

**California Pest Rating Proposal for**  
***Hemicriconemoides chitwoodi* Esser, 1960**  
**Sheathoid nematode**

**Current Pest Rating: D**

**Proposed Pest Rating: C**

Kingdom: Animalia, Phylum: Nematoda,  
Class: Secernentea, Subclass: Diplogasteria,  
Order: Tylenchida, Superfamily: Criconematoidea,  
Family: Criconematidae, Subfamily: Criconematinae

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**Comment Period: 10/13/2021 through 11/27/2021**

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**Initiating Event:**

During the 1950s and 1960s, many species of plant parasitic nematodes were given a ‘D’ rating by the CDFA as they were considered to be of little or no economic importance and to not justify State-enforced regulatory action. However, these D-ratings were, in most cases incorrect, as most, if not all, of these nematodes are plant parasitic and therefore capable of damaging plant production and causing significant economic losses especially at the county and local residential/grower level. Furthermore, the detection of plant parasitic nematodes in nursery stock may be an indication of contamination in violation of the State’s standard of pest cleanliness required for nurseries. Among these nematodes originally rated D are the sheathoid nematode species in the genus *Hemicriconemoides* (Chitwood and Birchfield 1957). The risk of infestation and the permanent rating of *H. chitwoodi* is re-assessed here, and a new pest rating is proposed.

**History & Status:**

**Background:** Sheathoid nematodes are migratory ectoparasites found mainly in warm climates that feed on various agricultural crops and fruit trees. The genus *Hemicriconemoides* was created to include those species which didn’t fit well as *Criconemoides* Taylor, 1936 or *Hemicycliophora* de Man, 1921. Their common name is derived from the morphology of the female that has the cuticle of her body covered by a loose outer cuticular sheath, which is attached to her body at the head and vulva. There are males but the characteristic cuticular sheath is absent. Juveniles have a single cuticle, ornamented by rows of scales and spines.

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The genus *Hemicriconemoides* includes at least 52 species (Geraert, 2010). The identification of these nematodes with morphological characters is challenging. The molecular characterization of populations has been made from the type localities of the original descriptions for only a few species (Van Den Berg et al., 2014). Around the world, sheathoid nematodes are commonly found in cultivated and uncultivated lands in association with a wide range of plants and it is not unusual to find two or more species co-occurring. Warm temperatures, flooding, and overwatering favor an increase of sheathoid nematode population levels (Inserra et al., 2014).

Sheathoid nematodes have multiple developmental stages that consist of egg, four juvenile stages (J1-J4) without a sheath and adults, both females and male. Samples of field soil from grapevines in Davis, CA yielded few or no males, and for all stages in test pots, females were far more common than males (Chang and Ruski, 1972). Males have a degenerated esophagus and do not feed. Juveniles and females feed on the roots. In general, sheathoid nematodes are obligate migratory ectoparasites (Whitlock and Steele, 1960). Females of a closely related species in Florida, *H. strictathecatus*, have semiendoparasitic habits; they are found partially embedded with the anterior portion of their body inside the root to feed on cortical cell tissue near the root tip. These females remained attached to the root even after the removal of the soil particles that coated the root (Inserra et al., 2014).

*Hemicriconemoides chitwoodi* was described by Esser (1960) from soil associated with the roots of *Camellia japonica*, *Cycas* sp. and *Wisteria* sp. in Florida. Dasgupta et al. (1969) extended the distribution of *H. chitwoodi* to other states including California with identifications of specimens from soil associated with *Camellia*. Additional collections of *H. chitwoodi* in California were reported by Chang and Ruski from UC Davis (1972) as follows: *Salix* sp. (willow) on Santa Cruz Island and *Camellia* sp. in Santa Barbara County, *Camellia* sp. from San Diego County, *Umbellularia californica* (California bay) from El Dorado County, and *Vitis* sp. (grapevines) in Napa County and Yolo County. Economically important hosts include camellia in Florida, grape in California, mulberry and bonsai in Japan, and fruit orchards in China and Iran.

