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Importation of fresh leaves and stems of common glasswort (*Salicornia europaea* L.) from Israel into the United States and its Territories for consumption

A Qualitative, Pathway-Initiated Pest Risk Assessment

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Animal and Plant Health Inspection Service

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Executive Summary

The purpose of this report is to assess the pest risks associated with importing commercially produced cut leaves and stems of common glasswort, *Salicornia europaea* L. (Chenopodiaceae), from Israel into the United States and territories for consumption.

Based on the market access request submitted by Israel (the export area), we focused on the pathway to include hand-cutting and culling common glasswort leaves. We did not consider any other mitigation possibilities during our analysis.

We used scientific literature, U.S. port-of-entry pest interception data, and information from the government of Israel to develop a list of pests with quarantine significance for the United States and territories. These pests occur in Israel (on any host) and are associated with the commodity plant species (anywhere in the world).

The following organisms are candidates for pest risk management because they have met the threshold for unacceptable consequences of introduction.

Pest type	Taxonomy	Scientific name	Likelihood of Introduction overall rating
Arthropod	Diptera: Agromyzidae	*Chromatomyia horticola*	Medium
	Lepidoptera: Gelechiidae	*Scrobipalpa ocellatella*	Low

A detailed examination of various phytosanitary measures to mitigate pest risk are addressed in a separate document.

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1. Introduction

1.1. Background

Analysts of the Plant Epidemiology and Risk Analysis Laboratory (PERAL), United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA-APHIS-PPQ) prepared this document in response to a request by the government of Israel on the entry of *Salicornia europaea* L. (Chenopodiaceae). The purpose of this report is to assess the pest risk associated with the importation of commercially produced fresh, cut leaves and stems of common glasswort (*Salicornia europaea* L.) from Israel (referred to as the export area) into the United States and territories[1] (referred to as the pest risk analysis or PRA area) for public consumption.

This is a qualitative risk assessment. We expressed the likelihood of pest introduction as a qualitative rating rather than on numerical terms. This methodology is consistent with guidelines provided by the International Plant Protection Convention (IPPC) under the International Standard for Phytosanitary Measures (ISPM) No. 11, "Pest Risk Analysis for Quarantine Pests" (IPPC, 2017). The use of biological and phytosanitary terms is consistent with ISPM No. 5, "Glossary of Phytosanitary Terms" (IPPC, 2019).

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 of the Code of Federal Regulations, Part 319.56-3 (7 CFR §319.56-3, 2019) (PPQ, 2018). Under this regulation, we do not authorize the entry of common glasswort from Israel into the PRA. This commodity risk assessment was initiated in response to a request by the Plant Protection and Inspection Services of the State of Israel to change the Federal Regulation to allow entry (PPIS, 2020).

1.3. Determining if a weed risk analysis for the commodity is needed

Because the stems of common glasswort could be propagated, we performed a weed risk analysis (PPQ, 2020). The most likely outcome of a PPQ WRA for *Salicornia europaea* is Moderate Risk of becoming weedy or invasive in the United States. *Salicornia europaea* is an annual succulent that requires brackish or maritime habitats for survival. Taxonomists originally described the native North American species complex of *Salicornia* as *S. europaea*, but researchers have reclassified them into distinct species. *Salicornia europaea* is most likely not present in the United States. We found no evidence of *S. europaea* being problematic or weedy; much of the literature focuses on the benefits of *Salicornia*. Given the species; expansive native distribution throughout Europe and Asia, we expect plant hardiness zones 5 through 12 to be inhabitable.

[1] The PRA area includes all 50 states, Guam, the Commonwealth of the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands.

However, *S. europaea* depends on saline and brackish environments; therefore, all coastal regions of the United States, Hawaii, and territories are suitable for establishment (PPQ, 2020).

1.4. Description of the pathway

A pathway is "any means that allows the entry or spread of a pest" (IPPC, 2019). In the context of this document, the pathway is the commodity intended for importation, together with all the processes the commodity undergoes from production through importation and distribution. The following description of this pathway focuses on the conditions and processes that may have an impact on pest risk. Our assessment is, therefore, contingent on the application of all components of the pathway as described in this section.

