

# A new species of *Encarsia* (Hymenoptera, Aphelinidae) developing on ficus whitefly *Singhiella simplex* (Hemiptera, Aleyrodidae) in China and Taiwan

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## Abstract

*Encarsia singhiellae* Polaszek & Shih, **sp. n.**, is described and illustrated. It is known so far from Taiwan and China. All specimens were reared from the ficus, or fig, whitefly *Singhiella simplex* (Singh), an Asian species recently attaining pest status in California, Colombia, and Florida.

## Keywords

Parasitoid, invasive species, potential biocontrol agent

## Introduction

The ficus or fig whitefly *Singhiella simplex* was described from India (Singh 1931), and appears to have a natural distribution across South and Southeast Asia that includes China, India, Myanmar and Taiwan (EPPO 2014, Natural History Museum, London, unpublished data). It was first recorded as an invasive species established in Florida (2007) and California (2012), has since become widespread in Central and South America and the Caribbean, and was recorded from Cyprus in 2014. It appears to be restricted to developing on several *Ficus* species, and is commonly recorded from

*F. benjamina* L. and *F. microcarpa* L.f. Some *Ficus* species appear to be unsuitable for its development (EPPO 2014).

There are three published records of parasitoids of this species, all apparently from Florida. Hodges (2007), recording *S. simplex* for the first time from Florida, cited *Encarsia tricolor* Förster, 1878 a species that occurs nowhere in the New World, nor anywhere within the natural Old World distribution of *S. simplex*. We therefore consider this parasitoid record to be a misidentification. *Encarsia protransvena* Viggiani, 1985, and *Amitus bennetti* Viggiani & Evans, 1992 were recorded from *S. simplex* in Florida (Avery et al. 2011) and, although no identification authority was cited, these seem to have been identified correctly. Given the origin of *S. simplex* in the Old World tropics, it seems likely that a native parasitoid, screened for a reasonable degree of host-specificity, might be a good candidate for classical biological control of *S. simplex* in the New World. Such a possible candidate is described below. Terminology follows Huang and Polaszek (1998).

## Abbreviations

- FAFU** Fujian Agriculture and Forestry University, Fuzhou, CHINA.  
**NHM** Natural History Museum, London, U.K.  
**NTU** National Taiwan University, Taipei, TAIWAN.

## Material and methods

A single series of reared specimens collected in September 2010 by the second author (YTS) was studied in detail for taxonomically useful morphological characters by the second and fourth (AP) authors. A single specimen reared one month later from the same host from mainland China proved to be morphologically identical. DNA was successfully sequenced from four individuals from the original sample, using the protocol described in detail by Polaszek et al. (2013). This “non-destructive” extraction method has proven extremely effective for the smallest parasitoids. Sequence data for the ribosomal 28S-D2 region were aligned using MUSCLE (Edgar 2004) and analysed using RAXML (Stamatakis 2014) by the third author.

## Results

### *Encarsia singhiellae* Shih & Polaszek, sp. n.

<http://zoobank.org/3E0E06D7-3280-44E4-B2C3-56BED3E54000>

Figs 1–15

**Description of female.** Colour: Head yellow, antenna yellow, slightly darker towards apex. Mesosoma yellow except following light brown: pronotum, posterior margin of

mesoscutum, anterior margin of scutellum, axillae and sides of propodeum. Metasoma yellow except T5 dark brown in strong contrast. Base of T1, and T4, infusate centrally. Fore wing slightly infusate below marginal vein. Legs yellow.

