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First detection of *Bactrocera tsuneonis* (Diptera: Tephritidae) in Guangdong Province of China

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The Japanese orange fly, *Bactrocera tsuneonis* (Miyake) (Diptera: Tephritidae), is one of the most economically important pests of citrus, and its only host is citrus (Yasunaga & Nagatomi 1959; Anonymous 1976; Zhang 1984; White & Wang 1992; Vargas et al. 2015). Severe outbreaks have been recorded in some commercial citrus orchards in Japan (Yasunaga & Nagatomi 1959) and China (Anonymous 1976; Zhang 1984). Natural distribution of *B. tsuneonis* is restricted in Japan and China (White & Elson-Harris 1992; Vargas et al. 2015), and probably Vietnam (Anonymous 1976; Zhang 1984; Zhang 1989). In China, the pest has been recorded in Guangxi, Guizhou, Hunan, Sichuan, Taiwan, and Yunnan (Anonymous 1976; Zhang 1984; White & Elson-Harris 1992; White & Wang 1992). Here, we report the first occurrence of *B. tsuneonis* in Guangdong, a major citrus growing area in southernmost mainland China.

A survey was conducted in an orchard of *Citrus reticulata* Blanco cv. 'Shiyueju' (Rutaceae). This orchard (24.3000°N, 123.7200°E) is located 30 km northwest of Huaiji County, northwestern Guangdong Province, China. The orchard is on the western side of Sankeng reservoir, surrounded by natural forest, with elevations between 210 to 426 masl (Fig. 1). Five commercially available lures were used in the survey: (1) torula yeast: 3 pellets per 300 mL water (Chemtica Internacional S.A., Heredia, Costa Rica); (2) methyl eugenol: a solid sustained-release preparation (Chemtica Internacional S.A., Heredia, Costa Rica); (3) cuelure: a solid sustained-release preparation (Chemtica Internacional S.A., Heredia, Costa Rica); (4) 2-component fruit fly bait (2-component): a solid sustained-release preparation with ammonium acetate + putrescine (Scentry Biologicals, Inc., Billings, Montana, USA); and (5) 3-component fruit fly bait (3-component): a solid sustained-release preparation with ammonium acetate + putrescine + tri-methylamine (Scentry Biologicals, Inc., Billings, Montana, USA). The food-based lure, torula yeast, was placed in McPhail traps. The olfactory lures, methyl eugenol, cuelure, and the 2-component and 3-component baits, were placed in Steiner traps. A total of 5 replicates, 25 traps (5 × 5) were deployed in the trial. All traps were checked and refreshed weekly. Captured insects were collected for species identification at the laboratory in Guangdong Institute of Applied Biological Resources in Guangzhou, China. All obtained *B. tsuneonis* adults were deposited at the Institute as voucher specimens.

Trapping data are presented in Table 1. The first trapping of *B. tsuneonis* occurred on 29 Apr 2016. The last trapping occurred on 30 Sep 2016. A total of 27 adults (13 males and 14 females) were captured in this orchard throughout the trapping period.

Detecting this pest in Guangdong, traditionally the most important citrus production region in China, has significant implications in Chinese citrus production, as well as understanding the biology of this important pest. *Bactrocera tsuneonis* occurs primarily in the temperate areas of China (Vargas et al. 2015), such as the mountainous terrains of Guizhou, Guangxi, and Yunnan. It had previously not been reported in the southernmost citrus growing province, Guangdong, which is the warmest inland province in China. However, Huaiji County, where this study was conducted, is located on the northwest border of Guangdong Province, adjacent to Guangxi Province where *B. tsuneonis* is known to occur (Anonymous 1976). Temperature in the county is lower than that of the coastal plain of the province, which may contribute to the presence of *B. tsuneonis* in Huaiji County. Nevertheless, further trapping in a larger area is needed to better understand the distribution, as well as the movement of the pest in Guangdong Province.