1.4.1. Description of the commodity

The specific pathway of concern is the importation of fresh leaves and stems of common glasswort (*Salicornia europaea* L.) (Chenopodiaceae) for consumption. Common glasswort is a perennial succulent that inhabits salt marshes (Kadereit et al., 2007).

1.4.2. Summary of the production, harvest, post-harvest procedures, shipping and storage conditions we considered

Although Israel's market access request has detailed numerous pest mitigation practices, we have considered only hand-culling as a form of mitigation during production, harvesting, and post-harvesting. Furthermore, we did not consider shipping and storage conditions that could affect pest risk during our assessment.

2. Pest List and Pest Categorization

The pest list is a compilation of plant pests that are of quarantine significance to the United States and Territories. This includes pests that are both present in Israel (on any host) and known to be associated with *Salicornia europaea* (anywhere in the world). Pests are considered to be of quarantine significance if they (a) are not present in the PRA area, (b) are actionable at U.S. ports of entry, (c) are regulated non-quarantine pests, (d) are considered for or under Federal official control, or (e) require evaluation for regulatory action. Consistent with ISPM No. 5, we considered pests that meet any of these definitions as "quarantine pests" and are candidates for analysis. To determine their pest risk potential, we analyzed species that have a reasonable likelihood of following the pathway into the PRA area.

2.1. Pest list

We developed the pest list based on the scientific literature, port-of-entry pest interception data, and information provided by the government of Israel. Under Table 1, we listed pests that are of quarantine significance to the PRA area. For each pest, we provided evidence of the pest's presence in Israel and its association with common glasswort (*Salicornia europaea*). We also indicated the plant parts with which the pest is generally associated with and any information about the pest's distribution in the United States. We indicated the pests that are likely to remain associated with the harvested commodity, in viable form, by shaded rows under Table 1. We assessed these pests separately under Table 2.

Table 1. List of quarantine pests associated with common glasswort (*Salicornia europaea*) (in any country) and present in Israel (on any host)

Pest name	Presence in Israel	Host association	Plant part(s) [2]	Considered further?[3]
Arthropoda: Insecta				
Coleoptera: Chrysomelidae				
Cassida nobilis L.	Borowiec et al., 1997	Davy et al., 2001; Hackston, 2014 (*Salicornia* spp.)	Leaves (Darby, 2020)	**No** Tortoise beetles may nibble on host leaves but disperse during harvest.
Cassida vittata de Villers	Borowiec et al., 1997	Davy et al., 2001 (*Salicornia* spp.); Hackston, 2014	Leaves (Darby, 2020)	**No** Tortoise beetles may nibble on host leaves but disperse during harvest.
Chaetocnema tibialis (Illiger)	Gerson and Applebaum, 2017	Ellis, 2020b	Roots, leaves (Ellis, 2020b)	**No** Larva feed inside the roots of their host and adults may nibble on leaves (Ellis, 2020b; Gerson and Applebaum, 2017), but disperse during harvest.
Diptera: Agromyzidae				
Chromatomyia horticola (Goureau)	Malipatil and Ridland, 2020	Spencer, 1990; B. Pitkin et al., 2019; Ellis, 2020c	Leaf miner (Spencer, 1990)	**Yes** The pea leaf miner feeds within the leaves of its host and could follow the pathway (CABI, 2020b).
Diptera: Cecidomyiidae				
Baldratia salicorniae Kieffer	Dorchin and Freidberg, 2008	Dorchin and Freidberg, 2008; Ellis, 2020a	Larvae form galls (Dorchin and Freidberg, 2008)	**No**, see justification in section 2.2.
Diptera: Ephydridae				
Clanoneurum cimiciforme (Halliday)	Mathis et al., 2017	Ellis, 2020d	Leaf miner (Ellis, 2020d; Pitkin et al., 2017)	**No**, see justification in section 2.2.

[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 as part of the Likelihood of Introduction assessment (section 3).

