (*Pterocarpus angolensis*, DC) dieback in Chobe Forest Reserves in Botswana. Journal of Plant Studies 1(2):154-157.

Moritz, G., S. Brandt, S. Triapitsyn, and S. Subramanian. 2013. Factsheet: *Megalurothrips sjostedti*. Thripsnet, Identification and information tools for pest thrips in East Africa. CBIT Publishing, Queensland (Accessed December 15, 2016). http://thripsnet.zoologie.uni-halle.de/key-server-neu/data/03030c05-030b-4107-880b-0a0a0702060d/media/Html/index.html. (Archived at PERAL).

Mound, L. A., and S. H. Halsey. 1978. Whitefly of the World: A Systematic Catalogue of the Aleyrodidae (Homoptera) with Host Plant and Natural Enemy Data. British Museum (Natural History) and John Wiley & Sons, Chichester, U.K. 340 pp.

Munthali, D. C. 1992. Effect of cassava variety on the biology of *Bemisia afer* (Priesner & Hosny) (Hemiptera: Aleyrodidae). Insect Science and Its Application International Journal of Tropical Insect Science 13(3):459-465.

Mutowo, G. 2010. Geographic information systems and remote sensing modelling of tree species diversity in the woodlands of Zimbabwe. Thesis submitted to the Department of Geography and Environmental Sciences, University of Zimbabwe. 60 pp.

NAPPO. 2001. *Eutetranychus orientalis* (Klein), citrus brown mite (or similar species) threatening North American citrus production. North American Plant Protection Organization (NAPPO). Phytosanitary Alert System (PAS) (accessed 02/16/2017) http://www.pestalert.org/viewArchPestAlert.cfm?rid=62&keyword=Eutetranychus%20orientalis.

NASS. 2014. 2012 Census of agriculture. United States Department of Agriculture, National Agricultural Statistics Service (NASS), Quick Stats Database. Last accessed 2/10/2017. https://www.nass.usda.gov/Data_and_Statistics/. (Archived at PERAL).

Nonveiller, G. 1973. Leaf malformations in groundnut caused by attack from thrips. (Preliminary note.) [translated title] [abstract]. Agronomie Tropicale 28(6/7):625-639.

NRCS. 2017. The PLANTS Database. United States Department of Agriculture, Natural Resources Conservation Service (NRCS). http://plants.usda.gov/java/. (Archived at PERAL).

Ogah, E. O. 2011. Assessing the impact of varietal resistance and planting dates on the incidence of African yam bean flower thrips (*Megalurothrips sjostedti*, Hochst. Ex. A. Rich) in Nigeria. Asian Journal of Plant Sciences 10(7):370-375.

Ogah, E. O. 2013. Field evaluation of plant extracts in the management of *Megalurothrips sjostedti* and *Maruca vitrata* of cowpea in southeastern Nigeria. Journal 1(1):11-17.

Ogah, E. O., and F. E. Ogah. 2012. Evaluating the effect of host plant resistance and planting dates on the incidence of legume pod borer (*Maruca vitrata* Geyer) on African yam bean in Nigeria. African Crop Science Journal 20(3):163-170.

Oke, O., and K. Banjoko. 1991. The effects of *Penicillium digitatum* and *Fusarium oxysporum* rots on nutritional content of pawpaw (*Carica papaya* L.). Mycopathologia 116(3):199-202.

Okeyo-Owour, J. B., and C. P. M. Khamala. 1980. Insect podborer infestations and their influence on developing pods and final seed yields by pigeonpea (*Cajanus cajan*) in Kenya. Kenya Journal of Science and Technology (B) 1(2):79-86.

Ouvrard, D., and J. H. Martin. 2017. The White-files - Taxonomic checklist of the world's whiteflies (Insecta: Hemiptera: Aleyrodidae). http://www.hemiptera-databases.org/whiteflies/. (Archived at PERAL).

Oyelade, O. J., and A. A. Ayansola. 2015. Diversity and distribution of whiteflies in southwestern Nigeria. African Crop Science Journal 23(2):135-149.

Özturk, N., and M. R. Ulusoy. 2009. Pests and natural enemies determined in pomegranate orchards in Turkey. Acta Horticulturae (818):277-284.

Panis, A., P. Kreiter, and J.-C. Onillon. 2009. *Acaudaleyrodes rachipora* (Singh), a whitefly species new to Algeria, Mauritania and Tunisia (Hemiptera, Aleyrodidae). Nouvelle Revue d'Entomologie 26(1):67-70.

