



Two new species of *Tamarixia* (Hymenoptera: Eulophidae) from Chile and Australia, established as biological control agents of invasive psyllids (Hemiptera: Calophyidae, Triozidae) in California

ROBERT L. ZUPARKO¹, DALVA LUIZ DE QUEIROZ^{2,3} & JOHN LA SALLE⁴

¹Essig Museum of Entomology, University of California, Berkeley, California 94720, USA. E-mail: rz@berkeley.edu

²Embrapa Florestas, Estrada da Ribeira, Km 111, Caixa Postal 319, 83411-000 Colombo-PR, Brazil. E-mail: dalva@cnpf.embrapa.br

³Department of Environmental Biology, Curtin University of Technology, P. O. Box U 1987, Perth-WA 6845, Australia

⁴CSIRO Ecosystem Sciences, GPO Box 1700, Canberra 2601, ACT, Australia. E-mail: john.lasalle@csiro.au

Abstract

Tamarixia schina Zuparko **sp. nov.** and *T. dahlsteni* Zuparko **sp. nov.** are described. Both species have become established in California following their introductions from Chile and Australia, respectively, for control of invasive psyllids. *Tamarixia schina* is known from *Calophya schini* (Hemiptera: Calophyidae) on *Schinus molle* (Anacardiaceae) and *T. dahlsteni* from *Trioza eugeniae* (Hemiptera: Triozidae) on *Syzygium paniculatum* (Myrtaceae). The use of *Tamarixia* in biological control is discussed, and an annotated list of world species including distribution, hosts, and host plants, is provided. *Tetrastichus atamiensis* Ashmead is transferred to *Tamarixia* as *Tamarixia atamiensis* (Ashmead) **comb. n.**

Key words: Insecta, *Tamarixia schina*, *Tamarixia dahlsteni*, *Tamarixia radiata*, *Tamarixia dryi*, *Tamarixia leucaenae*, *Tamarixia atamiensis*, biocontrol

Introduction

The peppertree psyllid, *Calophya schini* Tuthill (Hemiptera: Calophyidae) was first discovered in California in 1984 after being accidentally introduced from South America (Downer *et al.* 1988; da Silva 1994; Dreistadt *et al.* 2004). It was originally reported in Long Beach, and subsequently spread through coastal regions of the state from San Francisco to San Diego. This species seems to only attack the California pepper tree, *Schinus molle* Linnaeus (Anacardiaceae), and does not attack the congeneric Brazilian pepper tree *S. terebinthifolius* Raddi, which is also extensively planted throughout the state. Damage is caused by the nymphal stage. Adults deposit their eggs on the fresh growing tips, and the nymphs settle and form deep pits which can deform and discolor leaves and cause distortion of twiglets and even disfigured trees (Fig. 1). In warmer climates, reproduction and all life stages can occur throughout the year (Dreistadt *et al.* 2004). *Calophya schini* had been considered a synonym of *Calophya rubra* (Blanchard) (e.g. Burckhardt 1988; da Silva 1994; Dreistadt *et al.* 2004), but was removed from synonymy and reinstated as a valid species by Burckhardt & Basset 2000.

The eugenia psyllid, *Trioza eugeniae* (Froggatt) (Hemiptera: Triozidae), was first detected in Inglewood, California in May 1988, becoming a major pest of Australian bush cherry or lilly pilly, *Syzygium paniculatum* Gaertner (Myrtaceae), in the coastal counties (Downer *et al.* 1991; Dahlsten *et al.* 1995). It had spread throughout coastal regions of southern California by the end of 1988, and reached northern California in early 1989. Small populations of the eugenia psyllid were found in Florida in 1993, but these populations were eradicated at that time and further colonies have not been found (Mead 1994). The eugenia psyllid is multivoltine, with three to five generations a year in California. As with the peppertree psyllid, adults oviposit into new growth, and the nymphs form pits on the surface of the leaf (Fig. 2) where they feed and develop (Dahlsten *et al.* 1995; Dreistadt *et al.* 2004). Leaves can be severely disfigured, reducing the ornamental value of the plant.

Classical biological control programs were instituted by workers from the Division of Biological Control, University of California, Berkeley, against both species. Foreign exploration work in South America resulted in the