Hemiptera: Psylloidea				
Rhodochlanis bicolor (Scott)	Spodek et al., 2017	Ellis, 2020f	Leaf (Ellis, 2020f)	**No** Jumping plant lice feed externally on plant juices (Hodkinson, 1974), but will disperse during harvest.
Lepidoptera: Gelechiidae				
Scrobipalpa ocellatella (Boyd)	Bidzilya et al., 2019	Ellis, 2020h; Savela, 2020b	Leaf miner (Ellis, 2020h)	**Yes** The beet moth feeds inside the host and could follow the pathway (Ellis, 2020h).
Scrobipalpa suaedivorella (Chrétien)	Bidzilya et al., 2019	Bidzilya et al., 2019	Larvae spin twigs together with silk and mine the leaves (Ellis, 2020i; Huemer and Karsholt, 2010)	**No** We found little information on this species; larvae bind the leaves and twigs together with silk (Huemer and Karsholt, 2010), leading infested common glasswort to be culled.
Tracheophyta: Magnoliopsida				
Lamiales: Orobanchaceae				
Cistanche tubulosa Wight	GBIF, 2020	Qasem, 2009 (syn: *Salicornia herbacea* L.)	Root (Chen et al., 2016; Fahmy et al., 1996)	**No** This plant species is a root parasite (Chen et al., 2016; Fahmy et al., 1996). It is unlikely to associate with the harvested commodity.

2.2. Notes on pests identified in the pest list

We did not identify evidence of either pathogens or saprophytic fungi that associate with *Salicornia europaea* L. and are present in the export area.

<u>*Baldratia salicorniae* Kieffer (Diptera: Cecidomyiidae)</u>

Baldratia salicorniae is a gall midge where larvae develop in the stem forming a red gall (Dorchin and Freidberg, 2008; Ellis, 2020a). While *B. salicorniae* causes galls on its host, we found no evidence that this insect is considered a pest. Further, only one of the known hosts, *Sarcocornia perennis* (Chenopodiaceae), occurs in the United States (Dorchin and Freidberg 2008; Kartesz, 2015). *Sarcocornia perennis* does not appear to have any economic, cultural, or environmental importance. Because we found no evidence to suggest that this insect is a pest (i.e., it is unlikely to cause unacceptable consequences in the PRA area), we did not assess it further.

Clanoneurum cimiciforme (Halliday) (Diptera: Ephydridae)
Larvae feed inside host leaves and have the potential to follow the pathway (Ellis, 2020d). However, we found insufficient evidence to suggest that this species behaves like a pest. Instead, literature on *C. cimiciforme* focused on cataloging species diversity for habitat surveys (Mason et al., 1991; Mathis et al., 2017; Zatwarnicki and Zumeta, 1999). Since we found minimal information of its natural history, distribution and hosts, and without evidence of pest damage, we determined that this insect is unlikely to cause unacceptable consequences. Therefore, we did not assess it further.

2.3. Pests that were considered but not included on the pest list

2.3.1. Organisms with non-quarantine status
We found evidence of organisms that are associated with the common glasswort, and present in the export area, but these are not of quarantine significance for the PRA area. We listed these organisms in the Appendix.

Armored scales (Hemiptera: Diaspididae): These insects are highly unlikely to establish via the pathway of fruits and vegetables intended for consumption, due to their very limited ability to disperse to new host plants (Miller et al., 1985; PERAL, 2007). Further, diaspidids on fruits and vegetables for consumption, are considered non-actionable at U.S. ports of entry (NIS, 2008). For these reasons, armored scales are not included under Table 1 but are listed in the Appendix even if they are not present in the PRA area.

2.3.2. Quarantine pests with insufficient evidence for an association with the commodity or presence in the export area

Coleophora salicorniae Heinemann & Wocke (Lepidoptera: Coleophoridae): While this species of case-building moth does feed inside the stems of *Salicornia europaea* (Ellis, 2020e), we found no evidence that it occurs in Israel. The species is native to "all of Europe" and nearby countries: Iran, Turkmenistan, and Western China (Ellis, 2020e; Li, 2005; Savela, 2020a). Regardless, the likelihood of larvae following the pathway is probably low because *C. salicorniae* undergoes its pre-pupal stage in a conspicuous case, constructed from its host; then, it pupates in a silken cocoon while buried in the mud (Wheeler, 2020).