**Hosts:** *Camellia*, *Cycas*, *Juglans*, *Morus*, *Salix*, *Umbellularia*, *Vitis*, *Wisteria*, and turfgrass, Bonsai and fruit trees (CDFFA Database, Chang and Ruski, 1972; Zeng et al., 2012).

**Symptoms:** Disease symptoms induced by nematode feeding consist of stunting, premature wilting, leaf yellowing, root malformation, necrosis of cortical root tissues, and related symptoms difficult to separate from nutrient deficiencies (McSorley et al., 1980).

**Transmission:** Ectoparasitic nematodes can travel short distances by swimming, and longer distances with the movement of soil (e.g. with equipment and tools), or water (e. g. with irrigation or flooding). For long distance spread, nematodes can move with planting stock.

**Damage Potential:** Many of the species in *Hemicriconemoides* including *H. chitwoodi* are a component of the nematofauna of mixed hardwood forests and natural areas, but their economic importance in agriculture and the environment is largely undetermined. *Hemicriconemoides chitwoodi* has been found on golf courses showing nematode feeding damage, but it was only one of many species co-

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occurring (Zhang et al., 2012). In research plots with grapevines in Yolo County, Chang and Raski (1972) showed that very high populations of *H. chitwoodi* could build up on test plants.

**Worldwide Distribution:** *Hemicriconemoides chitwoodi* has been reported from China, Iran, Japan, and the United States (California, Florida, Georgia, Louisiana, New Jersey, New York, North Carolina, South Carolina) (Wang, 1993; Siddiqi, 1974; Ye and Robbins, 2000; Afshar et al., 2006; Toida, 1983; Hirata and Yuhara, 1986).

**Official Control:** *Hemicriconemoides* spp. are on the USDA's Harmful Organisms list for Australia, French Polynesia, and Nauru (USDA PCIT, 2021).

**California Distribution:** There have been two official detections, both in Yolo County on walnut (*Juglans* sp.) (CDFA PDR database). University of California Nematologists Chang and Raski (1972) reported detections in El Dorado, Santa Barbara, Napa, San Diego, and Yolo counties.

**California Interceptions:** None

The risk *Hemicriconemoides chitwoodi* would pose to California is evaluated below.

## Consequences of Introduction:

- 1) Climate/Host Interaction:** Medium textured soil at 25°C is the optimum environment for multiplication of *H. chitwoodi*, but it is a versatile species likely to thrive in a wide range of soils (Chang and Raski, 1972).

Evaluate if the pest would have suitable hosts and climate to establish in California.

**Score: 3**

- 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.**

- 2) Known Pest Host Range:** The host range includes diverse species of woody plants and turfgrass.

Evaluate the host range of the pest.

**Score: 3**

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

- 3) Pest Reproductive Potential:** This nematode reproduces with eggs and relies on the movement of soil, water, or infested plant material.
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Evaluate the natural and artificial dispersal potential of the pest.

**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.

- 4) **Economic Impact:** Impacts have been reported on camellia and on turf grass. There is no clear economic impact on grapevines although this nematode can develop large populations on that plant. The genus is a quarantine pest for a few countries.

Evaluate the economic impact of the pest to California using the criteria below.

**Economic Impact: A, C, G**

**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.**

- 5) **Environmental Impact:** None have been reported (Chitambar et al., 2018).

Evaluate the environmental impact of the pest to California using the criteria below

**Environmental Impact:**

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: 1**

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

## Consequences of Introduction to California for *Hemicriconemoides chitwoodi*: Medium

Add up the total score and include it here. **12**

-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.

*Evaluation is 'high'.*

**Score:-3**

-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: (Score)

**Final Score:** *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information = 9*

### Uncertainty:

There is a very closely related species, *H. californianus*, that is very similar morphologically and found in similar field situations in California. *Hemicriconemoides chitwoodi* can be separated from *H. californianus* by analysis of the ITS-rRNA (Van Den Berg et al., 2014).

### Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Hemicriconemoides chitwoodi* is C.

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## References:

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### Responsible Party:

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**\*Comment Period: 10/13/2021 through 11/27/2021**

### \*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).

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### 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.
- ❖ Comments may not be posted if they:

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

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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.

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**Proposed Pest Rating: C**

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