CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Profile

Metaphire hilgendorfi (Michaelsen): Jumping worm

Haplotaxida: Megascolecidae

Pest Rating: B

Comment Period: 07/31/2024 – 9/14/2024

Initiating Event:

Metaphire hilgendorfi has been found in the environment in San Joaquin County. A pest rating proposal is needed.

History & Status:

Background:

Metaphire hilgendorfi is known, along with some other species in the family Megascolecidae, as a "jumping worm." Like other jumping worms, it feeds on leaf litter and can convert the top several centimeters of soil into casts. It is parthenogenetic (Chang, 2015).

Worms in family Megascolecidae, including *M. hilgendorfi*, change chemical, physical, and microbial properties of soil (e.g., Chang, 2015; Görres et al., 2019). While earthworms are generally considered beneficial due to their ability to loosen and aerate soil, jumping worms are considered invasive pests with the ability to cause ecosystem-level impacts, primarily through their modification of soil. Jumping worms are also reported to cause damage to living plants, including potatoes (Ridge, 2023). In the eastern United States, *M. hilgendorfi* typically occurs with (but is less abundant than) other introduced species of jumping worm. It is not known how much of the damage attributed to jumping worms is due to *M. hilgendorfi*.

There do not appear to be any examples where a jumping worm species has been eradicated from the environment. They are likely transported in nursery stock, soil, etc.

Worldwide Distribution: **Asia:** Japan (native); **North America:** United States (California, New York, Tennessee, Vermont, Wisconsin) (Bowe et al., 2023; California Department of Food and Agriculture, 2024; Chang, 2015; Görres et al., 2019; Reynolds, 1978; Ziter et al., 2021). Reynolds (1978) lists it from California, but additional information regarding its presence in California up to the current find in Stockton was not found.

Official Control: *Metaphire hilgendorfi* is not known to be under official control.

California Distribution: *Metaphire hilgendorfi* was found at a residential garden in Stockton (San Joaquin County), California (California Department of Food and Agriculture, 2024).

California Interceptions: *Metaphire hilgendorfi* has not been intercepted in California (California Department of Food and Agriculture, 2024).

The risk *Metaphire hilgendorfi* poses to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** *Metaphire hilgendorfi* feeds on leaf litter, so food is likely widely distributed in California. It is possible that moisture may be a limiting factor in California for this worm. Still, it seems likely that this worm could establish widely in the state, at least in residential (and possibly agricultural) areas that are irrigated.. Therefore, *M. hilgendorfi* receives a **High (3)** in this category.

   – 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:** *Metaphire hilgendorfi* feeds on leaf litter. It is not known if it also feeds on living plants. Therefore, it receives a **High (3)** in this category.

– 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 and Dispersal Potential:** *Metaphire hilgendorfi* is parthenogenetic. While it can be moved in soil and nursery stock, it does not appear to have high dispersal ability. Therefore, it receives a **Medium (2)** in this category.

– 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**. Reports with quantified economic impacts attributed to *M. hilgendorfi* were not found. However, their evident capacity to alter soil characteristics suggests that there could be impacts to forests and timber resources. It is possible that its presence in California could lead to quarantines. Therefore, it receives a **Medium (2)** in this category.

Economic Impact: A, 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: Medium

– 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**. Jumping worms, including *M. hilgendorfi*, can alter soil structure and characteristics, and this could have significant impacts on California forest ecosystems. This worm is known to occur in gardens, and it could impact plants in those settings, either through soil modification or directly feeding on plants. Therefore, *M. hilgendorfi* receives a **High (3)** in this category.

Environmental Impact: A, 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: High (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.

Consequences of Introduction to California for *Metaphire hilgendorfi*: High (13)

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:** *Metaphire hilgendorfi* is established in San Joaquin County. It receives a **Low (-1)** in this category.

–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.

Final Score:

7) The final score is the consequences of introduction score minus the post entry distribution and survey information score: 12 (Medium)

Uncertainty:

There is significant uncertainty regarding the distribution of this worm in California. It is very likely that it is more widespread, and it could have been mistaken for one of the other common jumping worm species in California. Another species of *Metaphire californica*, has been present in California for over 100 years (K. Williams, pers. comm.). There is also significant uncertainty regarding the potential of *M. hilgendorfi* to cause economic and environmental impacts. It is not known how much

(if any) of the impact attributed to jumping worms in the eastern United States is due to the (often less-abundant) *M*. *hilgendorfi*. California is generally drier than the eastern United States, where this and other jumping worms are reported to impact the environment.

Conclusion and Rating Justification:

Metaphire hilgendorfi is an earthworm that has potential to impact environment and agriculture in California. However, it is established in San Joaquin County and eradication does not appear practical. It is not regulated by the United State Department of Agriculture and there appear to be little if any restrictions on movement of earthworms in the United States. For these reasons, a "B" rating is justified.

References:

Bowe, A., Serviss, M., Blossey, B., Dávalos, A. 2023. Impacts of invasive earthworms on early life stages of the threatened American Hart's-tongue fern American Fern Journal 113:217-236.

California Department of Food and Agriculture. Pest and damage record database. Accessed June 27, 2024:
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Chang, C. -H. 2015. The second wave of earthworm invasion: Interspecific interactions, soil- microbial communities, and carbon cycling. Ph.D. dissertation, Johns Hopkins University, Baltimore, Maryland.

Görres, J. H., Martin, C., Nouri-Aiin, M., and Bellitürk, K. 2019. Physical properties of soils altered by invasive pheretimoid earthworms: Does their casting layer create thermal refuges? Soil Systems http://dx.doi.org/10.3390/soilsystems3030052

Reynolds, J. W. 1978. The earthworms of Tennessee (Oligochaeta). IV. Megascolecidae, with notes on distribution, biology and a key to the species in the state. Megadrilogica 3:117-129.

Ridge, G. E. 2023. Jumping worms (Megascolecidae: Pheretima) in Connecticut. Accessed July 3, 2024: https://portal.ct.gov/-/media/caes/documents/publications/fact_sheets/entomology/jumping-worms-in-connecticut.pdf

Ziter, C. D., Herrick, B. M., Johnston, M. R., and Turner, M. G. 2021. Ready, set, go: Community science field campaign reveals habitat preferences of nonnative Asian earthworms in an urban landscape. BioScience 71:280-291.

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Responsible Party:

Kyle Beucke (see comment regarding authorship above, in Background), 1220 N Street, Sacramento, CA 95814, 916-698-3034, permits[@]cdfa.ca.gov

***Comment Period: 07/31/2024 – 9/14/2024**

***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.

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.

Pest Rating: B