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# First record of the pepper tree psyllid, *Calophya schini* Tuthill (Hemiptera, Calophyidae), in the Palaearctic region

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**Abstract** The presence of the psyllid *Calophya schini* infesting the Peruvian pepper tree, *Schinus molle,* was detected in several localities in the region of Lisbon, in Portugal. This is the first record of this jumping plant-louse in Europe and the Palaearctic region.

**Keywords** Galls · Jumping plant-lice · Portugal · Psylloids · *Schinus molle*

The Peruvian pepper tree, *Schinus molle* L. (Anacardiaceae), is an evergreen, fast-growing, 3–15-m tall dioicious plant, with alternate pinnate leaves, small yellow flowers and red fruits. Native to the Andes, *S. molle* was brought in the 16$^{th}$ Century to Mexico by Spanish settlers and introduced in the early 18$^{th}$ Century into Europe. Today, it is widely planted as an ornamental for its attractive foliage and showy red fruits in California (USA), Mexico, the arid parts of Australia and in many other moderately warm and semiarid regions, including southern Europe (Burckhardt & Basset 2000; Howard & Minnich 1989; D.M. Iponga, Ph.D. thesis, 2009, Stellenbosch Univ.; Kramer 1957). The dried fruits of *S. molle* are used as a pepper-like condiment or to adulterate pepper (Burckhardt & Basset 2000). This tree is also known for its medicinal properties. It has been used as an astringent, balsamic, diuretic, expectorant, masticatory, purgative, stomachic, tonic and vulnerary, and in the treatment of several health problems (Orwa *et al.* 2009). Extracts of *S. molle* were shown to have analgesic, anti-inflammatory and anti-cancer effects (Barrachina *et al.* 1997; Bendaoud *et al.* 2010; Diaz *et al.* 2008; Yueqin *et al.* 2003), and have been explored for pest control due to their antibacterial, antiviral, antifungal, insecticidal and repellent properties (Benzi *et al.* 2009; Deveci *et al.* 2010; Dikshit *et al.* 1986; Huerta *et al.* 2010). *Schinus molle* is also considered an invasive plant species of natural areas in California and South Africa (Howard & Minnich 1989; Iponga *et al.* 2009).

In its native range, *Schinus* is attacked by different insects including cecidogenous jumping plant-lice (Hemiptera, Psylloidea). The *Schinus* psylloids belong to two genera, *Calophya* Löw (Calophyidae) and *Tainarys* Brèthes (Psyllidae: Rhinocolinae). Native to China, *Calophya rhois* Löw is the only *Calophya* species known in Europe, reported from an Anacardiaceae host plant, *Cotinus coggygria* Scop. (Burckhardt & Basset 2000; de Jong 2011). There are 15 described *Calophya* species which have been reported from

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*Schinus* spp.: *C. andina* Burckhardt & Basset, *C. catillicola* Burckhardt & Basset, *C. clausa* Burckhardt & Basset, *C. duvauae* Scott, *C. floricola* Burckhardt & Basset, *C. gallifex* (Kieffer and Jörgensen), *C. hermicitae* Burckhardt & Basset, *C. latiforceps* Burckhardt, *C. mammifex* Burckhardt & Basset, *C. orbicola* Burckhardt & Basset, *C. patagonica* Burckhardt & Basset, *C. rubra* Blanchard, *C. schini* Tuthill, *C. scrobicola* Burckhardt & Basset and *C. terebinthifolii* Burckhardt & Basset (Burckhardt & Basset 2000; Burckhardt *et al.* 2011). In this note, we report the presence of the pepper tree psyllid, *C. schini*, infesting *S. molle* in Portugal. It is the first record of this jumping plant-louse in Europe and in the Palaearctic region (D. Burckhardt, pers. comm. 2011).

