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First report of the *Eucalyptus* gall wasp, *Ophelimus maskelli* (Hymenoptera: Eulophidae), an invasive pest on *Eucalyptus*, from the Western Hemisphere

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Ophelimus maskelli (Ashmead) (Hymenoptera: Eulophidae) was found in southern California, USA, on March 17, 2014, in Riverside County, University of California Riverside Campus (UCR), and has been common there since then. It has also been found in other locations in southern California, including San Diego County (San Diego Safari Park on November 1, 2014), and Orange County (Laguna Niguel Regional Park). Specimens collected from UCR were compared with voucher specimens of *O. maskelli* collected from Lazio, Italy, and were found to be conspecific. This represents the first report of *O. maskelli* from the Western Hemisphere.

Ophelimus maskelli is a uniparental leaf-gall inducing invasive pest of several *Eucalyptus* species of the Exsertaria, Latoangulata, and Maidenaria sections (Protasov *et al.* 2007a).

Ashmead's (1900) description of *O. maskelli* from New Zealand is its only report from that country. Instead, *O. maskelli* has been observed on *Eucalyptus* in New South Wales, Australia (Protasov *et al.* 2007a), and therefore is probably native to Australia. Its morphology and taxonomic history were reviewed recently by Protasov *et al.* (2007a), and partial sequences of the cytochrome oxidase I mtDNA, 28S D2 rDNA, and 18S rDNA of Italian specimens were obtained as part of a review of the higher systematics of Eulophidae (Burks *et al.* 2011). Other species of leaf-gall inducing Eulophidae are known from California (Schauff & Garrison 2000; La Salle *et al.* 2009), all from the diverse and widespread subfamily Tetrastichinae. While subjectively similar to these species morphologically, *O. maskelli* (Fig. 2) is only distantly related to them, in the entirely gall-associated subfamily Opheliminae native to Australia, New Guinea, and New Zealand (Bouček, 1988). Morphological features distinguishing *O. maskelli* from gall-inducing Tetrastichinae include shape of the marginal vein and parastigma of its fore wing, the lack of submedian grooves on its mesoscutellum, and the presence of 4 anelli followed by a larger preclaval flagellomere in its antenna. It differs from most other species of *Ophelimus* Haliday in having only a single seta on its submarginal vein (Protasov *et al.* 2007a).

Ophelimus maskelli was first recorded as an exotic pest in 1999 in Italy, where it was misidentified as *Ophelimus eucalypti* (Gahan) (Arzone & Alma 2000). It has since been found in several other regions where *Eucalyptus* is grown, including the Mediterranean Basin, but also Indonesia, South Africa, and Vietnam (Mendel *et al.* 2004, 2005; EPPO 2006; Lawson *et al.* 2012). Although not reported previously from the Western Hemisphere, the constant spread of many other pests of *Eucalyptus* to California indicated that it might soon be found there (Paine *et al.* 2011). Uncontrolled populations of *O. maskelli* rapidly reached high densities in Israel (Mendel *et al.* 2007). They caused severe leaf damage and early leaf drop that resulted in almost complete defoliation of mature trees in some cases, and populations reached high enough densities to disrupt everyday human activities, even disrupting the harvest of other crops. *Eucalyptus camaldulensis* Dehnhardt and *Eucalyptus tereticornis* Smith are economically important species that are particularly susceptible to attack by *O. maskelli*, but other economically important species of *Eucalyptus* are susceptible to a lesser extent (Protasov *et al.* 2007a). Galls produced by *O. maskelli* are blister-like galls that can cover nearly all of a leaf's surface (Fig. 1).

The Australian uniparental parasitoid *Closterocerus chamaeleon* (Girault) (Eulophidae) has been used to effectively control *O. maskelli* in the Mediterranean Basin (Laudonia *et al.* 2006; Rizzo *et al.* 2006; Mendel *et al.* 2007; Protasov *et al.* 2007b; Caleca *et al.* 2011). Control programs in Israel included release of *Stethynium ophelimi* Huber (Mymaridae), another Australian parasitoid reared together with *C. chamaeleon*, but which was not recovered in large numbers in subsequent surveys (Mendel *et al.* 2007). *Closterocerus chamaeleon* has since exhibited strong potential for independent expansion to populations of *O. maskelli* in distant areas (Caleca 2010; Caleca *et al.* 2011). The known host range of *C. chamaeleon* is limited to *O. maskelli*, but it is possible that other leaf-gall inducers on *Eucalyptus* may serve as hosts as well (Protasov *et al.* 2007b).

