

## ***Leptocybe invasa* Fisher & La Salle, 2004 and *Ophelimus maskelli* Haliday, 1844 - two new records of gall forming Eulophidae from Malta (Hymenoptera, Chalcidoidea)**

David MIFSUD<sup>1</sup>

The Eulophidae (Hymenoptera, Chalcidoidea) currently accommodates more than 4,000 described species worldwide in some 300 genera (NOYES, 2003). In Europe, the family is represented by about 1,100 species (GAULD & BOLTON, 1988). Eleven species have previously been recorded from Malta in various scattered publications, but of these only two were reported as occurring in Malta in the Fauna Europaea database (MITROIU, 2004). The purpose of the present work is to add a further two new records of the family from Malta bringing the total number of species known from these islands to 13, and to bring together the previously recorded species in the form of a short annotated list with references.

Most species of Eulophidae are primarily solitary parasitoids of eggs, larvae or pupae of various phytophagous insects. Other species are known to be gall-formers and are mainly restricted to two groups, Ophelimiini and Tetrastichinae (LA SALLE, 2005). The Ophelimiini is a small tribe with species native to Australia and currently accommodates two genera: *Australsecodes* and *Ophelimus*. The latter genus contains some 50 described species, most of which seem to be associated with plant galls. Species within the subfamily Tetrastichinae exhibit a wide range of biology from parasitoids of a wide range of insects, spider egg sacks, mites and nematodes in galls (LA SALLE, 1994) to phytophagous species including some true gall inducers (LA SALLE, 2005). No species from these two groups were previously reported as occurring in Malta even though the Tetrastichinae are so numerous and widespread that several species are expected to occur.

### ***Ophelimus maskelli* (Ashmead, 1900)** (Ophelimiini)

**Material examined. MALTA:** Msida and Valletta, numerous females which emerged between the 20-26.iv.2006 from galls on *Eucalyptus camaldulensis*, leg. D. Mifsud.

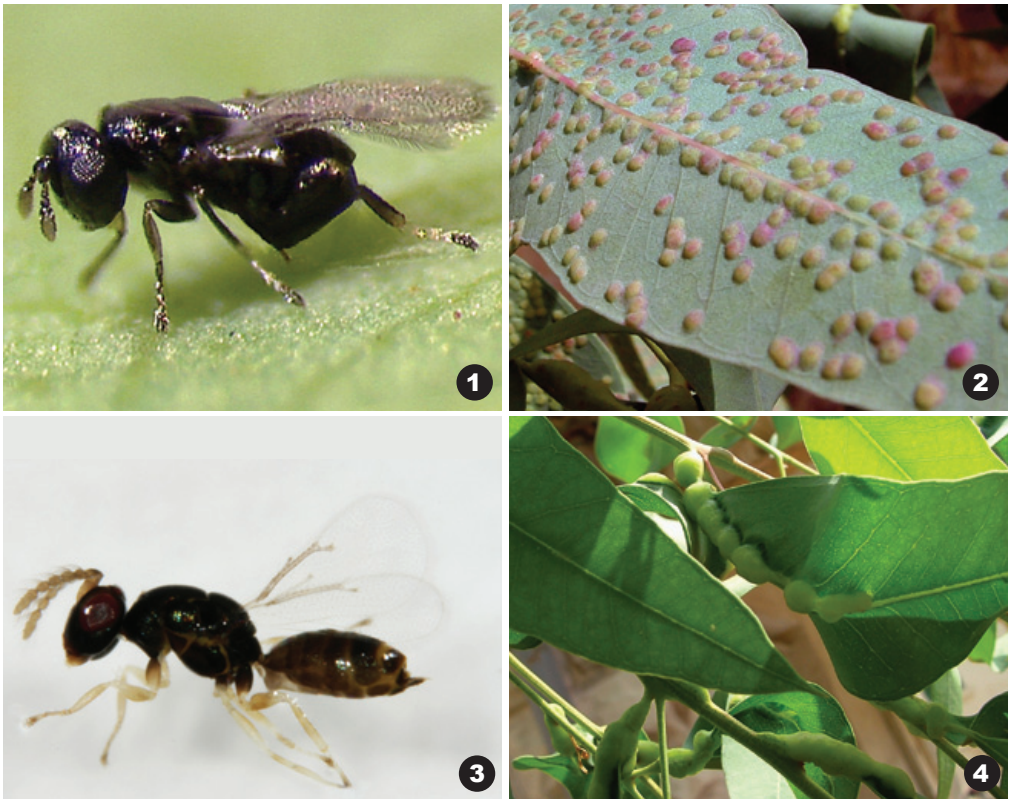
**Notes.** *Ophelimus maskelli* (Fig. 1) is native to Australia but has spread and established itself in various parts of Europe and the Mediterranean Region. It forms typical round flat button-shaped galls (Fig. 2) mainly on young leaves of several *Eucalyptus* species. Records of *Ophelimus eucalypti* have been mistakenly reported in the European literature (e.g. VIGGIANI & NICOTINA, 2001; LAUDONIA & VIGGIANI, 2004; PUJADE-VILLAR & RIBA-FLINCH, 2004) and these should refer to *O. maskelli* as pointed out by TILBURY & JUKES (2006) and PROTASOV *et al.* (2007). *Ophelimus maskelli* was first recorded in Europe from Italy where it was reported in 2000 (ARZONE & ALMA, 2000; BELLA & LO VERDE, 2002). It was subsequently recorded from Greece where it was first noted in 2002 (KAVALLIERATOS *et al.*, 2006), Spain (PUJADE-VILLAR & RIBA-FLINCH, 2004), south of France (EPPO, 2006), most likely in south-eastern England (TILBURY & JUKES, 2006), Portugal (BRANCO *et al.*, 2009) and Israel. The present is the first record of this alien invasive species from Malta, and is based on material reared from *Eucalyptus* galls in 2006.