Bactrocera tsuneonis, together with another morphologically and biologically similar *Bactrocera* species, *Bactrocera minax* (Enderlein) (Diptera: Tephritidae) are widely regarded as the predominant citrus pests in China (Wang & Luo 1995; White & Elson-Harris 1992; Vargas et al. 2015). Both species are large, univoltine, citrus-exclusive pests. In spite of the close similarity between the 2 species, the morphological and anatomical characteristics (Ming 1985; White & Wang 1992), as well as genetic distinctions (Jiang et al. 2014) between the 2 species have been well documented. Yasunaga & Nagatomi (1959) noted that adults of *B. tsuneonis* occur from the beginning of Jun, and can be found as late as Oct in Japan. Another study observed that *B. tsuneonis* adults can be found in the field for roughly 5 mo from the middle of Apr to the middle of Sep in Guangxi Province of China (Anonymous 1976). The results of this study indicated that adults of *B. tsuneonis* were detected from late Apr to late Sep in Guangdong (Table 1), close to the findings of the previous studies. *Bactrocera minax* adults are rare or absent from the fields by late Jul (Wang & Luo 1995; Dorji et al. 2006; Li et al. 2012), a field season that is about 2 mo shorter than that of *B. tsuneonis*.

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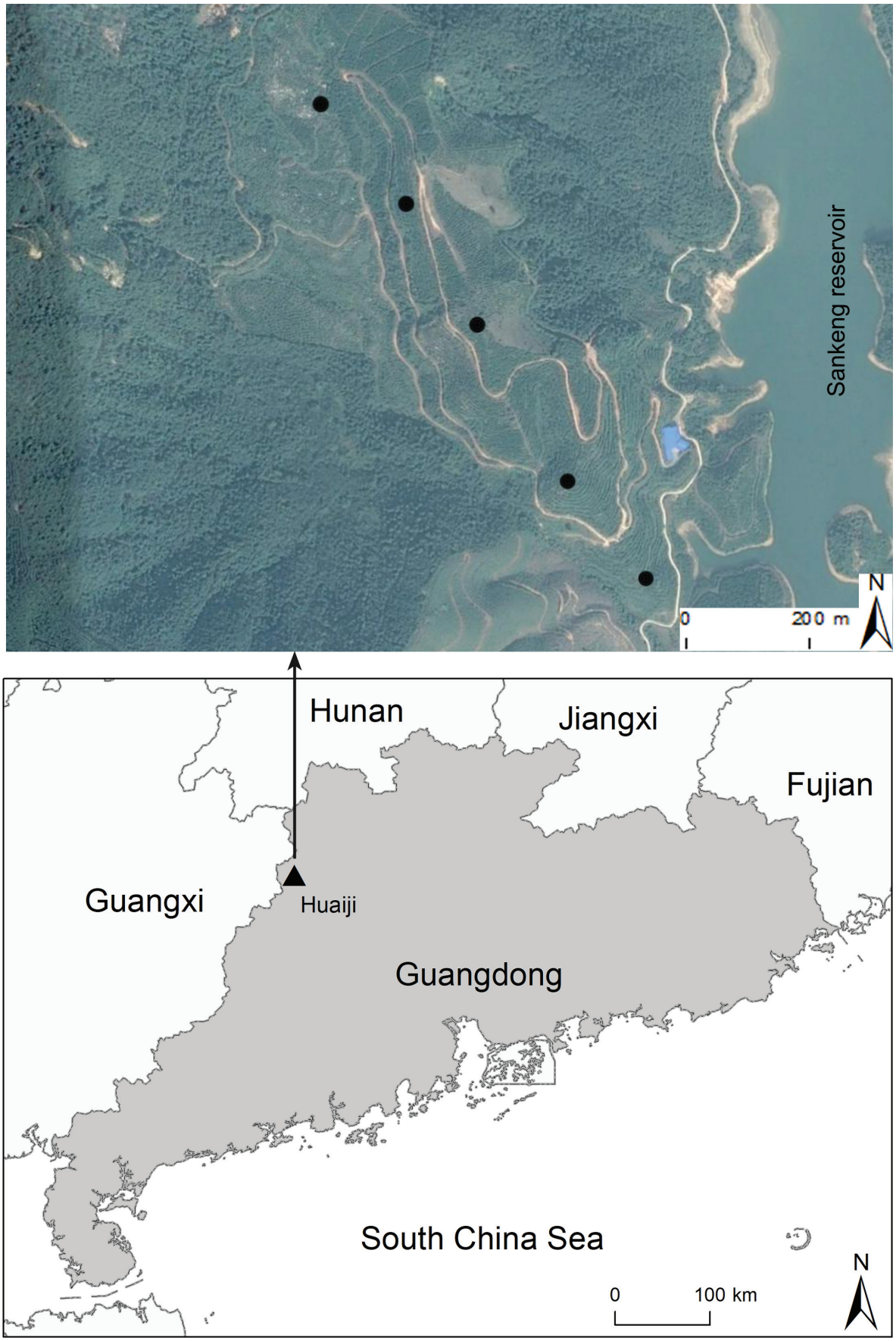

