CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal

Pheidole megacephala (Fabricius): Big-headed ant

Hymenoptera: Formicidae

Current Rating: A

Proposed Rating: B

Comment Period: 07/31/2024 – 09/14/2024

Initiating Event:

Pheidole megacephala has been found in the environment in Orange and San Diego counties. It is currently A-rated. An A-rating is not consistent with multiple established infestations in California that are not under eradication. A pest rating proposal is needed.

History & Status:

Background:

Pheidole megacephala is a common and dominant ant species across the tropics and subtropics (it appears to be largely absent from temperate areas), especially in open, disturbed areas (Wetterer, 2012). For example, in Cameroon, it is common in houses and gardens (Serge et al., 2019). It generally does not invade intact, dense forests. This ant is a predator and a scavenger (Antwiki, 2024) and it also tends plant-feeding Hemiptera (Wetterer, 2012). Where it is found, it has the potential to impact other insects through predation and (in the case of other ant species) competition and aggression. It apparently has excluded other ant species in certain locations (Asfiya et al., 2016). For example, in Australia, native ants declined and total ant biomass increased in areas invaded by *P. megacephala* (Callan and Majer, 2009). Soil nesting by *P. megacephala* was reported to impact tree saplings through reducing carbon fixation, possibly via disruption of roots and in turn reduced photosynthesis (Milligan et al., 2021). These reports suggest that this ant has the potential to have

ecosystem-level impacts in areas it invades. Impacts to plants, including potentially crops, could be positive as well as negative: While presence of *P. megacephala* resulted in higher densities of the soft scale *Coccus viridis*, likely as a result of protection of the scales from predators and parasitoids, it also reduced the abundance of caterpillars, thus providing a benefit to the plant (Bach, 1991).

Pheidole megacephala is common in urban areas and is considered a pest in those environments as well, as it can nest in buildings and feed on human foods (Wetterer, 2012).

Worldwide Distribution: *Pheidole megacephala* is probably native to sub-Saharan Africa. It has been introduced widely and is reported from: **Africa:** Morocco (likely introduced), numerous sub-Saharan countries, including Cameroon; **Asia:** Numerous southeast Asian countries; **North America:** United States (California and Florida); **Oceania:** Widely distributed, including Australia and Hawaii; **South America:** Brazil and Peru (Asfiya et al., 2016; Serge et al., 2019; Taheri et al., 2017; Tong et al., 2018; Wetterer, 2012).

Official Control: *Pheidole megacephala* is not known to be under official control.

California Distribution: *Pheidole megacephala* was found in the environment in Costa Mesa and Huntington Beach (Orange County) in 2014 and in San Diego (San Diego County) in 2019 (California Department of Food and Agriculture, 2024).

California Interceptions: *Pheidole megacephala* is frequently intercepted in California on plant material from Florida and Hawaii (California Department of Food and Agriculture, 2024).

The risk *Pheidole megacephala* poses to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** *Pheidole megacephala* is a scavenger and predator and would likely find food essentially anywhere in California. Climate is likely to be a limiting factor in its distribution, however. It is expected to be able to establish in much of coastal and southern California, especially if suitable moisture is present (irrigation, for example). Therefore, *P. megacephala* 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:** *Pheidole megacephala* is a predator and scavenger. 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:** *Pheidole megacephala* can disperse via mating flights, and it could also be moved in soil and nursery stock. 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**. *Pheidole megacephala* can apparently interfere with biological control of plant-feeding Hemiptera and it could increase crop production costs. Therefore, it receives a **Medium (2)** in this category.

Economic Impact: B, F

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**. *Pheidole megacephala* appears to be capable of ecosystem-level impacts through altering ant species composition and total ant biomass and impacting tree growth. Therefore, *P. megacephala* receives a **High (3)** in this category.

Environmental Impact: A, D

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 *Pheidole megacephala*: Medium (12)

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:** *Pheidole megacephala* is established in Orange and San Diego counties. 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: 11 (Medium)

Uncertainty:

There is uncertainty regarding the current distribution of this ant in California. It could be present over a larger area in the state than currently known. There is also uncertainty regarding the potential distribution of this ant in California. Climate may limit it to a much smaller area than was considered possible for this proposal. Either one of these could decrease the total score.

Conclusion and Rating Justification:

Pheidole megacephala is an ant that appears to have potential for economic and environmental impacts in California. It is established in two counties and eradication does not appear feasible. For these reasons, a "B" rating is justified.

References:

Antwiki. Accessed July 11, 2024:
https://www.antwiki.org/wiki/Pheidole_megacephala

Asfiya, W., Yeeles, P., Lach, L., Majer, J. D., Heterick, B., Didham, R. K. 2016. Abiotic factors affecting the foraging activity and potential displacement of native ants by the invasive African big-headed ant *Pheidole megacephala* (Fabricius, 1793) (Hymenoptera: Formicidae). Myrmecological News 22:43-54.

Bach, C. E. 1991. Direct and indirect interactions between ants (*Pheidole megacephala*), scales (*Coccus viridis*) and plants (*Pluchea indica*). Oecologia 87:233-239.

California Department of Food and Agriculture. Pest and damage record database. Accessed July 11, 2024:
https://pdr.cdfa.ca.gov/PDR/pdrmainmenu.aspx

Callan, S. K., Majer, J. D. 2009. Impacts of an incursion of African big-headed ants, *Pheidole megacephala* (Fabricius), in urban bushland in Perth, Western Australia. Pacific Conservation Biology 15:102-115.

Milligan, P. D., Martin, T. A., Pringle, E. G., Riginos, C., Mizell, G. M., Palmer, T. M. 2021. A soil-nesting invasive ant disrupts carbon dynamics in saplings of a foundational ant-plant. Journal of Ecology DOI: 10.1111/1365-2745.13803

Serge, M. M. P., Giovani, E. T., and Mony, R. 2019. Household and home garden infesting arthropods (ants and myriopods) in the city of Yaoundé, Cameroon. Journal of Entomology and Zoology Studies 7:1030-1037.

Taheri, A., Wetterer, J. K., Reyes-Lopéz, J. 2017. Tramp ants of Tangier, Morocco. Transactions of the American Entomological Society 143:299-304.

Tong, R. L., Grace, J. K., Krushelnycky, P. D., Spafford, J. 2018. Roadside survey of ants on Oahu, Hawaii. Insects http://dx.doi.org/10.3390/insects9010021

Wetterer, J. K. 2012. Worldwide spread of the African big-headed ant, *Pheidole megacephala* (Hymenoptera: Formicidae). Myrmecological News 17:51-62.

Responsible Party:

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***Comment Period: 07/31/2024 – 09/14/2024**

***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.

Proposed Pest Rating: B