Pandey, V. P., S. I. Ahmed, and R. Sundararaj. 2012. The babul whitefly, *Acaudaleyrodes rachipora* (Singh), a pest of forest ecosystem in Indian arid zone and its management. Pages 243-282 in V. B. David, (ed.). The Whitefly or Mealywing Bugs: Bioecology, Host Specificity and Management. Lambert Academic Publishing, Saarbrücken, Germany. 411 pp.

Passoa, S., and D. Bean. 2001. Pest Risk Analysis for *Maruca vitrata* (Fabricius), bean pod borer. 2001 Eastern Pest Survey Committee Guidelines for the Cooperative Agricultural Pest Survey (CAPS) Program. 5 pp.

Patnaik, H. P., A. P. Samalo, and B. N. Samalo. 1986. Susceptibility of some early varieties of pigeonpea for pod borers under protected conditions [abstract only]. Legume Research 9(1):7-10.

PCIT. 2017. Phytosanitary Certificate Issuance & Tracking System (PCIT). United States Department of Agriculture, Animal and Plant Health Inspection Service. https://pcit.aphis.usda.gov/pcit/faces/signIn.jsf. (Archived at PERAL).

Peña, J. E., and J. H. Crane. 2013. Insect/mite management in *Annona* sp. University of Florida IFAS Extension Fact Sheet No. ENY-834. Department of Entomology and Nematology, Florida Cooperative Extension Service, University of Florida. 5 pp.

PERAL. 2015. Plant Hardiness Zones of the United States: Area and Population Analysis (Rev.Original). United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, Center for Plant Health Science and Technology, Plant Epidemiology and Risk Analysis Laboratory (PERAL), Raleigh, NC. 6 pp.

PestID. 2017. Pest identification database (PestID). United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ). PestID Report: Entire list of insects in database (Queried 02/27/2017). https://aqas.aphis.usda.gov/aqas/HomePageInit.do#defaultAnchor. (Archived at PERAL).

PPQ. 2002. Electronic files for arthropods from pests not known to occur in the United States or of limited distribution and insects not known to occur in the United States. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (PPQ), Policy and Program Development, Risk Analysis Systems. 941 pp.

PPQ. 2012. Guidelines for Plant Pest Risk Assessment of Imported Fruit and Vegetable Commodities (First Edition). United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (PPQ), Raleigh, NC.

PPQ. 2016. Treatment Manual. United States Department of Agriculture. Animal and Plant Inspection Service. Plant Protection and Quarantine (PPQ), Riverdale, MD, USA.

Roberts, H. 1968. Notes on the biology of ambrosia beetles of the genus *Trachyostus* Schedl (Coleoptera: Platypodidae) in West Africa. Bulletin of Entomological Research 58(2):325-352.

Roberts, H. 1969. Forest Insects of Nigeria With Notes on Their Biology and Distribution. Commonwealth Forestry Institute, University of Oxford. 206 pp.

Robinson, G. S., P. R. Ackery, I. J. Kitching, G. W. Beccaloni, and L. M. Hernández. 2017. HOSTS - A Database of the World's Lepidopteran Hostplants. Natural History Museum, London. http://www.nhm.ac.uk/hosts. (Accessed: July 24, 2017). (Archived at PERAL).

Rudinsky, J. A. 1962. Ecology of Scolytidae. Annual Review of Entomology 7:327-348.

Saha, S., S. Moorthi, H.-L. Pan, X. Wu, J. Wang, S. Nadiga, P. Tripp, R. Kistler, J. Woollen, D. Behringer, H. Liu, D. Stokes, R. Grumbine, G. Gayno, J. Wang, Y.-T. Hou, H.-Y. Chuang, H.-M. H. Juang, J. Sela, M. Iredell, R. Treadon, D. Kleist, P. Van Delst, D. Keyser, J. Derber, M. Ek, J. Meng, H. Wei, R. Yang, S. Lord, H. Van Den Dool, A. Kumar, W. Wang, C. Long, M. Chelliah, Y. Xue, B. Huang, J.-K. Schemm, W. Ebisuzaki, R. Lin, P. Xie, M. Chen, S. Zhou, W. Higgins, C.-Z. Zou, Q. Liu, Y. Chen, Y. Han, L. Cucurull, R. W. Reynolds, G. Rutledge, and M. Goldberg. 2010. The NCEP climate forecast system reanalysis. Bulletin of the American Meteorological Society 91(8):1015-1057.