Hypotia pectinalis (Herrich-Schäffer) Syn.: *Mnesixena pectinalis* (Lepidoptera: Pyralidae): We could not find specific locality data that places this species in Israel; however, Leruat (2004) claims it is in all of the Middle East. In addition, we could not find taxonomic specific information on hosts, only *Salicornia* sp. (Robinson et al., 2010). Regardless, larvae are not likely to follow the pathway because they feed within silken nests that extend from the host to the soil (Dionisio, 2007). Harvesters would cull the commodity if this pest were present.

Scrobipalpa salinella (Zeller) (Lepidoptera: Gelechiidae): This species of moth is an important pest of *Salicornia europaea* in tidal salt marshes (Yang et al., 2011). In 1937, the entomologist F.S. Bodenheimer considered it to be native to Israel; however, recent surveys failed to find its presence in Israel where its occurrence is doubtful (Bidzilya et al., 2019).

Scrobipalpa nitentella (Fuchs) (Lepidoptera: Gelechiidae): This species of moth feeds on *Salicornia europaea* (Ellis, 2020g; Savela, 2020b). In 1935 and 1937, entomologists Hans Georg Amsel and F.S. Bodenheimer considered it to be native to Israel; however, recent surveys did not record this species and its occurrence in Israel is doubtful (Bidzilya et al., 2019; Savela, 2020b).

2.4. Pests selected for further analysis

We identified two quarantine pests for further analysis (Table 2).

Table 2. Pests selected for further analysis

Pest type	Taxonomy	Scientific name
Arthropod	Diptera: Agromyzidae	*Chromatomyia horticola*
	Lepidoptera: Gelechiidae	*Scrobipalpa ocellatella*

3. Assessing Pest Risk Potential

3.1. Introduction

We estimated the overall pest risk potential for each pest. Risk is described by the likelihood of an adverse event, the potential consequences, and the uncertainty associated with these parameters. For each pest, we determined if an endangered area exists within the United States and territories. The endangered area is defined as the portion of the PRA area where ecological factors favor the pest's establishment and where the pest's presence will likely result in economically important losses. If a pest causes an unacceptable impact (i.e., is a threshold pest), that means it could adversely affect agricultural production by causing yield loss at 10 percent or greater, increasing production costs, or impacting an environmentally important host or international trade. Once we defined the endangered area for a pest, we assessed the pest's overall risk by evaluating the likelihood of its introduction into the endangered area on the imported commodity.

The likelihood of introduction is based on the likelihoods of entry and establishment. We qualitatively assessed risk using the ratings: Low, Medium, and High. The risk factors comprising the likelihood of introduction are interdependent; therefore, the model is multiplicative rather than additive. We defined the risk categories as follows:

> **High**: This outcome is highly likely to occur.
> **Medium**: This outcome is possible; but for that to happen, the exact combination of required events needs to occur.
> **Low**: This outcome is unlikely to occur because one or more of the required events are unlikely to happen, or because the full combination of required events is unlikely to align properly in time and space.

We addressed uncertainty within the assessment as follows:

> **Negligible:** Additional or better evidence is very unlikely to change the rating.
> **Low:** Additional or better evidence probably will not change rating.
> **Moderate:** Additional or better evidence may or may not change rating.

High: Reliable evidence is not available.

3.2. Assessment

3.2.1. *Chromatomyia horticola* (Diptera: Agromyzidae)

The pea leaf-miner fly is a polyphagous pest that feeds on tissue within leaves. It is widespread in Europe, Africa, Asia, and the Mediterranean (CABI, 2020b). The larvae are small, but leave noticeable mines in their host (Ellis, 2020c). Larvae pupate inside the host and have two to six generations a year (Ellis, 2020c; B. Pitkin et al., 2019). The species prefers human-disturbed habitat and cultivated plants (Ellis, 2020c).

