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Notes and Comments

# Expansion of the area of occurrence of *Zaprionus tuberculatus* (Diptera: Drosophilidae) in the Americas and registration of new host plants

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The Afrotropical species *Zaprionus tuberculatus* Malloch. 1932, known as vinegar or pomace fly, is a species of Afrotropical origin (Yassin, 2008) that colonized Europe (Yassin and David, 2010; Chireceanu et al., 2015; Raspi et al., 2014, Ebejer, 2015), Asia (Yassin and David, 2010; Patlar et al., 2012) and recently the Americas (Cavalcanti et al., 2021). The species has been recorded in three units of the federation in Brazil: the Federal District (Cavalcanti et al., 2021), São Paulo state (Mateus and Machado, 2022; Montes and Vilela, 2022), and Rio de Janeiro state (Faria and Bitner-Mathé, 2023) collected by traps baited with fermented banana. Its presence raises the concern that its behavior is similar to that of other invasive drosophilids such as *Zaprionus indianus* Gupta, 1970 (Vieira et al., 2019) and *Drosophila suzukii* (Matsumura, 1931) (Garcia et al., 2022).

It is believed that exotic drosophilids, with geographical origins from different continents, probably reach new territories through passive diffusion, that is, the transport of fruits that were visually healthy but infested with insect eggs (Newbold et al., 2018, Garcia 2020a). These exotic drosophilid species represent a potential risk for biodiversity conservation, as they may outcompete native species and cause long-term environmental imbalances (Simberloff et al., 2013). In addition, many of these exotic drosophilids are generalist species that explore efficiently a wide range of native and exotic host plants (Valadão et al., 2019). Therefore, their impacts can be environmental, economic, and social, given that some invasive drosophilids cause a reduction in production, increase in control costs, and make it difficult to export fruits, mainly to Europe and the United States (Garcia, 2020b; Garcia et al., 2022).

*Zaprionus tuberculatus* has been already recorded breeding on 49 species of 11 families of host plants (EPPO, 2023). Knowledge of preferred and alternative host plants of invasive species with potential for pest status is essential for the development of integrated pest management programs in an Area Wide approach (Lee et al., 2015; Garcia, 2020b). This work aims to record the expansion of the area of occurrence of *Z. tuberculatus* and new records of host plants.

Fruits were randomly collected from *Vitis labrusca* Linnaeus cv Isabel (Vitaceae) (31º 35' 54"S and 52º 28' 28"W) located in the rural area, and fruits from the urban area (*Butia capitata* (Mart.) Becc., 1916 (Arecaceae); *Eugenia uniflora* Linnaeus, 1753 (Myrtaceae), both (31º 45' 40"S and 52º 19' 51"W), and fruits from *Psidium cattleianum* Sabine, 1821 (Myrtaceae) (31º 45' 42"S and 52º 19' 52"W), all sampling were conducted in Pelotas, Rio Grande do Sul, Brazil, during January 2022 to February, 2023.

Each fruit was weighed and placed in a plastic bottle containing two centimeters of extra fine vermiculite. The opening of the container was covered with a transparent fabric of the "voile" type. The containers were kept under controlled conditions (25 ± 3°C, 70 ± 10% RH, and 12 h photophase). After seven days, experimental observation was carried out, sucking (removing) the emerged insects and placing them in a 2 mL Eppendorf tube with 70% alcohol for later identification of the species. Fruits of *E. uniflora* were also evaluated, but in a smaller quantity than the others, so the methodology was modified, packing all the fruits collectively in the same container until the emergence of the insects. *Zaprionus tuberculatus* specimens were identified based on the diagnostic characteristics provided by Cavalcanti et al. (2021).

The infestation indexes were calculated in two ways: (1) by dividing the total number of flies obtained by the number of fruits in the sample (flies/fruit); or (2) by dividing the total number of flies by the total mass (kg) of fruits in the sample (flies/kg) (Garcia and Norrbom, 2011).

The first detection of *Z. tuberculatus* (Figure 1) occurred in January 2023. In the urban area of the city of Pelotas, it was recorded breeding in *B. capitata*, *E. uniflora*, and *P. cattleianum*; and in a preserved rural area, it was found infesting grape berries (*V. labrusca* cv Isabel). This information demonstrates that the invasion of this species is recent in the region.

In percentage terms, the fruits most infested by *Z. tuberculatus* were *B. capitata* (69.7%), *V. labrusca* L. (25.5%), and *P. cattleianum* (7.5%). The highest infestation rates related to the number of emerged flies per biomass were found in *B. capitata* (383 adults per kg), *V. labrusca* (429 adults per kg), and *P. cattleianum* (429 adults per kg) (Table 1).