Morphology: Mandibles each with three small teeth. Stemmaticum with five robust setae and reticulate surface sculpture. Antennal formula 1,1,4,2. F1, F2, F3 approximately equal in length, with any of the three antennomeres the longest in different specimens. Pedicel with two robust setae dorsally. F4 0.9 times F1 (0.85 in holotype); F5 0.7–0.9× F1 (0.73 in HT); F6 0.8–1.0times F1 (0.9 in HT); funicle length 2.5times clava length (2.3 in HT). F1–F6 with the following numbers of multiporous plate sensilla: F1:0; F2:2; F3:2; F4:3; F5:3 F6:3. Mid lobe of mesoscutum with 4 or 5 pairs of setae, 1 lateral pair and 3–4 centrally (one central seta unpaired in holotype); side lobes with three setae. Scutellar sensilla closely placed, separated by less than the maximum width of one sensillum. Distance between posterior pair of scutellar setae 2 times distance between posterior pair (2.1 times in HT). Fore wing 2.8 times maximum width of disc (2.84 in HT). Marginal fringe 0.26 times maximum width of disc (0.25 in HT). Submarginal vein with 3 setae; marginal vein anteriorly with 7–9 setae (8+9 in HT). Basal cell with 9–15 setae (11+12 in HT). Tarsal formula 5-5-5. Mid tibial spur 0.56 times corresponding basitarsus. Mid tibia with a prominent spine-like seta apically. Metasomal tergites with the following numbers of setae: T1: 0, T2: 2, T3: 2, T4: 2, T5: 4, T6: 4, T7: 4. Ovipositor 1.2 times mid tibia; 2nd valvifers 3.8 times third valvulae (3.7 in HT).

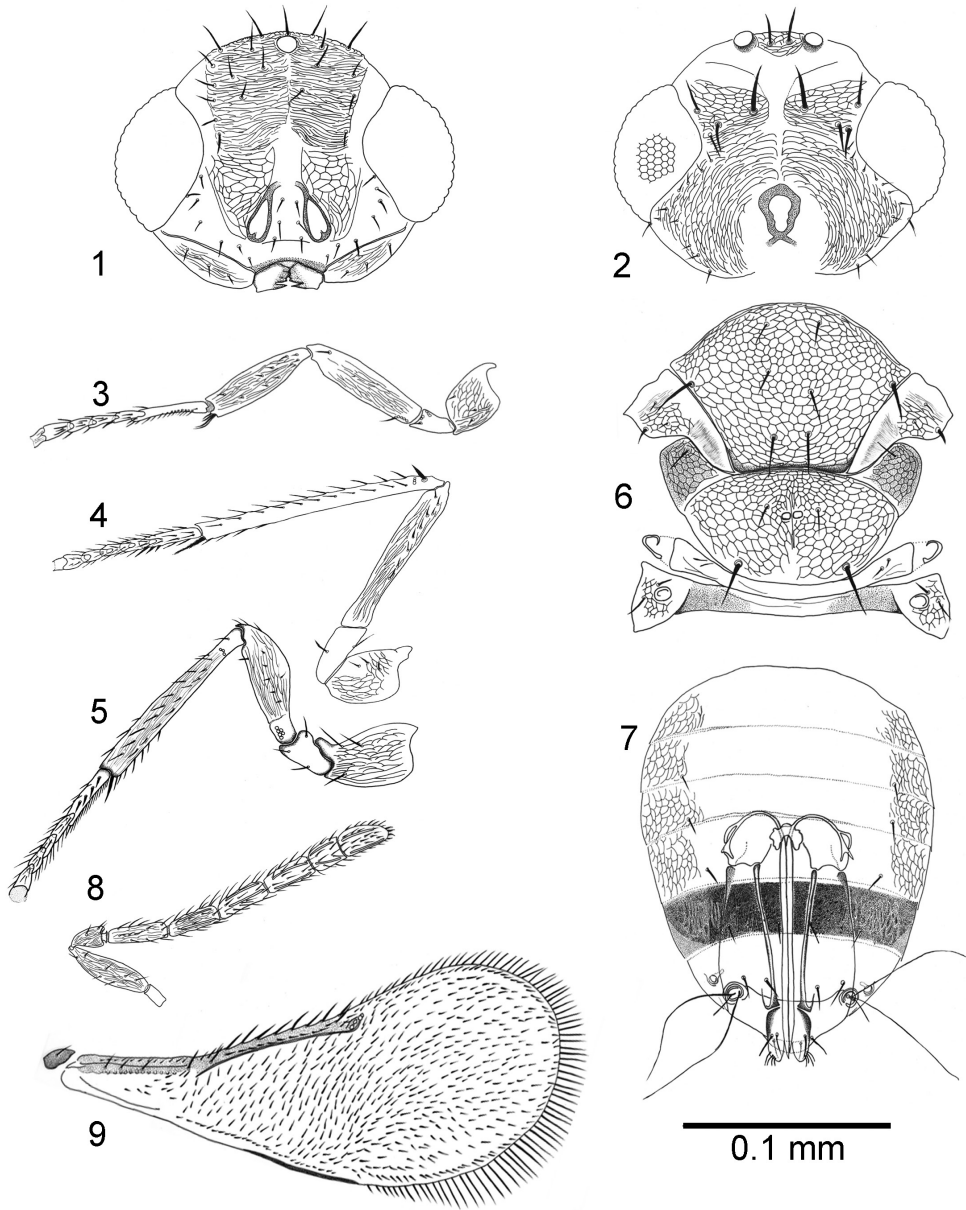
**Male.** Unknown.