Salifu, A. B. 1992. Some aspects of the biology of the bean flower thrips *Megalurothrips sjostedti* (Trybom) (Thysanoptera: Thripidae) with reference to economic injury levels on cowpea (*Vigna unguiculata* (L.) Walp). Revue de Zoologie Africaine – Journal of African Zoology 106(5):451-459.

Schedl, K. E. 1982. Scolytoidea (Coleoptera), mainly from South Africa. Annals of the Transvaal Museum 33(15):277-286.

Sharma, V. 1978. Taxonomic studies on Indian Braconidae (Hymenoptera). Oriental Insects 12(1):123-132.

Singh, S. R., and T. A. Taylor. 1978. Pests of grain legumes and their control in Nigeria. Pages 99-111 in S. R. Singh, H. F. Van Emden, and T. A. Taylor, (eds.). Pests of Grain Legumes: Ecology and Control. Academic Press, New York. 454 pp.

Singh, S. R., H. F. Van Emden, and T. A. Taylor (eds.). 1978. Pests of Grain Legumes: Ecology and Control. Academic Press, New York. 454 pp.

Singh, S. R., and H. F. van Emden. 1979. Insect pests of grain legumes. Annual Review of Entomology 24:255-278.

Sivaprakash, M., P. Balasubramaniam, and S. Prabhu. 2009. Temporal pattern of phytonematodes associated with Red Sanders, *Pterocarpus santalinus*. Annals of Plant Protection Sciences 17(2):440-442.

Sivaprakash, M., and P. Balasubramanian. 2008. Temporal pattern of plant parasitic nematodes associated with Red Sanders, *Pterocarpus santalinus* during the month from June' 04 to June' 05 at Sennamalaikaradu, Mettupalayam. Madras Agricultural Journal 95(1-6):83-91.

Smith Meyer, M. K. P. 1981. Mite pests of crops in southern Africa. Science Bulletin, Department of Agriculture and Fisheries, Republic of South Africa 397:1-92.

Smith Meyer, M. K. P. 1998. Lowveld citrus mite *Eutetranychus orientalis* (Klein). Pages 69-72 in Bedford, E. C .G., M. A. Van der Berg, and E. A. de Villiers (eds.). Citrus Pests in the Republic of South Africa. Institute for Tropical and Subtropical Crops, Nelspruit, South Africa.

Sonune, V., R. Bharodia, D. Jethva, R. Rathod, and S. Deshmukh. 2010. Field efficacy of chemical insecticides against spotted pod borer, *Maruca vitrata* (Fabricius) infesting blackgram. Legume Research 33(4):287-290.

Spaulding, P. 1961. Foreign diseases of forest trees of the world. Agriculture Handbook No. 197. United States Department of Agriculture, Agricultural Research Service, Washington, D.C. 361 pp.

Sundararaj, R., and S. Murugesan. 1996. Occurrence of *Acaudaleyrodes rachipora* (Singh) (Aleyrodidae: Homoptera) as a pest of some important forest trees in Jodhpur (India). Journal of Forestry 19(6):247-248.

Tams, W. H. T. 1936. Dr. Karl Jordan's expedition to South-West Africa and Angola: Lasiocampidae. Novitates Zoologicae 40(1):95–114.

Tamò, M., D. Y. Arodokoun, N. Zenz, M. Tindo, C. Agboton, and R. Adeoti. 2002. The importance of alternative host plants for the biological control of two key cowpea insect pests, the pod borer *Maruca vitrata* (Fabricius) and the flower thrips *Megalurothrips sjostedti* (Trybom). Pages 81-93 in C.A. Fatokun, S.A. Tarawali, B.B. Singh, P.M Kormawa, and M. Tamò (eds.). Challenges and Opportunities for Enhancing Sustainable Cowpea Production. International Institute of Tropical Agriculture, Ibadan, Nigeria.

Tamò, M., J. Baumgärtner, V. Delucchi, and H. R. Herren. 1993a. Assessment of key factors responsible for the pest status of the bean flower thrips *Megalurothrips sjostedti* (Thysanoptera: Thripidae) in West Africa. Bulletin of Entomological Research 83(2):251-258.

Tamò, M., J. Baumgärtner, and D. Arodokoun. 1993b. The spatio-temporal distribution of *Megalurothrips sjostedti* (Trybom) (Thysanoptera, Thripidae) life stages on cowpea, and development of sampling plans. Mitteilungen der Schweizerischen Entomologischen Gesellschaft 66(1-2):15-34.

