

California Pest Rating Proposal

Tetrastichus planipennis Yang: a parasitoid wasp

Hymenoptera: Eulophidae

Current Rating: Q

Proposed Rating: D

Comment Period: **03/25/2024 – 05/09/2024**

Initiating Event:

Tetrastichus planipennis has been released in the eastern United States in an effort to control emerald ash borer (EAB). EAB is now present in Oregon and it is therefore more likely to invade California. In order to prepare for an introduction of EAB in California, potential biological control agents are being assessed. Insects, by statute, are considered plant pests in California, and in addition, biological control agents have the potential to impact agriculture and environment. Therefore, a pest rating proposal is needed.

History & Status:

Background: *Tetrastichus planipennis* is a parasitoid wasp that feeds internally on emerald ash borer (EAB), *Agilus planipennis*, larvae in galleries made by the EAB larvae. One life cycle is reported to take approximately four weeks (Duan et al., 2011). It overwinters in the host or gallery and emerges the following spring. Liu et al. (2007) suggest that four generations per year may be possible.

No-choice trials were conducted by Bauer et al. (2007, in USDA, 2007). Potential hosts tested included eight buprestids (including five *Agilus* species: *subcinctus*, *anxius*, *bilineatus*, *ruficollis*, and *putillus*), five cerambycids, two lepidopterans, and one hymenopteran, all in various hosts. One of the non-EAB *Agilus* species and one cerambycid were in ash. EAB was used as a control. Oviposition

only occurred in EAB, suggesting that *T. planipennisi* is highly host-specific and that this specificity is not explained solely by the tree host. In 2015, the USDA issued a decision and finding of no significant impact for field release of *T. planipennisi* in the Contiguous United States.

Tetrastichus planipennisi has been widely released in the eastern United States and it is established and parasitizing EAB there. Parasitism rates as high as 29% were reported in Michigan and these rates were typically higher than those from other parasitoids in the same areas. Quinn et al. (2022) reported that parasitism of EAB larvae in sentinel logs by *T. planipennisi* approached 50% in some cases. This parasitoid was considered to have had a significant effect on decreasing population growth of EAB (Duan et al., 2015).

Worldwide Distribution: *Tetrastichus planipennisi* is native to China. It has been introduced in the eastern United States. The reported distribution includes the following: **Asia:** China; **North America:** United States (Connecticut, Illinois, Indiana, Maryland, Michigan, Minnesota, New York, Ohio, Wisconsin) (Bauer et al., 2014; Gould et al., 2022; Liu et al., 2007; Quinn et al., 2022).

Official Control: *Tetrastichus planipennisi* is not known to be under official control.

California Distribution: *Tetrastichus planipennisi* is not known to be present in California (California Department of Food and Agriculture, 2023).

California Interceptions: *Tetrastichus planipennisi* has not been intercepted in California (California Department of Food and Agriculture, 2023).

The risk *Tetrastichus planipennisi* poses to California is evaluated below.

Consequences of Introduction:

- 1) **Climate/Host Interaction:** For the purpose of determining the potential range of this wasp in California, it will be assumed that EAB is established in the state. EAB is expected to be capable of establishing widely in California. This is based on the wide distribution of ash trees in the state and the extensive distribution of EAB in the eastern United States. There would likely be a host and suitable climate present over much of California. Therefore, *T. planipennisi* receives a **Medium (2)** 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:** *Tetrastichus planipennisi* is only known to parasitize one species of insect (EAB). Therefore, it receives a **Low (1)** 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:** *Tetrastichus planipennisi* flies and could be moved in EAB-infested wood. 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:** *Tetrastichus planipennisi* is only known to parasitize one species of insect, EAB. As EAB is not yet known to be present in California, but there does not appear to be any

recognized economic benefit that could be provided by EAB to California. Reduction of the population of EAB, if it was present, would likely be economically beneficial. Therefore, it receives a **Low (1)** in this category.