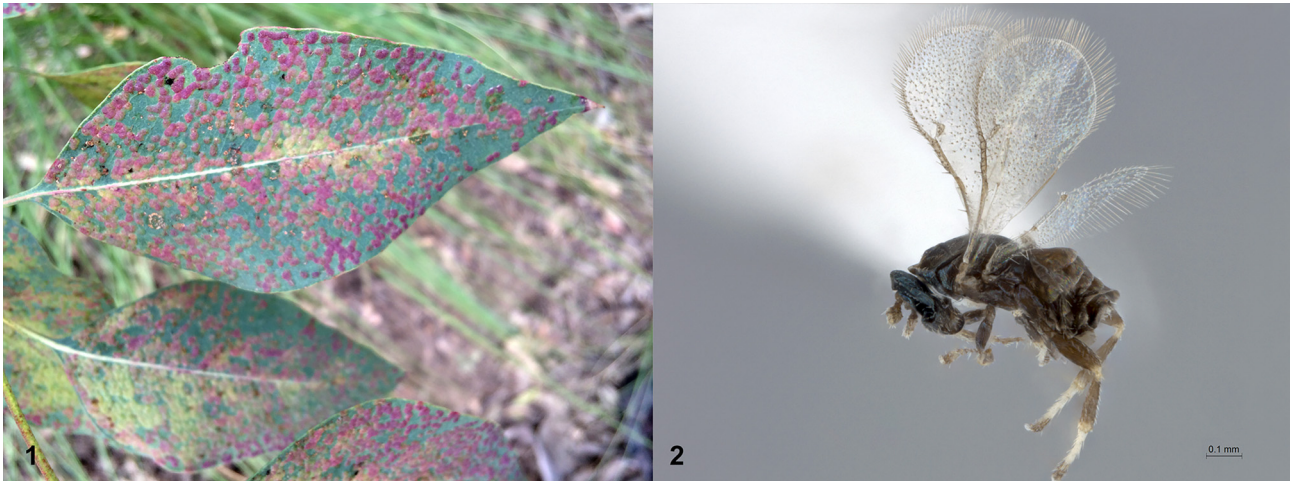


FIGURE 1. Galls of *Ophelimus maskelli* on leaves of *Eucalyptus* sp. from San Diego, CA.

FIGURE 2. *Ophelimus maskelli*, lateral view, specimen collected from Lazio, Italy (UCRCENT161366).

An unknown species of the eulophid subfamily Tetrastichinae was reared from *O. maskelli* galls collected from the UCR Campus but not from the other localities. Species identity and interaction with *O. maskelli* are currently unknown for this tetrastichine, but it may be the same species as unidentified tetrastichines found to be parasitoids of *O. maskelli* in Israel (Mendel *et al.*, 2007).

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References

- Arzone, A. & Alma, A. (2000) Eulofide galligeno dell'Eucalipto in Italia. *Informatore Fitopatologico*, 50 (12), 43–46.
- Ashmead, W.H. (1900) Notes on some New Zealand and Australian parasitic Hymenoptera, with descriptions of new genera and species. *Proceedings of the Linnean Society of New South Wales*, 25, 327–360.
- Bouček, Z. (1988) *Australasian Chalcidoidea (Hymenoptera)*. C.A.B. International, Wallingford, UK, 832 pp.
- Burks, R.A., Heraty, J.M., Gebiola, M. & Hansson, C. (2011) Combined molecular and morphological phylogeny of Eulophidae (Hymenoptera: Chalcidoidea), with focus on the subfamily Entedoninae. *Cladistics*, 27 (6), 581–605. <http://dx.doi.org/10.1111/j.1096-0031.2011.00358.x>
- Caleca, V. (2010) First record in Algeria of two eulophid wasps: *Closterocerus chamaeleon* (Girault) and its host, the eucalyptus gall wasp *Ophelimus maskelli* (Ashmead) (Hymenoptera Eulophidae). *Naturalista siciliano*, Series IV, 34 (1–2), 201–206.
- Caleca, V., Lo Verde, G., Rizzo, M.C. & Rizzo, R. (2011) Dispersal rate and parasitism by *Closterocerus chamaeleon* (Girault) after its release in Sicily to control *Ophelimus maskelli* (Ashmead) (Hymenoptera, Eulophidae). *Biological Control*, 57, 66–73. <http://dx.doi.org/10.1016/j.biocontrol.2010.12.006>
- European Mediterranean Plant Protection Organization (2006) First report of two new eucalyptus pests in the South of France. *Ophelimus maskelli* and *Leptocybe invasa*. *EPPO Reporting Service*, 189 (9), 9.
- La Salle, J., Arakelian, G., Garrison, R.W. & Gates, M.W. (2009) A new species of invasive gall wasp (Hymenoptera: Eulophidae: Tetrastichinae) on blue gum (*Eucalyptus globulus*) in California. *Zootaxa*, 2121, 35–43.
- Laudonia, S., Viggiani, G. & Sasso, R. (2006) Nuova introduzione in Italia. Parassitoide esotico in aiuto degli eucalipiti. *Informatore Agrario*, 40, 74
- Lawson, S., Griffiths, M., Nahrung, H., Noack, A., Wingfield, M., Wilcken, C., Slippers, B., Lo, N., Thu, P.Q., Lee, S.-S., Lelana, N.E., Ketphanh, S., Zhou, X. & Eungwijarnpanya, S. (2012) *Biological control of eucalypt pests*