Taylor, T. A. 1967. The bionomics of *Maruca testulalis* Gey. (Lepidoptera: Pyralidae), a major pest of cowpeas in Nigeria. Journal of the West African Science Association 12:111-129.

Taylor, T. A. 1974. On the population dynamics of *Taeniothrips sjostedti* (Tryb.) (Thysanoptera, Thripidae) on cowpea and an alternative host, *Centrosema pubescens* Benth., in Nigeria. Revue de Zoologie Africaine 88(4):689-702.

Taylor, T. A. 1978a. *Maruca testulalis*: an important pest of tropical grain legumes. Pages 193-200 in S. R. Singh, H. F. Van Emden, and T. A. Taylor, (eds.). Pests of Grain Legumes: Ecology and Control. Academic Press, New York, New York. 454pp.

Thindwa, H., and P. Khonje. 2005. Chapter 2.5: Malawi. Pages 150-156 In P. K. Anderson & F. J. Morales (Eds.), Whitefly and Whitefly-Borne Viruses in the Tropics: Building a Knowledge Base for Global Action. Centro Internacional de Agricultura Tropical, Cali, Colombia.

Thomas, R.H. and D.W. Zeh. 1984. Sperm transfer and utilization strategies in arachnids: ecological and morphological constraints, pp. 179-221. *In* R.L. Smith (ed.). Sperm Competition and the Evolution of Animal Mating Systems. Orlando, FL: Academic Press, Inc.

Timm, R. W. 1965. A preliminary survey of the plant parasitic nematodes of Thailand and the Philippines. South-East Asia Treaty Organization Secretariat-General. 71 pp.

USCB. 2017. United States Census Bureau (USCB). QuickFacts. 2016 population statistics for Miami-Dade and Monroe counties in Florida. https://www.census.gov/quickfacts/. (Archived at PERAL).

USDA-FAS. 2017. Global Agricultural Trade Service (GATS) Online. United States Department of Agriculture (USDA), Foreign Agricultural Service (FAS). http://apps.fas.usda.gov/gats/. (Archived at PERAL).

USFWS. 2017. Listed Plants. United States Fish and Wildlife Service (USFWS). Environmental Conservation Online System (ECOS). https://ecos.fws.gov/ecp0/reports/ad-hoc-species-report?kingdom=P&status=E&status=T&status=EmE&status=EmT&status=EXPE&status=EXPN&status=SAE&status=SAT&fcrithab=on&fstatus=on&fspecrule=on&finvpop=on&fgroup=on&ffamily=on&header=Listed+Plants. (Archived at PERAL).

van Lenteren, J. C., and L. P. J. J. Noldus. 1990. Whitefly-plant relationships: behavioural and ecological aspects. Pages 47-89 in D. Gerling, (ed.). Whiteflies: Their Bionomics, Pest Status and Management. Intercept Limited, Andover, U.K. 348 pp.

van Someren, V. G. L. 1970. Revisional notes on African *Charaxes* (Lepidoptera: Nymphalidae). Part VI. Bulletin of the British Museum of Natural History (Entomology) 25(5):197-250.

Venters, N. 1998. African *Charaxes*. In M. Savela. Lepidoptera and Some Other Life Forms (accessed 12/21/2016). http://ftp.funet.fi/index/Tree_of_life/insecta/lepidoptera/ditrysia/papilionoidea/nymphalidae/charaxinae/charaxes/. (Archived at PERAL).

Vuattoux, R., J. Pierre, and J. Haxaire. 1989. Les sphinx de Côte-d'Ivoire, avec des données nouvelles sur les élevages effectués à la station écologique de Lamto [Lep. Sphingidae]. Bulletin de la Société Entomologique de France 93(7-8):239-255.

Walter, D. E., R. B. Halliday, and D. Smith. 1995. The oriental red mite, *Eutetranychus orientalis* (Klein) (Acarina: Tetranychidae), in Australia. Australian Journal of Entomology 34(4):307-308.

Watanabe, C. 1940. Hymenopterous parasites of the mulberry pyralid moth, *Margaronia pyloalis* Walker, in Japan (1). Insecta Matsumurana 14(2-3):85-94.

West, J. 1938. A preliminary list of plant diseases in Nigeria. Bulletin of Miscellaneous Information (Royal Botanic Gardens, Kew). 1938(1):17-23.

