CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Punctodera punctata (Thorne, 1928) Mulvey & Stone, 1976

Current Pest Rating: Z

Proposed Pest Rating: C

Comment Period: 09/24/2019 through 11/08/2019

Initiating Event:

Punctodera punctata, the grass-cyst nematode, was found in multiple California counties in a survey that was originally designed to detect *Meloidogyne fallax*.

Meloidogyne fallax, the false Columbia root-knot nematode, was first reported in North America in 2013 (Nischwitz et al., 2013a). One of the locations where this species was found was a golf course in San Francisco, California. This species was initially described from the Netherlands in 1992 and was considered to be a race of the Columbia root-knot nematode, *M. chitwoodi.* These nematodes are important pests of potatoes and of quarantine significance (EPPO 2016). In response to the 2013 report, CDFA conducted a survey. Hundreds of samples were collected from golf courses in 25 California counties leading to nearly 600 nematode detections. *Meloidogyne fallax* was not detected.

Punctodera punctata, the grass-cyst nematode, was found in multiple California counties and was assigned a temporary Z rating in 2013. An assessment of the status of *P. punctata* in California is presented herein, and a permanent rating is proposed.

History & Status:

Background:

In 1928 in Saskatchewan, Canada, Thorne collected and described a new cyst nematode from the soil and roots of wheat and gave it the name *Heterodera punctata*. It was assumed to be feeding on the roots of the wheat seedlings where it was collected. The preferred common name is the grass cyst nematode. In 1949, Chitwood found *H. punctata* in North Dakota, which was the first record in the United States. *Punctodera punctata* was subsequently reported as a common species infecting grasses

from Europe (Franklin, 1951). In 1976, the genus *Punctodera* was proposed by Mulvey and Stone and this nematode was subsequently transferred into that genus as *P. punctata*. A review of the systematics for *Punctodera* was published by Subbotin et al. (2010).

Punctodera punctata is considered a fairly insignificant pest (Horne and Thames, 1966; Radice et al., 1985). However, it has become established in at least 30 countries on 4 continents representing a diversity of climates. For example, it is present in both Morocco and Iceland (CABI, 2019).

Hosts: Common bentgrass (*Agrostis capillaris*), creeping bentgrass (*Agrostis stolonifera*), oat (*Avena sativa*), red fescue (*Festuca rubra*), barley (*Hordeum vulgare*), perennial ryegrass (*Lolium perenne*), annual meadowgrass (*Poa annua*), smooth meadow-grass (*Poa pratensis*), wheat (*Triticum aestivum*) (Goodey et al. 1965; Thorne, 1926, Thorne and Malek, 1968; Radice et al., 1985).

Symptoms: Females feed as sedentary ectoparasites on the roots of their host plants but males do not feed. Above ground symptoms caused by *Punctodera punctata* are consistent with other cyst-forming nematodes and usually include increased sensitivity to water stress, including slower growth and wilting. *Punctodera punctata* is usually found where water is abundant during its development, so if the host is not subjected to water stress as on golf or sports fields, the plant usually remains symptomless (Nischwitz et al. 2013a, b).

Transmission: Reproduction of this nematode is by amphimixis (sexual reproduction with both males and females). The females do not lay eggs in the soil. Instead, the eggs accumulate within her body and when she dies her cuticle thickens and hardens, turning into a cyst. The cysts are a dark yellow or brown and they protect the eggs and first stage juveniles inside the eggs against severe weather and desiccation. Studies by Radice et al. on *Poa annua* show that *P. punctata* develops from second stage juveniles to immature white females in 21 days in greenhouse conditions (22-28° C). After 40 days, brown cyst females, eggs, new J2s and males were found. Diapause was observed (eggs did not immediately hatch), suggesting that a single generation is produced per year as cysts stay in the soil over the winter. Grasses are often moved between countries as seed and the cysts could have easily be mixed with the grass seeds in the past. Current cleaning and inspection procedures to remove weed seeds and pathogens greatly reduce the likelihood of distribution of the nematode cysts with seed. The nematode's main means of transport for long-distance distribution is therefore soil or water (CABI CPC, 2019).

Damage Potential:
Poa species growing as lawns and in natural habitats that were heavily infected with *P. punctata* were showed chlorosis and an unhealthy appearance (Horne, 1965; Brzeski et al. 1971). In inoculation studies with moderate populations of *P. punctata* (500 eggs and J2's added to pots with 2-week-old seedlings), Radice et al. (1985) concluded there was little damage to infested *Poa annua* based on the plant top dry weight, root dry weight, and total dry weight. Problems were more noticeable in the first few years of development of perennial grasses for pastures (Thorne and Malek, 1968) but there is no published information on the damage it causes on golf course greens (Nischwitz et al., 2013b).

Worldwide Distribution: Asia: *Israel*, *Japan*; Africa: *Morocco*; North America: *Canada, Mexico, United States* (Michigan, Minnesota, New Jersey, North Dakota, South Dakota, Texas); South America: *Argentina, Chile*; Europe: *Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Netherlands, Norway, Poland, Portugal, Russian Federation, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Ukraine*.

Official Control: *Punctodera punctata* is on the USDA PExD harmful organism list for Colombia and is a Z rated nematode in California (see "Initiating events").

California Distribution: This nematode has been found in Marin, Monterey, Merced, and San Francisco counties; all samples were collected from golf courses (See "initiating events").

California Interceptions: none

The risk *Punctodera punctata* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** *Punctodera punctata* has been reported worldwide in areas that cover a range of tropical, subtropical, temperate, and desert climates. Climate is not expected to be a limiting factor for this nematode in California.

   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 is limited to Poaceae, including pasture grass, turfgrasses, and grains.

   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.

3) **Pest Reproductive Potential:** In the past, this nematode has likely spread as cysts contaminating commercial grass seed. Modern cleaning techniques have greatly reduced the probability of this

occurring today. Now spread is limited to the movement of soil or water. *Punctodera punctata* only produces one generation per year (Horne, 1966).

Evaluate the natural and artificial dispersal potential of the pest.

Score: 1

- **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:** It is likely this nematode has been present in California for years, and no specific economic impact has been reported for this species, but new pasture plantings and high-value turf could be damaged if populations are high.

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

Economic Impact: A

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: **1**

- **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:** No environmental impacts have been reported and none are expected.

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.
- High (3) causes two or more of the above to occur.

Consequences of Introduction to California for *Punctodera punctata is Low:*

Add up the total score and include it here. **7**
-**Low = 5-8 points**
-Medium = 9-12 points
-High = 13-15 points

6) **Post Entry Distribution and Survey Information**: Based on the CDFA golf course survey of 2013, this nematode is known to be present in multiple counties (Marin, Merced, Monterey, and San Francisco) and climates (coast and Central Valley).

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:

Final Score: *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information* ***= 4***

Uncertainty:

None.

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Punctodera punctate is C*.**

References:

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Responsible Party:

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***Comment Period: 09/24/2019 through 11/08/2019**

***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 plant.health[@]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.

- 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: C