**Material examined.** Holotype female (NHM) on slide, labelled “TAIWAN: Taoyuan, Kuanyin (25.034°N, 121.113°E), 07 July 2011, ex *Singhiella simplex* on *Ficus microcarpa* Y.T. Shih col. Holotype *Encarsia singhiellae* Shih & Polaszek”; paratypes: 9 females, same data as holotype (NHM, NTU). **CHINA:** Fujian, Xiamen (24.481°N, 118.089°E), 6.x.2010 ex *Singhiella simplex* on *Ficus microcarpa*, J Huang, A Polaszek, Z-H Wang col. (1 female, FAFU).

**Species group placement.** The close proximity of the scutellar sensilla, coupled with three setae on the submarginal vein might suggest placement of the new species in the *E. strenua* group, but the shape of the stigma vein indicates that this placement would be incorrect. *E. strenua* group species have a distinct constriction between the marginal and stigmal veins. DNA analysis of the 28S D2 region places *E. singhiellae* sp. n. far away from the monophyletic *E. strenua* group, in an assemblage that includes *E. tricolor* Foerster, *E. tachii* (Polaszek & Hayat), and *E. mineoi* Viggiani (S. Schmidt, unpublished data). *Encarsia singhiellae* is therefore currently unplaced with respect to any known species group of *Encarsia*. The sequence has been deposited in GenBank under accession number KT279403.