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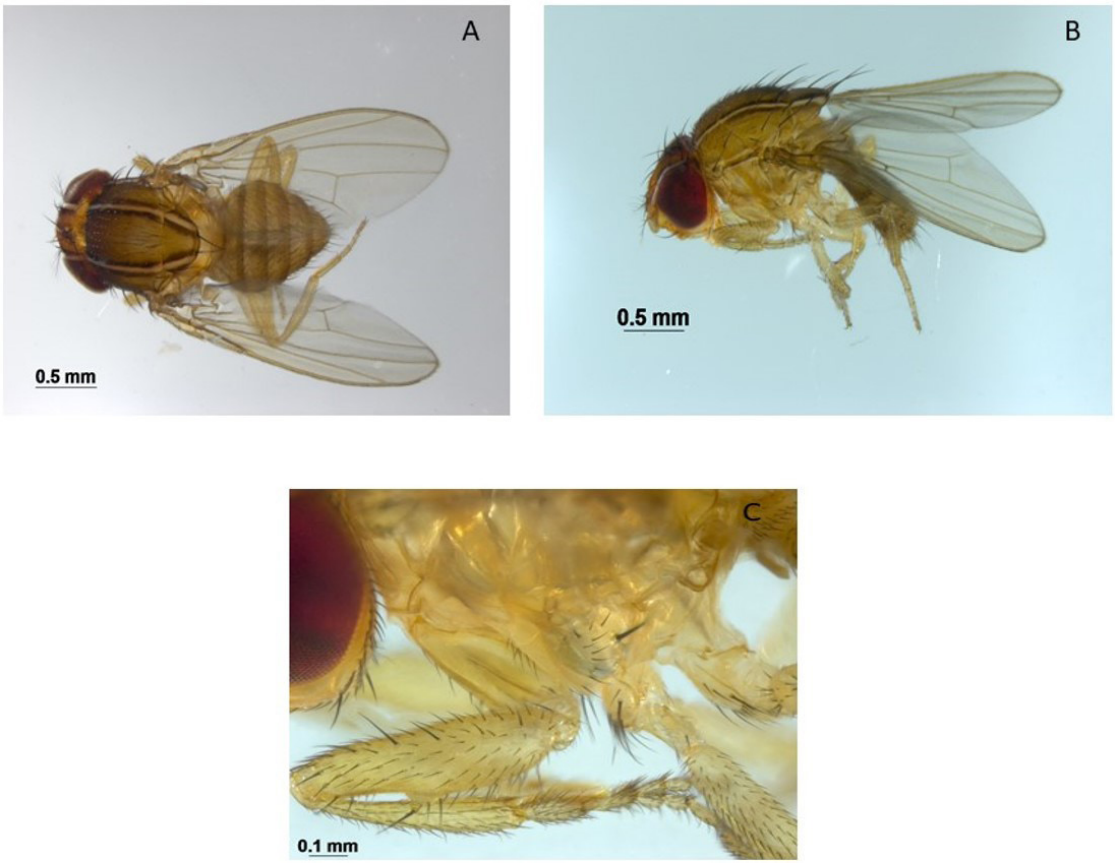


**Figure 1.** Dorsal view of adult *Zaprionus tuberculatus* (A); Lateral view of adult *Zaprionus tuberculatus* (B) and characteristic tubercle of the species on the first pair of legs (C).

**Table 1.** Plants sampled with their respective number of fruits sampled (n), weight, abundance of *Zaprionus tuberculatus* average number of *Z. tuberculatus* specimens per fruit, and average number of flies *Z. tuberculatus* per kg.

| Hosts plants | n | Weight | Abundance | Flies per fruit | Flies per kg |
|---|---|---|---|---|---|
| *Butia capitata* (Mart.) Becc., 1916 (Arecaceae) | 99 | 572.06 | 219 | 3.17 | 383 |
| *Eugenia uniflora* L., 1753 (Myrtaceae) | 50 | * | 4* | * | * |
| *Psidium cattleianum* Sabine, 1821 (Myrtaceae) | 94 | 23.31 | 10 | 1.42 | 429 |
| *Vitis labrusca* L. cv Isabel (Vitaceae) | 47 | 32.61 | 14 | 1.16 | 429 |
| Total | 290 | 627.98 | 247 | 5.75 | 416 |

*Values not quantified.

The number of host plants for *Z. tuberculatus* must be greater than that reported in the literature (EPPO, 2023) because the insects have been detected using traps in most published works, which makes it impossible to accurately associate with the hosts. The four host plants recorded in this work are new world records. Therefore, we suggest that the methodology used in our work should be used in future research aiming at the proper association of *Z. tuberculatus* with its hosts.

This record represents the southernmost occurrence of *Z. tuberculatus* in the Americas, given that the closest point is 1421 km away, which is fundamental for the construction of future studies of population dispersion, and models of potential and niche distribution and to serve as a subsidy for future pest management programs.

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