Economic Impact:

- 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: Low

- **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:** California has at least 31 species of *Agrilus*. Host specificity testing involved five species in this genus besides EAB, and only EAB was parasitized. This suggests that *T. planipennisi* may be restricted to EAB or, at least, that few species of *Agrilus* besides EAB are likely to be parasitized. Presence of EAB in California would likely have significant negative impacts on the environment. High rates of parasitism of EAB by *T. planipennisi* in eastern states suggest it may be an effective control agent of EAB in California. Therefore, *T. planipennisi* is expected to have, if anything, a beneficial effect on the environment in California in EAB was present (and if EAB was not present, it seems unlikely that *T. planipennisi* could establish here). Therefore, *T. planipennisi* receives a **Low (1)** in this category.

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: Low (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 *Tetrastichus planipennis*: Low (7)

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: *Tetrastichus planipennis* is not known to be established in California. It receives a **Not established (0)** 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 the introduction score minus the post-entry distribution and survey information score: Low (7)

Uncertainty:

There is some uncertainty regarding the potential host range and the potential for this wasp to control EAB if it became established in California. It is not known to be established in any area with a Mediterranean climate.

Conclusion and Rating Justification:

Tetrastichus planipennis appears unlikely to pose a threat to California. Based on limited host specificity testing, it appears to be highly host-specific to EAB, a pest that poses a clear threat to California's environment and street trees. The potential benefits of *T. planipennis* appear to greatly outweigh the risk it may pose to the state.

References:

Bauer, L. S., Duan, J. J., Gould, J. R., Abell, K. J., Lelito, J. P., Van Driesche, R. 2014. Classical biocontrol of emerald ash borer in North America: Monitoring demonstrates successful establishment. 25th USDA Interagency Research Forum on Invasive Species, Research Reports 15-17.

Bauer, L. S. 2007. Petition for Release of the Exotic Parasitoid *Tetrastichus planipennis* for Biological Control of the Emerald Ash Borer, *Agilus planipennis*. Petition submitted to USDA, Animal and Plant Health Inspection Service.

California Department of Food and Agriculture. Pest and damage record database. Accessed May 22, 2023.

Duan, J. J., Bauer, L. S., Abell, K. J., Ulyshen, M. D., Van Driesche, R. G. 2015. Population dynamics of an invasive forest insect and associated natural enemies in the aftermath of invasion: Implications for biological control. *Journal of Applied Ecology* 52:1246-1254.

Duan, J. J., Opper, C. B., Ulyshen, M. D., Bauer, L. S., Lelito, J. 2011. Biology and life history of *Tetrastichus planipennis* (Hymenoptera: Eulophidae), a larval endoparasitoid of the emerald ash borer (Coleoptera: Buprestidae). *Florida Entomologist* 94:933-940

Gould, J., Fierke, M. K., and Hickin, M. 2022. Mortality of emerald ash borer larvae in small regenerating ash in New York forests. *Journal of Economic Entomology* 115:1442-1454.

Liu, H., Bauer, L. S., Zhao, T., and Gao, R. 2007. Population biology of emerald ash borer and its natural enemies in China. Emerald ash borer research and development review meeting: 59-60.

Quinn, N. F., Gould, J. S., Rutledge, C. E., Fassler, A., Elkinton, J. S., Duan, J. J. 2022. Spread and phenology of *Spathius galinae* and *Tetrastichus planipennis*, recently introduced for biocontrol of emerald ash borer (Coleoptera: Buprestidae) in the Northeastern United States. *Biological Control* <https://doi.org/10.1016/j.biocontrol.2021.104794>

United States Department of Agriculture, Animal and Plant Health Inspection Service. 2007. Proposed release of three parasitoids for the biological control of the emerald ash borer (*Agilus planipennis*) in the Continental United States.

Responsible Party:

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***Comment Period: 03/25/2024 – 05/09/2024**

*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](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.

❖ 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: D