Defining the endangered area for *Chromatomyia horticola* within the Continental United States, Hawaii, and territories

Climatic suitability	*Chromatomyia horticola* is present across Europe, Africa, and Asia (Boucher, 2008; CABI, 2020b) in Plant Hardiness Zones 6 through 13 (Takeuchi, 2018). In the continental United States, these Plant Hardiness Zones cover the southern, western, and eastern states. Low temperatures exclude states in the Midwest and the most northern portion of the Northeast. These Plant Hardiness Zones also include Hawaii, Puerto Rico, and the U.S. Virgin Islands.
Hosts in PRA area	Hosts include at least 160 plant genera, in 31 families (B. Pitkin et al., 2019). *Chromatomyia horticola* is associated with the following host plants that are present in the United States (Kartesz, 2015). **Asteraceae**: *Chrysanthemum* spp. (chrysanthemum) (Alford, 2012; Benavent-Corai, 2005), *Helianthus annuus* (common sunflower) (Gençer, 2009), *Lactuca sativa* (lettuce) (Anderson et al., 2008; Gençer, 2009), and *Lapsana communis* (common nipplewort) (Gençer, 2009); **Amaranthaceae**: *Beta vulgaris* (common beet) (Gençer, 2009); **Amaryllidaceae**: *Allium cepa* (onion) (Anderson et al., 2008; Bhat, 2009); **Brassicaceae**: *Brassica juncea* (Indian mustard) (Tran, 2009), *Brassica oleracea* (cabbage) (Gençer, 2009), *Brassica rapa* (turnip) (Bhat, 2009), *Lepidium draba* (whitetop) (Cripps, 2006; Gençer, 2009), and *Raphanus sativus* (radish) (Gençer, 2009); **Cucurbitaceae**: *Cucumis sativus* (cucumber) (Gençer, 2009); **Fabaceae**: *Lens esculenta* (lentil) (Erskine, 2009), *Melilotus officinalis* (sweet clover) (Gençer, 2009), and *Pisum sativum* (pea) (Anderson et al., 2008; Gençer, 2009); **Papaveraceae**: *Papaver somniferum* (opium poppy) (Gençer, 2009); **Plantaginaceae**: *Antirrhinum majus* (snapdragon) (Gençer, 2009); and **Solanaceae**: *Solanum lycopersicum* (tomato) (Tran, 2009).
Economically important hosts at risk[a]	Economically important hosts at risk include lettuce, onion, cabbage, cucumber, lentil, pea, and tomato (Anderson et al., 2008; Erskine, 2009; Gençer, 2009; Ostrauskas, 2005; Tran, 2009).

Pest potential on economically important hosts at risk	*Chromatomyia horticola* is likely to cause unacceptable consequences because it forms galleries in the foliage of ornamental and crop plants (Alford, 2012; Boucher, 2008). When the fly is present at high densities, damage caused by the larvae can reduce crop yields and kill plants (Bhat, 2009).
Endangered Area	The endangered area includes the regions in Plant Hardiness Zones 6 through 13 where suitable hosts occur within the United States, Puerto Rico, and the U.S. Virgin Islands.

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

Assessing the likelihood of introduction of *Chromatomyia horticola* into the endangered area via common glasswort imported from within the Continental United States, Hawaii, and territories

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Entry			
Pest prevalence on the harvested commodity	Low	Medium	Common glasswort is a host for *C. horticola* (Spencer, 1990), and the foliage is the preferred feeding site (B. Pitkin et al., 2019; Ellis, 2020c). However, we found minimal evidence that glasswort is a major host; consequently, the prevalence of the pest may be low in the field. Larvae form visible mines in the leaves (B. Pitkin et al., 2019; Ellis, 2020c); therefore, harvesters would likely cull affected leaves.
Likelihood of surviving post-harvest processing before shipment	Low	Medium	*Chromatomyia horticola* larvae live and feed within the leaf tissue, and therefore, post-harvest processing would not affect the number of eggs, larvae, or pupae in the glasswort. Hence, we did not change the rating from the previous risk element.
Likelihood of surviving transport and storage conditions of the consignment	Low	Medium	We did not consider post-harvest storage and transport conditions for this assessment; therefore, we left the risk rating as "low".
Overall Likelihood of Entry	Low		

