

Scientific Note

First record of *Glycaspis brimblecombei* (Moore, 1964) and *Blastopsylla occidentalis* (Taylor, 1985) (Hemiptera, Aphalaridae) in eucalyptus plantations in State of Pará, Brazil

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Abstract. The monoculture of eucalyptus species shows great expansion in the state of Pará, Brazil, so the culture presents high propensity to be a host species of both native and exotic entomological fauna. Commercial plantations of eucalyptus were monitored in a monthly basis from January 2015 to December 2016 through yellow sticky traps that were replaced in each observation. These traps were installed in the municipalities of Paragominas, Ulianópolis, Dom Eliseu, and Rondon do Pará, southeastern Pará, Brazil. The species *Glycaspis brimblecombei* (Moore, 1964) and *Blastopsylla occidentalis* (Taylor, 1985) were observed in all municipalities sampled, which becomes the first record of these species in the Brazilian Amazonian state of Pará. Therefore, these species have now their geographical distribution expanded in the Brazilian Amazon.

Keywords: Occurrence, yellow sticky traps, insect pest, Brazilian Amazon.

Planted forests respond for 91% of the timber produced and 6.2% of the total Brazilian GDP. The eucalyptus monoculture had a great increase in planted areas in Brazil due to favorable climatic and ecological conditions (Santana 2005). Such plantations are susceptible to exotic and native insect pests (Wilcken et al. 2003, Santana 2005) that can result in productivity reduction, with consequent economic losses.

Psyllids are small insects similar to tiny sharpshooters with sucking habit feeding on sap, especially from young plants. The most frequent damages caused by psyllids are shoot plants drying, leaves deformation and reduction, winding, leaf blade deformation, and induction to the sooty mold. These damages cause a decrease in plant photosynthetic area and consequently the plants' growth (Santana 2005, Penteado et al. 2014). *Glycaspis brimblecombei* (Moore, 1964) and *Blastopsylla occidentalis* (Taylor, 1985) (Hemiptera: Aphalaridae) are found in eucalyptus in several countries, including Brazil (Santana 2005).

G. brimblecombei (red gum lerp psyllid) was firstly introduced in the Americas, followed by Europe, Africa, and Asia (Tab. 1). In Brazil, its introduction was firstly recorded in southeast, municipality of Mogi Guaçu, São Paulo state, in June 2003 attacking eucalyptus trees (Wilcken et al. 2003, Santana 2005). Later the species was recorded in regions of the country, that today sums a total of 13 states, including the insect's first occurrence in Pará, as recorded in this study (Fig. 1) (Burckhardt & Queiroz 2012, Silva et al. 2013, Mazzardo et al. 2017). Adults of *G. brimblecombei* are 2.5-3.1 mm in length, present projections from the head back side, and females are bigger than males (Paine et al. 2006). Their color varies from yellow, light-yellow to greenish yellow with small brown, black, or reddish spots over the body. Females can lay 45-700 eggs on lines, clusters, or isolated (Santana 2005). Eggs present elliptic shape being white at the beginning and yellow to bright orange when close to hatching (Firmino-Winckler et al. 2009). Immature individuals, known as nymphs, have five instars. They have yellow to orange and flat body through the back-venter direction, and secrete liquid white feces that originate the shell that shelters the

insect during its adult stage. *G. brimblecombei* life-cycle lasts 25-45 days, depending on the environmental temperature (Wilcken et al. 2003, Santana 2005). The insect is highly specific with its hosts, being restricted to one or a few closely related plant species (Burckhardt et al. 2014). *Eucalyptus urophylla*, *Eucalyptus microtheca*, *Eucalyptus rudis*, *Eucalyptus gomphocephala*, *Eucalyptus oleosa*, *Eucalyptus camaldulensis*, *Eucalyptus platypus*, *Eucalyptus forrestiana*, *Eucalyptus microneura*, *Eucalyptus nicholii*, *Eucalyptus spathulata*, *Eucalyptus globulus*, *Eucalyptus viminalis*, and hybrids of *Eucalyptus grandis* x *E. urophylla* are some of its hosts (Brennan et al. 1999, Santana 2008, Penteado et al. 2014, Queiroz et al. 2018).

B. occidentalis (eucalyptus shoot psyllid) had its first record in New Zealand in 1985 (Taylor 1985) followed by countries in the Americas, Asia, and Europe (Tab. 1). The insect pest had its first record in Brazil in 1999 and now is spread over 12 states including Pará, with the insect's first occurrence in the state recorded in this study (Fig. 1) (Santana 2008, Burckhardt & Queiroz 2012, Penteado et al. 2014). *B. occidentalis* is a small sucking insect with phytophagous habits, resembling a cicada. Males are yellow with 1.71-2.13 mm in length while females are darker with 2.02-2.40 mm in length. The species has short antennas, yellow thorax, and its head is as wide as its thorax. Immature individuals present five instars. In the last stage they are yellow, having the tips of their antennas a dark brown color. Females lay eggs near the apexes and leaf axils, small twigs, and young leaves (Santana 2008, Penteado et al. 2014). Attacks of *B. occidentalis* cause earlier leaves falling, super-budding and, in high infestations, death of apex twigs, branches, and even the individual. They secrete a high amount of honeydew and wax in the form of white cottony filaments, which favor the occurrence of fungi on the hosts. The attacked individuals present numerous nymphs and adults in apexes and in leaves, mainly over young trees. Besides this, nymphs secrete a kind of white fluff that can cover apexes and leaves of eucalyptus trees. Attacked shoots wither away, become twisted and deformed, shifting to a greyish-blackish color (Meza Durán & Baldini Urrutia 2001, Santana 2005).