Adults and nymphs of *C. schini* were found on leaves of *S. molle* at the following localities: Póvoa de Santo Adrião (Odivelas) (38º80′33″N, 9º16′09″W), 26 July 2011, coll. A. Lima; Queluz (Sintra) (38°44′57.68″N, 9°15″34.80″W), 6 September 2011, coll. C. Abrantes; Sete Rios (Lisbon) (38°44′37.36″N, 9°10′11.52″W) and Restelo (Lisbon) (38°42′30.84″N, 9°12′22.79″W), 12 September 2011, coll. M.F. Caetano; Parque dos Poetas (Oeiras) (38º42′2″N, 9º18′10 W), Avenida do Conselho da Europa (Oeiras) (38º42′42″N, 9º17′52″W), and Tapada da Ajuda (Lisbon) (38°42′N, 9°11″W), 26 September 2011, coll. A.P. Ramos; Cabeço de Mouro (Cascais) (38º43′2″N, 9º19′59″), 27 September 2011, coll. A.P. Ramos; Paço d'Arcos (Oeiras) (38°41′43.38″N, 9°17′24.11″W), 29

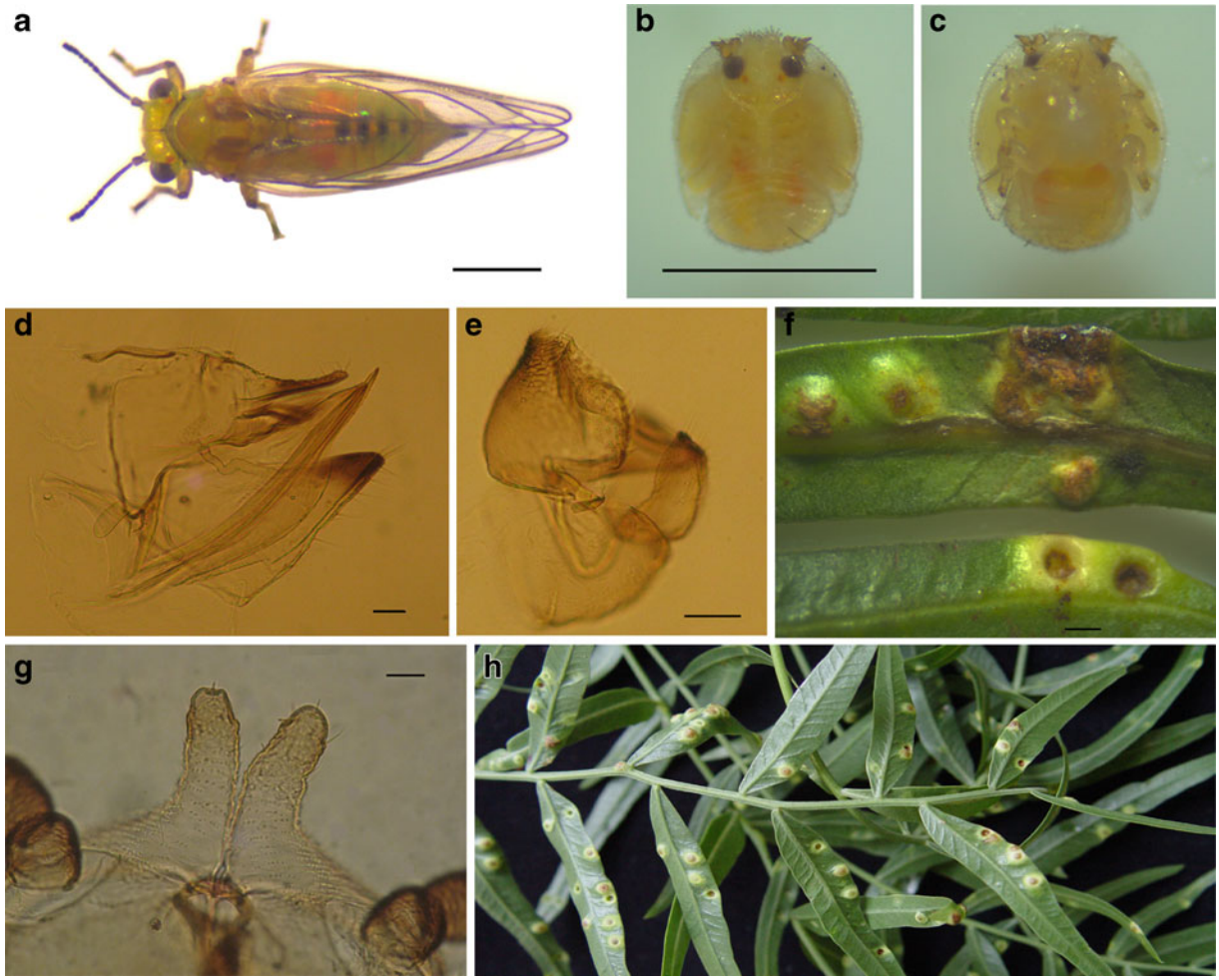


**Fig. 1** Morphology of and damage by *Calophya schini* Tuthill: **a** adult; **b** fifth instar nymph (dorsal view); **c** fifth instar nymph (ventral view); **d** female terminalia; **e** male terminalia; **f** pit galls on leaflets; **g** detail of the genal processes head; **h** damaged leaves. The line scale corresponds to 1 mm for (**a**, **b**, **c** and **f**) photos; and 1 μm for (**d**, **e** and **g**)

September 2011, coll. A.P. Ramos. The collected specimens were prepared for identification according to Hodkinson & White (1979). The species identification was based on the morphology of adults and nymphs and the type of galls (Burckhardt & Basset 2000), and kindly confirmed by Dr. Daniel Burckhardt (Naturhistorisches Museum Basel). The level of infestation of the sampled *S. molle* trees ranged between 27.1±4.7 and 152.6±27.5 pit galls per leaf (mean± SE). *Calophya schini* was not detected on *S. molle* trees sampled in the following localities: Azambuja (Santarém) (39°4′21.53″N, 8°51′47.83″W), 5 October 2011, coll. A.P. Ramos; Patacão (Faro) (37° 2′47.74″N, 7°57′4.03″W), and Tavira (37°7′33.51″N, 7°38′56.36″W), 14 October 2011, coll. A.P. Ramos, A. Lima and M.F. Caetano; Linda-a-Velha (Oeiras) (38°43′0.93″N, 9°14′14.65″W), 25 October 2011, coll. M.F. Caetano. The fact that the presence of *C. schini* is apparently restricted to an area along the north river bank of Tagus, between Lisbon and Cascais, and not detected either in the south of Portugal (Algarve), or in the region of Azambuja (about 50 km north of Lisbon), suggests that Lisbon was most probably the area of introduction.