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Establishment	Medium	Medium	*Chromatomyia horticola* has a wide host range and suitable host plants are widely distributed in the continental United States (Kartesz, 2015; Pitkin et al., 2019); however, eggs, larvae, or pupae would have to reach adulthood on a perishing commodity and then find a mate and a host in order to reproduce. We assess the likelihood of establishment to be Medium.
Likelihood of Introduction (combined likelihoods of entry and establishment)	Medium		

3.2.2. *Scrobipalpa ocellatella* (Lepidoptera: Gelechiidae)

The beet moth has a wingspan of 12-14mm, maximum larval size is 10mm long (Ovsyannikova and Grichanov, 2009). The species is widespread throughout Europe, the Middle East, and northern Africa (Bella and Karsholt, 2015). In warm climates, as many as five generations can occur per year (Ovsyannikova and Grichanov, 2009). The pest is fairly host-specific to the Chenopodiaceae and Amaranthaceae family (CABI, 2020a). Larvae feed on plant tissue inside their host and form visible mines in leaves and leaf stems. Eventually, larvae spin the leaves together with silk (Ovsyannikova and Grichanov, 2009). The stems and leaves bound in silk die, and pupation occurs outside of the host, at the soil surface in a silken cocoon, usually spun with debris (Bella and Karsholt, 2015; Ovsyannikova and Grichanov, 2009).

Defining the endangered area for *Scrobipalpa ocellatella* within the Continental United States, Hawaii, and territories

Climatic suitability	*Scrobipalpa ocellatella* is widely distributed from Portugal to Greece and southern Russia. In the northwest, along the coasts of the Atlantic Ocean and North Sea from Ireland to Denmark. In the southern Mediterranean, recorded from North Africa to the Middle East and Canary Islands (Bella and Karsholt, 2015; CABI, 2020a; Huemer and Karsholt, 2020; Ovsyannikova and Grichanov, 2009). The associated Plant Hardiness Zones range from 5 (Southern Russia) to 13 (Canary Islands). Low temperatures exclude the Midwest and Great Plains states along the Canadian border. Climactically, all other contiguous states, Hawaii, Puerto Rico, and U.S. Virgin Islands are at risk (Takeuchi, 2018).
Hosts in PRA area	*Scrobipalpa ocellatella* has a narrow host range, the few host plants present in the United States include **Chenopodiaceae:** cultivated *Beta vulgaris* (beet), *Suaeda maritima* (seepweed), and *Camphorosma*

	monspeliaca (Bella and Karsholt, 2015; CABI, 2020a; Huemer and Karsholt, 2020; Kartesz, 2015).
Economically important hosts at risk[a]	The only economically important host at risk in the U.S. or territories is *Beta vulgaris* (beet) (Bella and Karsholt, 2015; Huemer and Karsholt, 2020; Kartesz, 2015).
Pest potential on economically important hosts at risk	*Scrobipalpa ocellatella* can cause serious beet crop losses during outbreaks; Iran estimated losses of 2.36-3.8 tons of beet/ hectare (CABI, 2020a).
Endangered Area	The endangered area includes the regions in Plant Hardiness Zones 5 through 13 where suitable hosts occur within the United States, Puerto Rico, and the U.S. Virgin Islands. Since *S. ocellatella* is fairly host specific, we only found evidence of host presence along the east coast and a few other sporadic states (Kartesz, 2015; USDA-NRCS, 2020).

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

Assessing the likelihood of introduction of *Scrobipalpa ocellatella* into the endangered area via common glasswort imported from within the Continental United States, Hawaii, and territories

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Entry			
Pest prevalence on the harvested commodity	Low	Medium	The literature indicates that cultivated and wild beets are the primary host of *S. ocellatella* (Ellis, 2020h); however, the pest also attacks a few halophytic (salt tolerate) plants, including glasswort (Jansen, 1999; Ovsyannikova and Grichanov, 2009). A query for "*Scrobipalpa*" resulted in three interceptions at U.S. ports of entry (PestID, 2020), but none were on *Salicornia* spp. Hence, we rated the risk as "low" and our uncertainty "medium."
Likelihood of surviving post-harvest processing before shipment	Low	Medium	Eggs and young *S. ocellatella* larvae may avoid detection, but as the larvae develops, its mine becomes evident. Late instar larvae use silk to bind numerous leaves together and excrete obvious black frass on the webbing and plant (Ellis, 2020h; Ovsyannikova and Grichanov, 2009). We assume the harvesters would cull these plants; therefore, we maintained our risk and uncertainty rating as "low" and "medium".