<sup>1</sup> Department of Biology, Junior College, University of Malta, Msida MSD 1252, Malta. E-mail: david.a.mifsud@um.edu.mt

*Leptocybe invasa* Fisher & La Salle, 2004  
(Tetrastichinae)

**Material examined. MALTA:** Msida and Valetta, numerous females which emerged between the 2-14.x.2006 from galls on *Eucalyptus camaldulensis*, leg. D. Mifsud.

**Notes.** *Leptocybe invasa* (Fig. 3) is a relatively new pest of *Eucalyptus* of Australian origin. It was observed as causing severe injury to young foliage of *Eucalyptus* plantations by inducing galls mainly on rapidly growing shoots (MENDEL *et al.*, 2004). It forms typical bump-shaped galls on the leaf midribs (Fig. 4), petioles and stems of new growth of several *Eucalyptus* species. It was originally found in the Mediterranean Basin and the Middle East in 2000 with records from Algeria, France, Greece, Iran, Israel, Italy, Jordan, Morocco, Portugal, Spain, Syria and Turkey. It subsequently spread to Sub-Saharan Africa where it was first reported in 2002 from Kenya (MUTITU, 2003) and subsequently found in Ethiopia, Mozambique, South Africa, Tanzania, Uganda and Zimbabwe. It was then recorded from Southeast Asia with records from India, China, Taiwan, Thailand and Vietnam (e.g. CABI, 2007; WU *et al.*, 2009; TUNG & LA SALLE, 2010), Brazil (COSTA *et al.* 2008), and the USA (Florida) (GASKILL *et al.* 2009). The present is the first record of this alien invasive species from Malta, and is based on material reared from *Eucalyptus* galls in 2006.



**Figures 1-2:** *Ophelimus maskelli*; 1: Adult male; 2: Galls on *Eucalyptus*; **Figures 3-4:** *Leptocybe invasa*; 3: Adult male; 4: Galls on *Eucalyptus*.

**Check-list of parasitic Eulophidae previously recorded from Malta**

*Aprostocetus* nr. *toddaliae* (Risbec, 1958) recorded as parasitic on the Florida Wax Scale, *Ceroplastes floridensis* by FARRUGIA (1998);

*Astichus bachmaieri* Doğanlar, 1992 recorded as parasitic on the bark beetle, *Hypoborus ficus* by MIFSUD *et al.* (2012);

*Chrysocharis pubicornis* (Zetterstedt, 1838) recorded by HANSSON (1985);

*Cirrospilus pictus* (Nees, 1834) recorded as a parasite of the Citrus Leaf-miner, *Phyllocnistis citrella* by SCHAUFF *et al.* (1998);

*Diglyphus isaea* (Walker, 1838) recorded as a deliberately introduced leaf-miner parasite by MIFSUD (1997a);

*Diglyphus minoeus* (Walker, 1838) recorded as parasitic on the leaf-miner, *Chromatomyia horticola* (Goureau) by MIFSUD (1997a);

*Euderomphale* sp. recorded as parasitic on the whitefly, *Tetralicia ericae* by MIFSUD *et al.* (1995);

*Pnigalio agraulis* (Walker, 1839) recorded as parasitic on the olive fly, *Bactrocera oleae* by HABER & MIFSUD (2007);

*Tamarixia pronomus* (Walker, 1839) recorded as parasitic on the jumping plant-louse, *Bactericera crithmi* by MIFSUD (1997b);

*Tamarixia tremblayi* (Domenichini, 1965) recorded as parasitic on the jumping plant-louse, *Bactericera crithmi* by MIFSUD (1997b);

*Tamarixia* sp. recorded as parasitic on the jumping plant-louse, *Trioza chenopodii* by MIFSUD (1997b).