Fig. 1. Map indicating the trapping location (▲) in Guangdong Province in 2016. The photograph above shows an orchard in Huaiji County, where *Bactrocera tsuneonis* was detected. Solid circles (●) in the orchard denote the lure trap locations.

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Table 1. Weekly captured number of *Bactrocera tsuneonis* adults in 5 lure traps in a tangerine orchard in Huaiji County, northwestern Guangdong Province in 2016.

	Lure trap					
Sample dates	Torula yeast	Methyl eugenol	Cuelure	2-component	3-component	Total
1 Jan–22 Apr	0	0	0	0	0	0
29 Apr	0	0	0	0	1♂	1♂
6 May	1♂	0	0	0	0	1♂
13 May	1♂	0	0	4♂♂	2♀♀	5♂♂, 2♀♀
20 May	0	0	0	2♂♂	1♀	2♂♂, 1♀
27 May	0	0	0	1♀	1♂	1♂, 1♀
3 Jun	0	0	0	1♂	0	1♀
10 Jun	0	0	0	0	1♂, 1♀	1♂, 1♀
17 Jun	0	0	0	0	1♀	1♀
24 Jun–15 Jul	0	0	0	0	0	0
22 Jul	0	0	0	1♀	0	1♀
27 Jul	0	0	0	1♀	0	1♀
5 Aug	0	0	0	2♀♀	1♀	3♀♀
12 Aug–2 Sep	0	0	0	0	0	0
9 Sep	0	0	1♂	1♀	0	1♂, 1♀
16 Sep	1♀	0	0	0	0	1♀
23 Sep	0	0	0	0	0	0
30 Sep	1♀	0	0	0	0	1♀
7 Oct–30 Dec	0	0	0	0	0	0
Total	2♂♂, 2♀♀	0	1♂	7♂♂, 6♀♀	3♂♂,6♀♀	13♂♂, 14♀♀

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Summary

The Japanese orange fly, *Bactrocera tsuneonis* (Miyake) (Diptera: Tephritidae) is one of the most destructive pests of citrus. The pest has formerly been recorded in Guangxi, Guizhou, Hunan, Sichuan, Taiwan, and Yunnan in China. Here, we report the first occurrence of *B. tsuneonis* in Guangdong, the southernmost province of mainland China. The adults were trapped from late Apr to late Sep in 2016. A total of 27 adults (13 males and 14 females) of *B. tsuneonis* were captured.

Key Words: citrus; lure; Japanese orange fly; trapping

Sumario

La mosca japonesa de la naranja, *Bactrocera tsuneonis* (Miyake) (Diptera: Tephritidae) es una de las plagas más destructivas de los cítricos. La plaga se ha registrado anteriormente en Guangxi, Guizhou, Hunan, Sichuan, Taiwán y Yunnan en China. Aquí, primero informamos *B. tsuneonis* en Guangdong, la provincia más meridional de China continental. Los adultos se atraparon desde el final de abril hasta el final de septiembre del 2016. Se capturo un total de 27 adultos (13 machos y 14 hembras) de *B. tsuneonis*.

Palabras clave: cítricos; señuelo; mosca japonesa de naranja; captura

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