



Figure 1: Arrowhead scale (*Unaspis yanonensis*). Photo: Giuseppina Pellizzari (2010)

California Pest Rating Proposal for

Unaspis yanonensis (Kuwana): arrowhead scale

Hemiptera: Diaspididae

Current Pest Rating: NR

Proposed Pest Rating: A

Comment Period: **04/21/2023 through 06/05/2023**

Initiating Event:

Unaspis yanonensis (arrowhead scale) is currently not rated. A permanent pest rating proposal is required to support an official pest rating.

History & Status:

Background:

Adult female scale covers are oyster-shell shaped, 2.5 to 3.6 mm in length, blackish-brown with pale coloring along the margin (CABI, 2023). Immature male scale covers are elongate, 1.3 to 1.6 mm in length, and felted white (CABI, 2023). Heavily infested host plants can be easily recognized by the large amounts of white males covering twigs, leaves, and fruit (Sullivan and Molet, 2011).

In southeast Asia, arrowhead scale has three generations per year. The fertilized adult female overwinters. Each generation has two population peaks, and the duration of these is affected by day length and temperature. The nymphal stages last approximately 22 days and the adults live for approximately 34 days, but these figures tend to be longer for the the second and third generations. In Japan, the third generation is only seen in southern regions (CABI, 2023).

Damage to attacked plants includes inhibited growth, yellow blotches and necrosis of leaves, leaf fall, shortened or dead branches and small deformed fruits. In cases of severe attacks, tree mortality has been observed (CABI, 2023).

Worldwide Distribution:

Arrowhead scale is considered native to China but has invaded and spread though much of Japan. It has been found in limited areas of France and Italy (EPPO, 2023). It is not known to occur in the U.S.

Official Control:

Arrowhead scale is a quarantine pest for the Caribbean Plant Protection Commission (CPPC) and Organismo Internacional Regional de Sanidad Agropecuaria (OIRSA). In view of its establishment in southern France and northern Italy, there was concern that the pest could present a risk to citrus-growing throughout the Mediterranean area, leading to its original listing as an EPPO A2 quarantine pest. However, no spread has been observed in 25 years in the Mediterranean region, so its quarantine pest status is under revision (CABI, 2023).

Arrowhead scale is a U.S. regulated pest (USDA-APHIS, 2023).

California Distribution:

Arrowhead scale is not known to occur in California.

California Interceptions:

Since the mid-1980s, arrowhead scale has been intercepted over 100 times at border stations, primarily at the Hornbrook and Dorris stations on the northern border of California. The majority of the interceptions were on mandarin oranges being transported in passenger vehicles (CDFA, 2023).

The risk **arrowhead scale** would pose to California is evaluated below.

Consequences of Introduction:

- 1) Climate/Host Interaction:** Evaluate if the pest would have suitable hosts and climate to establish in California.

Score: 2

- Low (1) Not likely to establish in California; or likely to establish in very limited areas.
- **Medium (2) may be able to establish in a larger but limited part of California.**
- High (3) likely to establish a widespread distribution in California.

This predominately Asian species prefers the warm temperate Mediterranean and tropical climates. There is potential for the arrowhead scale to become established in particular areas where citrus production and warm temperatures co-exist (Sullivan and Molet, 2011). Arrowhead scale has the potential to become established in much of coastal California (Davis et al., 2005).

Therefore, arrowhead receives a Medium (2) in this category.

- 2) Known Pest Host Range:** Evaluate the host range of the pest.

Score: 1

- **Low (1) has a very limited host range.**
- Medium (2) has a moderate host range.
- High (3) has a wide host range.

Arrowhead scale is mostly restricted to *Citrus* species. The major hosts include lemon (*Citrus limon*), grapefruit (*Citrus paradisi*), mandarin orange (*Citrus reticulata*), Satsuma orange (*Citrus unshiu*), and sweet orange (*Citrus sinensis*). In addition, arrowhead scale has been found on *Fortunella japonica* (round kumquat) and *Poncirus trifoliata* (trifoliolate-orange) (USDA-APHIS, 1985; Davis et al., 2005; CABI, 2023).

- 3) Pest Dispersal Potential:** Evaluate the natural and artificial dispersal potential of the pest.
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Score: 2

- Low (1) does not have high reproductive or dispersal potential.
- **Medium (2) has either high reproductive or dispersal potential.**
- High (3) has both high reproduction and dispersal potential.