Native to Peru and Bolivia, *C. schini* has been expanding its geographical range to North America and Africa. It was reported from Argentina, California (USA), Chile, Colombia, Mexico, New Zealand, and South Africa (Downer *et al*. 1988; Giliomee 2011; Pinzon & González 2001; Tuthill 1959).

The single known host plant of *C. schini* is *S. molle*. The psyllid does not attack the congeneric Brazilian pepper tree, *S. terebinthifolius* Raddi. Damage is caused by the nymphal stage of the plant-lice, inducing the formation of deep pit galls on the leaves (Figure 1), petioles, twiglets, and flower buds of the host plant (Burckhardt & Basset 2000; Downer *et al.* 1988; Zuparko *et al*. 2011). Several dozen pits may occur on the same leaflet. The pitting and associated distorted twiglets disfigure trees and high psyllid populations provoke a grayish appearance on the infested trees, followed by extensive foliage drop (Downer *et al.* 1988).

Adults of *C. schini* are greenish or tan and resemble minute cicadas (Paine & Dreistadt 2007; Figure 1). Adult females deposit their eggs on tender new growth of the pepper tree. The yellow or orange nymphs settle both in the lower and upper surface of leaflets and nymphal development includes five instars (Downer *et al.* 1988; Figure 1). Pinzon & González (2001) studied the life cycle of *C. schini* at a mean temperature of 13.7°C and 80% r.h. The estimated development time of egg and nymphal stages was 19 and 43 days, respectively; adult longevity was 33 days. In warmer places, such as California, the psyllid is multivoltine (Downer *et al.* 1988; Hodkinson 2009). Pinzon & González (2001) estimated four generations per year in Colombia. Overwintering occurs on the host plant leaves as eggs, nymphs and adults (Hodkinson 2009).

Downer *et al.* (1988) evaluated the efficacy of different insecticides for the chemical control of *C. schini*. *Tamarixia schina* Zuparko (Hymenoptera: Eulophidae), a primary ectoparasitoid of late-instar nymphs of *C. schini,* was successfully introduced into California from Chile for the biological control of the psyllid (Zuparko *et al.* 2011), which is often satisfactorily controlled by this parasitic wasp (Paine & Dreistadt 2007).

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