**ACKNOWLEDGEMENTS**

I would like to thank Dr John La Salle (Australia) for very kindly providing information and literature on the gall-inducing Eulophidae and for reading a draft of the manuscript. I also thank Dr Christer Hansson (Sweden) for correcting some errors in an earlier draft of this work, Prof. Zvi Mendel (Israel) for providing figure 1 and Dr Gene-Sheng Tung (Taiwan Forestry Research Institute) for providing figure 3.

**REFERENCES**

- ARZONE, A. & ALMA, A. (2000) Eulofide galligeno dell'Eucalipto in Italia. *Informatore Fitopatologico*, **50** (12): 43-46.
- BELLA, S. & LO VERDE, G. (2002) Presenza nell'Italia continentale e in Sicilia di *Ophelimus prope eucalypti* (Gahan) e *Aprostocetus* sp., galligeni degli Eucalipti (Hymenoptera, Eulophidae). *Naturalista siciliano*, S. IV, **26** (3-4), 191-197.

- BRANCO, M., BOAVIDA, C., DURAND, N., FRANCO, J.C. & MENDEL, Z. (2009) Presence of the Eucalyptus gall wasp *Ophelimus maskelli* and its parasitoid *Closterocerus chamaeleon* in Portugal: First record, geographic distribution and host preference. *Phytoparasitica*, **37**: 51-54.
- CABI (2007) *Leptocybe invasa* Fisher & La Salle. *Distribution Maps of Pests*, 698, 2 pp. CAB International, Wallingford, UK. Available from: <http://www.cabi.org/dmpps/FullTextPDF/2007/20073255775.pdf>
- COSTA, V.A., BERTI FILHO, E., WILCKEN, C.F., STAPE, J.L., LA SALLE, J. & TEIXEIRA, L. DE D. (2008) Eucalyptus gall wasp, *Leptocybe invasa* Fisher & La Salle (Hymenoptera: Eulophidae) in Brazil: New forest pest reaches the New World. *Revista de Agricultura (Piracicaba)*, **83**: 136-139.
- EPPO (2006) First report of two new eucalyptus pests in the South of France: *Ophelimus maskelli* and *Leptocybe invasa*. *EPPO Reporting Service*, 2006-09: 189.
- FARRUGIA, C. (1998) Parasitic Hymenoptera associated with scale insects on citrus trees in the Maltese Islands (pp. 6-8 + 1 fig.). In: DANDRIA, D. [ed.], *Biology Abstracts MSc, PhD 1998 and contributions to Marine Biology*. Malta University Press, University of Malta. iv + 38 pp.
- GASKILL, D.A., HUNG, S.E. & SMITH, T.R. (2009) Florida CAPS Blue Gum Chalcid Survey Report. Florida Cooperative Agricultural Pest Survey. Program Report No. 2009-03 BGCW-01. 7 pp.
- GAULD, I.D. & BOLTON, B. [eds.] (1988) *The Hymenoptera*. Oxford University Press, Oxford, UK. xi + 332 pp (Reprinted and revised, 1996; ISBN 0-19-858521-7).
- HABER, G. & MIFSUD, D. (2007) Pests and diseases associated with olive trees in the Maltese Islands (Central Mediterranean). *The Central Mediterranean Naturalist*, **4** (3): 143-161.
- HANSSON, C. (1985) Taxonomy and biology of the Palaearctic species of *Chrysocharis* Forster, 1856 (Hymenoptera: Eulophidae). *Entomologica Scandinavica* (supplement) **26**: 51 pp.
- KAVALLIERATOS, N.G., KONTODIMAS, D.C., ANAGNOU-VERONIKI, M. & EMMANOUEL, N.G. (2006) First record of the gall inducing insect *Ophelimus eucalypti* (Gahan) (Hymenoptera: Chalcidoidea: Eulophidae) in Greece. *Annals of the Benaki Phytopathological Institute* (NS) **20**, 125-128.
- LA SALLE, J. (1994) North American genera of Tetrastichinae (Hymenoptera, Eulophidae). *Journal of Natural History*, **28**: 109-236.
- LA SALLE, J. (2005) Biology of gall inducers and evolution of gall induction in Chalcidoidea (Hymenoptera: Eulophidae, Eurytomidae, Pteromalidae, Tanaostigmatidae, Torymidae) (pp. 507-537). In: RAMAN, A., SCHAEFER, C.W. & WITHERS, T.M. [eds.], *Biology, ecology, and evolution of gall-inducing arthropods* (2 volumes). Science Publishers, Inc., Enfield, New Hampshire, USA. 817 pp.
- LAUDONIA, S. & VIGGIANI, G. (2004) Descrizione degli stadi preimmaginali dell'Imenottero galligeno *Ophelimus eucalypti* (Gahan) (Hymenoptera: Eulophidae). *Bollettino del Laboratorio di entomologia agraria "Filippo Silvestri"*, **59** (2003): 93-98.
- 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**: 101-113.
- MIFSUD, D. (1997a) Biological Control in the Maltese Islands - past initiatives and future programmes. *EPPO Bulletin*, **27**: 77-84.
- MIFSUD, D. (1997b) The jumping plant-lice (Hemiptera: Psylloidea) of the Maltese Islands (pp. 35-36 + 1 fig.). In: DANDRIA, D. [ed.], *Biology Abstracts B.Sc. 1996-1997 M.Sc. 1996-1997*, University of Malta. v + 39 pp.
- MIFSUD, D., FALZON, A., MULUMPHY, C., DE LILLO, E., VOVLAS, N. & PORCELLI, F. (2012) On some arthropods associated with *Ficus* species (Moraceae) in the Maltese Islands. *Bulletin of the Entomological Society of Malta*, **5**: 5-34.
- MIFSUD, D., VIGGIANI, G., DANDRIA, D. & LANFRANCO, E. (1995) Whitefly parasitoids from the Maltese Islands. *The Central Mediterranean Naturalist*, **2** (3): 101-107.
- MITROIU, M.-D. (2004) Eulophidae. Fauna Europaea version 2.4. <http://www.faunaeur.org> [accessed 17<sup>th</sup> July 2012].