Reproductive potential: The arrowhead scale has multiple generations per year. The number of generations per year vary by location, with two recorded in France, and three in Japan. Due to the multiple generations per year, arrowhead scale is rated to have a high reproductive potential.

Artificial dispersal potential: One route of introduction of arrowhead scale to California is by citrus fruit from infested areas. Nearly all of the interceptions in California were on fruit carried by individuals crossing the California border (CDFA, 2023). Another potential route is by shipments of citrus for planting from infested areas. There have not been any interceptions recorded by this route (CDFA, 2023).

Natural dispersal potential: The arrowhead scale adult females are sedentary.. The main dispersal stage is the first instar, which can walk and may be naturally dispersed by wind and animals (Naturalis, 2023). Arrowhead scale has a moderate dispersion potential considering both adults and nymphs.

With a high reproductive potential and moderate to low dispersion potential, arrowhead scale is given a **Medium (2)** in this category.

- 4) Economic Impact:** Evaluate the likely economic impacts of the pest to California using the criteria below.

Economic Impact: A, B, and C

- A. The pest could lower crop yield.**
- B. The pest could lower crop value (includes increasing crop production costs).**
- C. The pest could trigger the loss of markets (includes quarantines).**
- D. The pest could negatively change normal cultural practices.
- E. The pest can vector, or is vectored, by another pestiferous organism.
- F. The organism is injurious or poisonous to agriculturally important animals.
- G. The organism can interfere with the delivery or supply of water for agricultural uses.

Economic Impact Score: 3

- Low (1) causes 0 or 1 of these impacts.
- Medium (2) causes 2 of these impacts.
- **High (3) causes 3 or more of these impacts.**

California produces a majority of the citrus fruits in the U.S. In 2022, California accounted for 62 percent of total United States citrus production (USDA-NASS, 2022). The value of the citrus production in California was estimated at \$2.35 billion dollars for 2022 (USDA-NASS, 2022). As such, citrus in California is an important industry both for the state as well as nationally.

Arrowhead scale is a serious pest of citrus in the areas where it has established, such as Japan, France and Italy. As a pest, arrowhead scale affects fruits, leaves, and stems and can cause serious damage to orchards due to leaf drop and rapid dieback. Damage to attacked plants include inhibited growth, yellow blotches and necrosis of leaves, leaf fall, shortened or dead branches and small deformed fruits. In cases of severe attacks, arrowhead scale can cause tree death (CABI, 2023). Even in instances where the tree only sustains minor damage, the pest can cause fruit to lose its commercial value because of the feeding punctures. Even at low densities, arrowhead scale can reduce the cosmetic value of fruit resulting in economic damage (Sullivan and Molet, 2011).

Because of its potential impact on the citrus industry, arrowhead scale receives a **High (3)** in this category.

5) Environmental Impact: Evaluate the likely environmental impacts of the pest to California using the criteria below.

Environmental Impact: D, E

- A. The pest could have a significant environmental impact such as lowering biodiversity, disrupting natural communities, or changing ecosystem processes.
- B. The pest could directly affect threatened or endangered species.
- C. The pest could impact threatened or endangered species by disrupting critical habitats.
- D. The pest could trigger additional official or private treatment programs.**
- E. The pest significantly impacts cultural practices, home/urban gardening or ornamental plantings.**

Environmental Impact Score: 3

- Low (1) causes none of the above to occur.
- Medium (2) causes one of the above to occur.
- **High (3) causes two or more of the above to occur.**

Arrowhead scale has a fairly narrow host range, feeding primarily on citrus hosts within the family Rutaceae, and on one additional host (*Damnacanthus*) in the family Rubiaceae. No state or federally listed threatened or endangered plant species are closely related to known hosts of arrowhead scale (CNDDDB, 2023). Therefore, there appears to be limited risk to California native plants.

However, if arrowhead scale becomes established in California citrus, it could lead to additional pesticide treatments as industry and homeowners try to control the pest. Therefore, arrowhead scale receives a **High (3)** in this category.

Consequences of Introduction to California for arrowhead scale: Medium (11)

Add up the total score and include it here.

- Low = 5-8 points
- Medium = 9-12 points**
- High = 13-15 points

6) Post Entry Distribution and Survey Information: Evaluate the known distribution in California. Only official records identified by a taxonomic expert and supported by voucher specimens deposited in natural history collections should be considered. Pest incursions that have been eradicated, are under eradication, or have been delimited with no further detections should not be included.

Arrowhead scale has been intercepted many times, but there is no evidence that it has established in California. It receives a **Not established (0)** in this category.