White, J. 2013. Whiteflies in the greenhouse. Entfact-456. Kentucky Cooperative Extension Service, University of Kentucky https://entomology.ca.uky.edu/ef456. (Archived at PERAL).

Williams, M.C. 2015. Genus *Andronymus* Holland, 1896. In Butterflies and Skippers of the Afrotropical Region, 14th ed. Lepidopterists' Society of Africa; http://www.metamorphosis.org.za/articlesPDF/965/406%20Genus%20Andronymus%20Holland.pdf.

Wolcott, G. N. 1951. The insects of Puerto Rico. Journal of Agriculture of the University of Puerto Rico 32(3):417-748.

Wood, S.L. and D.E. Bright, Jr. 1992a. A catalog of Scolytidae and Platypodidae (Coleoptera), part 2: taxonomic index. Volume A. Great Basin Naturalist Memoirs (13): 1-833.

Wood, S.L. and D.E. Bright, Jr. 1992b. A catalog of Scolytidae and Platypodidae (Coleoptera), part 2: taxonomic index. Volume B. Great Basin Naturalist Memoirs (13): 835-1553.

Zeng, Y., W. Ye, S. B. Martin, M. Martin, and L. Tredway. 2012. Diversity and occurrence of plant-parasitic nematodes associated with golf course turfgrasses in North and South Carolina, USA. Journal of Nematology 44(4):337-347.

7. Appendix A. Pests with non-actionable regulatory status

We found some evidence of the below-listed organisms being associated with *Pterocarpus* spp. and being present in Nigeria. Because these organisms have non-actionable regulatory status for the United States, however, we did not list them in Table 1 of this risk assessment, and we did not evaluate the strength of the evidence for their association with *Pterocarpus* spp. or their presence in the United States. Because we did not evaluate the strength of the evidence, we consider the following pests to have only "potential" association with the commodity and presence in the United States.

Below we list these organisms along with the references supporting their potential association with *Pterocarpus* spp., their potential presence in Nigeria, their presence in the United States, and their regulatory status for the United States.

Organism	Evidence and/or other notes
Arthropods	
HEMIPTERA:Aleyrodidae	
Aleurodicus dispersus Russell	Pest of *Pterocarpus* spp. in Nigeria (Oyelade and Ayansola, 2015) and present in the United States (Cherry, 1980); Deregulated: DEEP (PestID, 2017).
Bemisia tabaci (Gennadius)	Pest of *Pterocarpus* spp. (Mound and Halsey, 1978), present in Nigeria (Mound and Halsey, 1978) and present in the United States (McKenzie, 2009). Reportable, but No Action Required except when on tomato from the Dominican Republic (PestID, 2017).
LEPIDOPTERA: Hyblaeidae	
Hyblaea puera (Cramer)	Evidence in Nigeria (Medler, 1980) and present in the United States (Kimball, 1965; Martorell, 1976; CABI 2017). The species is listed as non-reportable in PestID (Queried 02/27/2017).
COLEOPTERA: Cerambycidae	
Mallodon downesii Hope	Pest of *Pterocarpus* spp. in Nigeria (Roberts, 1969). The genus and one species of *Mallodon* are listed as non-reportable in PestID (Queried 02/27/2017).
Fungi	
Albonectria rigidiuscula (Berk. & Broome) Rossman & Samuels	Pest of *Pterocarpus* spp. (Farr and Rossman, 2017); present in Nigeria and in the United States (Farr and Rossman, 2017).
Athelia rolfsii (Curzi) C.C. Tu & Kimbr. (= *Sclerotium rolfsii* Sacc.)	Pest of *Pterocarpus* spp. (Farr and Rossman, 2017); present in Nigeria and in the United States (Farr and Rossman, 2017).
Colletotrichum gloeosporioides (Penz.) Penz. & Sacc.	Pest of *Pterocarpus* spp. (Farr and Rossman, 2017); present in Nigeria and in the United States (Farr and Rossman, 2017).
Colletotrichum truncatum (Schwein.) Andrus & W. D. Moore	Pest of *Pterocarpus* spp. (Farr and Rossman, 2017) in Nigeria (Farr and Rossman, 2017; Kobayashi, 2007) and present in the United States (Farr and Rossman, 2017).
Fusarium oxysporum Schltdl. : Fr.	Pest of *Pterocarpus* spp. (Farr and Rossman, 2017) in Nigeria (Fajola, 1979; Oke and Banjoko, 1991; Farr & Rossman, 2017) and present in the United States (Farr and Rossman, 2017).