- MUTITU, K.E. (2003) A pest threat to *Eucalyptus* species in Kenya. *KEFRI Technical Report*, 12 pp.
- NOYES, J.S. (2003) Universal Chalcidoidea Database. World Wide Web electronic publication [<http://www.nhm.ac.uk/research-curation/projects/chalcidooids/>] [accessed 26<sup>th</sup> August 2012].
- PROTASOV, A., LA SALLE, J., BLUMBERG, D., BRAND, D., SAPHIR, N., ASSAEL, F., FISHER, N. & MENDEL, Z. (2007) 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.
- PUJADE-VILLAR, J. & RIBA-FLINCH, J.M. (2004) Dos especies australianas de eulófidos, muy dañinas para *Eucalyptus* spp., introducidas en el nordeste ibérico (Hymenoptera: Eulophidae). *Boletín de la Sociedad Entomológica Aragonesa (S.E.A.)*, **35**: 299-301.
- SCHAUFF, M. E., LASALLE, J. & WIJESSEKARA, G. A. (1998) The genera of Chalcid parasitoids (Hymenoptera: Chalcidoidea) of Citrus Leafminer *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae). *Journal of Natural History*, **32**: 1001-1056.
- TILBURY, C. & JUKES, M. (2006) *Ophelimus ? maskelli*: A new gall-causing eulophid wasp (Hymenoptera: Chalcidoidea) on *Eucalyptus* in London. *Cecidology*, **21** (2) 90-91.
- TUNG, G.-S. & LA SALLE, J. (2010) Pest Alert - a newly discovered invasion of gall-forming wasps, *Leptocybe invasa* (Fisher & La Salle), on Eucalyptus Trees in Taiwan. *Formosan Entomol*, **30**: 241-245.
- VIGGIANI, G. & NICOTINA, M. (2001) L'Eulofide galligeno fogliare degli eucalipti *Ophelimus eucalypti* (Gahan) in Campania. *Bollettino di Zoologia Agraria e di Bachicoltura*, series II, **33** (1): 79-82.
- WU, Y., JIANG, X., LI, D., LUO, J., ZHOU, G., CHANG, M. & YANG, Z. (2009) *Leptocybe invasa*, a new invasive forest pest making galls on twigs and leaves of eucalyptus trees in China (Hymenoptera: Eulophidae). *Scientia Silvae Sinicae*, **45**: 161-165.

Received: February 20, 2012

Accepted: September 15, 2012