Score: 0

-Not established (0) Pest never detected in California or known only from incursions.

-Low (-1) Pest has a localized distribution in California or is established in one suitable climate/host area (region).

-Medium (-2) Pest is widespread in California but not fully established in the endangered area, or pest established in two contiguous suitable climate/host areas.

-High (-3) Pest has fully established in the endangered area, or pest is reported in more than two contiguous or non-contiguous suitable climate/host areas.

7) The final score is the consequences of introduction score minus the post entry distribution and survey information score:

Final Score: *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information = **Medium (11)***

Uncertainty:

There have been no known instances of arrowhead scale infestations in California, so there is uncertainty regarding the suitability of the climate and ecosystem to the pest.

Conclusion and Rating Justification:

While the risk score is medium, the potential economic consequences to the citrus industry are severe and the scale is not known to be established in California. Therefore, arrowhead scale warrants an “A” rating.

References:

CABI, 2023. *Unaspis yanonensis*. Crop Protection Compendium. Accessed March 1, 2023:
<https://www.cabidigitallibrary.org/doi/full/10.1079/cabicompendium.55687>

CDFA Pest and Damage Report Database. 2023. *Unaspis yanonensis*. Plant Health and Pest Prevention Services. CA Department of Food and Agriculture. Accessed March 1, 2023:
<http://phpps.cdfa.ca.gov/user/frmLogon2.asp>

CNDDDB: California Natural Diversity Database. California Department of Fish and Wildlife. Accessed March 27, 2023.

<https://wildlife.ca.gov/Data/CNDDDB/Plants-and-Animals>

Davis, E.E., French, S., and Venette, R.C. 2005. Mini Risk Assessment, Arrowhead Scale: *Unaspis yanonensis* (Kuwana) [Hemiptera: Diaspididae]. Cooperative Agricultural Pest Survey Program (CAPS) Pest Risk Assessment (PRA). September 30, 2005.

EPPO Global Data Base. Accessed March 20, 2023:
<https://gd.eppo.int/taxon/UNASYA/hosts>

Kuwana, I. 1923. Descriptions and biology of new or little-known coccids from Japan. Department of Agriculture and Commerce, Imperial Plant Quarantine Station Bulletin (Japan) 3: 1-67.

Naturalis. 2023. Naturalis Biodiversity Center: Diaspididae of the World 2.0. Accessed March 30, 2023:

https://diaspididae.linnaeus.naturalis.nl/linnaeus_ng/app/views/species/nsr_taxon.php?id=113133&epi=155

Sullivan, M. and T. Molet. 2011. CPHST Pest Datasheet for *Unaspis yanonensis*. USDA-APHIS-PPQ-CPHST. Accessed: March 30, 2023.

<https://download.ceris.purdue.edu/file/3093>

USDA-APHIS. 2023. Animal Plant Health Inspection Service. U.S. Regulated Plant Pest Table. Accessed March 20, 2023:

<https://www.aphis.usda.gov/aphis/ourfocus/planthealth/import-information/rppl/rppl-table>

USDA-NASS. 2022. Citrus Fruit 2022 Summary. United States Department of Agriculture, National Agricultural Statistics Service. ISSN:1948-9048. September 2022.

USDA NRCS. 2023. The PLANTS database. Accessed March 27, 2023

<https://plants.usda.gov/home>

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***Comment Period: 04/21/2023 through 06/05/2023**

***NOTE:**

You must be registered and logged in to post a comment. If you have registered and have not received the registration confirmation, please contact us at [permits\[@\]cdfa.ca.gov](mailto:permits[@]cdfa.ca.gov).

Comment Format:

- ❖ Comments should refer to the appropriate California Pest Rating Proposal Form subsection(s) being commented on, as shown below.

Example Comment:

Consequences of Introduction: 1. Climate/Host Interaction: [Your comment that relates to “Climate/Host Interaction” here.]

- ❖ Posted comments will not be able to be viewed immediately.
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❖ Comments may not be posted if they:

Contain inappropriate language which is not germane to the pest rating proposal;

Contains defamatory, false, inaccurate, abusive, obscene, pornographic, sexually oriented, threatening, racially offensive, discriminatory or illegal material;

Violates agency regulations prohibiting sexual harassment or other forms of discrimination;

Violates agency regulations prohibiting workplace violence, including threats.

❖ Comments may be edited prior to posting to ensure they are entirely germane.

❖ Posted comments shall be those which have been approved in content and posted to the website to be viewed, not just submitted.

Proposed Pest Rating: A