- overseas and in Australia*. Australian Centre for International Agricultural Research, Final Report Number FR2012-26, 40 pp.
- Mendel, Z., Protasov, A., Fisher, N. & La Salle, J. (2004) Taxonomy and biology of *Leptocybe invasa* gen. & sp. n. (Hymenoptera: Eulophidae), an invasive gall inducer on Eucalyptus. *Australian Journal of Entomology*, 43 (2), 101–113.
<http://dx.doi.org/10.1111/j.1440-6055.2003.00393.x>
- Mendel, Z., Protasov, A., Saphir, N., Brand, D., Assale, F., Blumberg, D. & La Salle, J. (2005) Insect plant interactions of two invasive Eucalyptus gall inducers, *Leptocybe invasa* Fisher & La Salle and *Ophelimus maskelli* (Ashmead) (Hymenoptera: Eulophidae), and management possibilities. In: Bento, A., Miranda-Arabolaza, M.J. & Pereira, J.A. (Eds.), *IV Congresso Nacional de Entomologia Aplicada*. Braganca, Portugal, pp. 17–21.
- Mendel, Z., Protasov, A., Blumberg, D., Brand, D., Saphir, N., Madar, Z. & La Salle, J. (2007) Release and recovery of parasitoids of the Eucalyptus gall wasp *Ophelimus maskelli* in Israel. *Phytoparasitica*, 35 (4), 330–332.
<http://dx.doi.org/10.1007/BF02980694>
- Paine, T.D., Steinbauer, M.J. & Lawson, S.A. (2011) Native and Exotic Pests of *Eucalyptus*: A Worldwide Perspective. *Annual Review of Entomology*, 56, 181–201.
<http://dx.doi.org/10.1146/annurev-ento-120709-144817>
- Protasov, A., La Salle, J., Blumberg, D., Brand, D., Saphir, N., Assael, F., Fisher, N. & Mendel, Z. (2007a) Biology, revised taxonomy and impact on host plants of *Ophelimus maskelli*, an invasive gall inducer on *Eucalyptus* spp. in the Mediterranean area. *Phytoparasitica*, 35 (1), 50–76.
<http://dx.doi.org/10.1007/BF02981061>
- Protasov, A., Blumberg, D., Brand, D., La Salle, J. & Mendel, Z. (2007b) Biological control of the eucalyptus gall wasp *Ophelimus maskelli* (Ashmead): taxonomy and biology of the parasitoid *Closterocerus chamaeleon* (Girault), with information on its establishment in Israel. *Biological Control*, 42, 196–206.
<http://dx.doi.org/10.1016/j.biocontrol.2007.05.002>
- Rizzo, M.C., Lo Verde, G., Rizzo, R., Buccellato, V. & Caleca, V. (2006) Introduzione di *Closterocerus* sp. in Sicilia per il controllo biologico di *Ophelimus maskelli* Ashmead (Hymenoptera, Eulophidae) galligeno esotico sugli eucalipti. *Bollettino di Zoologia agraria e Bachicoltura*. Series II, 38 (3), 237–248.
- Schauff, M.E. & Garrison, R. (2000) An introduced species of *Epichrysocharis* (Hymenoptera: Eulophidae) producing galls on Eucalyptus in California with notes on the described species and placement of the genus. *Journal of Hymenoptera Research*, 9 (1), 176–181