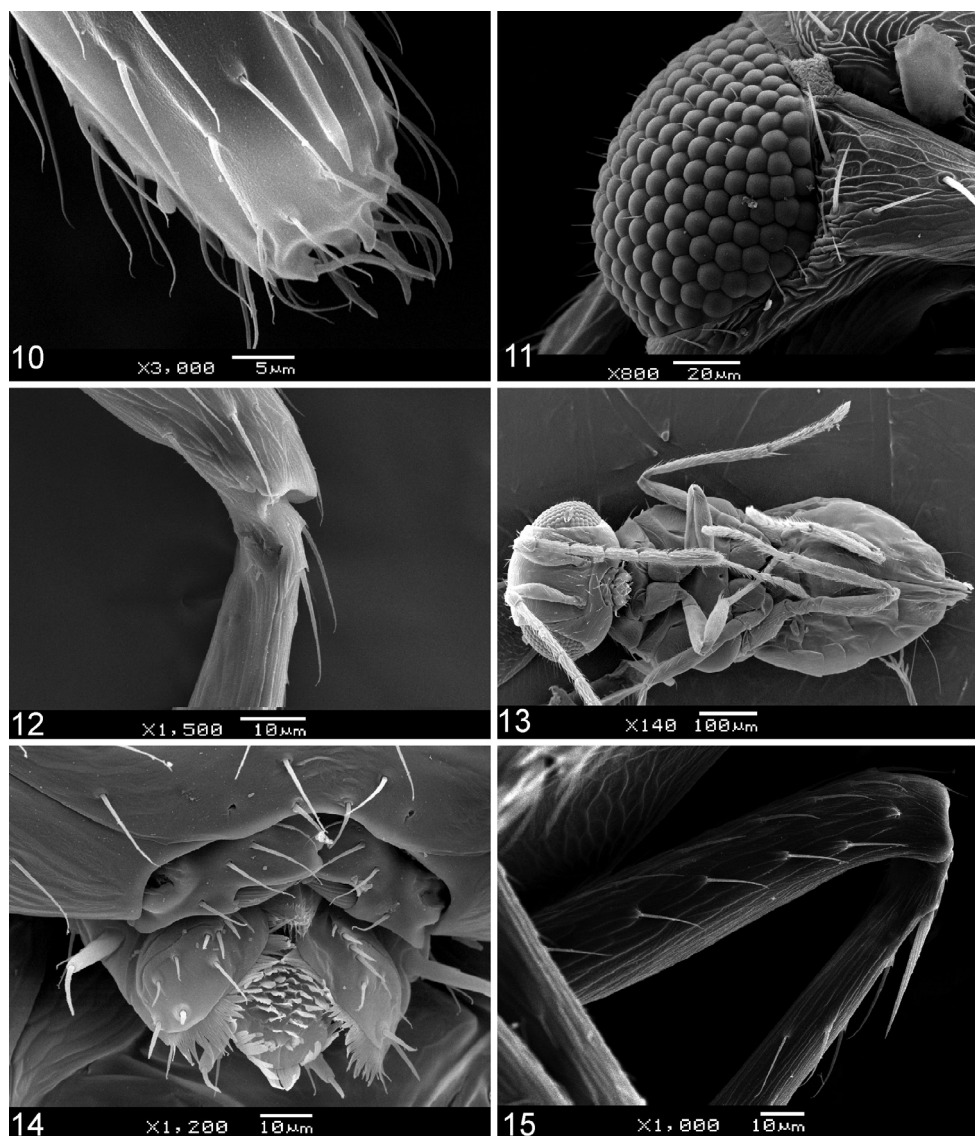
In the key to Chinese *Encarsia* species (Huang and Polaszek 1998), *E. singhiellae* sp. n. keys to *E. noyesana* Huang & Polaszek, 1998. It can be easily distinguished from that species by the three setae on the submarginal vein (two in *E. noyesana*); 2-segmented clava (3-segmented in *E. noyesana*); and the distinct colour pattern of the metasoma.

**Host.** *Singhiella simplex* (Singh) (Hemiptera: Aleyrodidae).



**Figures 1–9.** *E. singhiellae* sp. n.: **1** Head, frontal view **2** Head, back view **3** Fore leg **4** Mid leg **5** Hind leg **6** Dorsal mesosoma **7** Dorsal metasoma **8** Antenna **9** Fore wing.

**Remarks.** *Encarsia singhiellae* sp. n. is not closely related to any known *Encarsia* species, either in the Oriental Region or elsewhere. It has several unusual characters as follows: antenna with two robust setae on the pedicel, and F1 having distinct sculpture; anterior apex of mid tibia with one distinct long spine-like seta. The following



**Figures 10–15.** *E. singhiellae* sp. n.: **10** Apex of antenna **11** Detail of compound eye **12** Articulation of tibia and femur, fore leg **13** Ventral habitus **14** Mouth **15** Articulation of tibia and femur, mid leg.

character states place the new species in the genus *Encarsia*: fore and hind tarsi five-segmented, eight antennomeres (excluding radicle), scutellum with two pairs of setae, marginal vein longer than submarginal vein, stigmal vein very short and postmarginal vein absent.

It is the first recorded parasitoid of *Singhiella simplex* in Asia, and appears to show a high degree of host specificity, as there are no host records from other whitefly species. The species is currently only known from the type locality.

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