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of surviving transport and storage conditions of the consignment	Low	Medium	We did not consider post-harvest storage and transport conditions for this assessment; therefore, we maintained our risk and uncertainty rating as “low” and “medium”.
Overall Likelihood of Entry	Low		
Likelihood of Establishment	Low	Low	*Scrobipalpa ocellatella* prefers coastal and maritime habitats and the hosts that grow there (Jansen, 1999; Ovsyannikova and Grichanov, 2009). This habitat is relatively uncommon throughout the United States and territories. Beets are the primary host and the only economically valuable host in the U.S. where it grows in only a few states (Kartesz, 2015). The likelihood is low that *S. ocellatella* could avoid detection during harvest, complete its lifecycle on a perishing commodity (cut stems and leaves of glasswort), and find a suitable host and mate.
Likelihood of Introduction (combined likelihoods of entry and establishment)	Low		

4. Summary

Of the organisms associated with common glasswort, worldwide and present in the export area, we identified two organisms that are quarantine pests for the United States and territories. These pests are likely to meet the threshold for unacceptable consequences in the PRA area and have a reasonable likelihood of following the commodity pathway (Table 3). Thus, these pests 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.

Table 3. Summary of pests selected for further evaluation and determined to be candidates for risk management; these pests meet the threshold for unacceptable consequences of introduction and have a reasonable likelihood of following the commodity pathway.

Pest type	Taxonomy	Scientific name	Likelihood of Introduction overall rating
Arthropod	Diptera: Agromyzidae	*Chromatomyia horticola*	Medium
	Lepidoptera: Gelechiidae	*Scrobipalpa ocellatella*	Low

Our assessment of risk is contingent on the application of all components of the pathway as described in section 1.4. The choice of appropriate phytosanitary measures to mitigate pest risk is not addressed in this document.

5. Literature Cited

7 CFR § 319.56-3. 2019. U.S. Code of Federal Regulations, Title 7, Part 319.56-3 (7 CFR § 319.56-3 - General requirements for all imported fruits and vegetables). https://www.govinfo.gov/app/details/CFR-2019-title7-vol5/CFR-2019-title7-vol5-sec319-56-3.

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6. Appendix: Pests with non-quarantine status

We found some evidence that the organisms, listed below, are associated with common glasswort and present in Israel. However, since these organisms are not of quarantine significance for the United States and territories (PestID, 2019; or as defined by ISPM 5, IPPC, 2019), we did not list them under Table 1 of this risk assessment. In addition, we did not do an extensive evaluation of their association with common glasswort or of their presence in Israel. Therefore, we considered the following pests to have only "potential" association with the commodity and their presence in Israel.

We listed these organisms along with the references supporting their potential presence in Israel, their presence in the United States and territories, and their potential association with common glasswort. If any of the organisms listed in the table are **not** present in the United States and territories, we provided justification for their non-quarantine status. Unless otherwise noted, these organisms are non-actionable at U.S. ports of entry.

Organism	**In Israel**	**In U.S.**	**Host Association**	**Notes**
ARTHROPODS				
Coleoptera: Curculionidae				
Cosmobaris scolopacea (Germar)	Halperin and Fremuth, 2003	Cristofaro et al., 2014	Davy et al., 2001	
Hemiptera: Diaspididae				
Targionia nigra Signoret	García Morales M et al., 2016; Ben-Dov, 2012	No	García Morales M et al., 2016	All armored scales (Diaspididae) are non-actionable at U.S. ports of entry on fruits and vegetables for consumption (NIS, 2008).