Table 1. Country and year of the first occurrence of the insect pests *Glycaspis brimblecombei* and *Blastopsylla occidentalis* worldwide.

| First occurrence of <i>Glycaspis brimblecombei</i> | | First occurrence of <i>Blastopsylla occidentalis</i> | |
|--|------|--|------|
| Country | Year | Country | Year |
| USA | 1999 | New Zealand | 1985 |
| Chile | 2002 | Mexico | 1989 |
| Mexico | 2003 | Brazil | 1999 |
| Australia | 2004 | Chile | 1999 |
| Argentina | 2007 | China | 2004 |
| Ecuador | 2007 | Argentina | 2005 |
| Peru | 2008 | Italy | 2006 |
| Venezuela | 2008 | Turkey | 2007 |
| Portugal | 2009 | Portugal | 2011 |
| Spain | 2010 | Spain | 2011 |
| Italy | 2010 | USA | 2014 |
| Madagascar | 2011 | Uruguay | 2014 |
| Marocco | 2011 | Israel | 2015 |
| France | 2012 | Indonesia | 2018 |
| Montenegro | 2013 | Philippines | 2018 |
| Algeria | 2013 | Yemen | 2018 |
| Greece | 2013 | | |
| Tunisia | 2014 | | |
| Israel | 2015 | | |
| Turkey | 2015 | | |
| Zambia | 2017 | | |

Ulianópolis (03°58'26.50"S; 47°33'01.96"W), Dom Eliseu (04°30'02.73"S; 47°49'31.50"W), and Rondon do Pará (04°36'32.91"S; 47°57'18.51"W) (Fig. 1). Seven yellow sticky traps (ISCA Technologies, Brazil) were installed in 32 georeferenced points. Traps were always placed between two eucalyptus trees at 1.60 m from the ground and at 100 m away from the main road in order to avoid edge effects. Such method, the target-insects catch, was chosen due to the wide eucalyptus plantations in all selected municipalities, easy handling, logistics, and the high efficiency of these traps to capture the species approached in this study (Santana 2005, Ferreira Filho et al. 2008, Silva et al. 2013). According to the Köppen classification, the study areas' climate is Aw, rainy tropical with a clearly defined dry season with average temperature of 26.7 °C.

Traps were screened and analyzed through a stereoscopic microscopy QM Q7714Z in an entomology laboratory at Universidade Federal Rural da Amazônia, in Belém (Pará State, Brazil) where specimens were labeled for further identification. The specimens were identified by Dr. Daniel Burckhardt, of the Museum of Natural History, Switzerland, according to the classification and nomenclature of Psylloidea described by Burckhardt & Ouvrard (2012) and Burckhardt & Queiroz (2012). Voucher specimens were deposited in the entomological collection of Embrapa Amazônia Oriental in Belém, under number 2445 for *G. brimblecombei* and 2446 for *B. occidentalis*.

A total of 1,630 individuals of the superfamily Psylloidea were collected during the two years in 100 traps. *G. brimblecombei* was represented by 126 individuals (101 – 80.16% collected in 2015 and 25 – 19.84% in 2016) and *B. occidentalis* had 978 individuals (483 – 49.39% collected in 2015 and 495 – 50.61% in 2016). These data will be used for further population studies. The two species can be dispersed by wind or transportation of the infested host plants (Hodkinson 1991). Their rapid dispersion can be associated to their efficient colonization features (Queiroz et al. 2013).

Probably *G. brimblecombei* and *B. occidentalis* had already dispersed to other municipalities of Pará with eucalyptus plantations, since they were present in all four municipalities sampled in 2015 and 2016. Moreover, the two species can also be occurring in the States close to Pará like Maranhão State (Fig. 1). However, the official record of these species in Maranhão still depends on further collections and detailed studies. In this way, we suggest that new areas are included for surveys and monitoring of psyllids and their natural enemies, adopting specific methodologies for that.

Authors' Contribution

All authors of this article had relevant contribution, that consisted in Project coordination (AML), field work (AML/ ILS), data analysis (ILS/ TFB), manuscript preparation (AML/ ILS/ TFB/ GS/ DLQ), and manuscript review and translation (GS/ DLQ).

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Brazilian states with occurrence of *Glycaspis brimblecombei* and *Blastopsylla occidentalis*

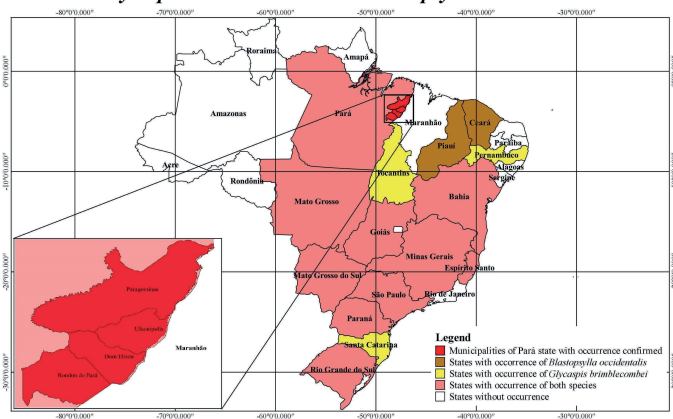


Figure 1. Distribution of *Glycaspis brimblecombei* and *Blastopsylla occidentalis* in Brazil showing in yellow the states with occurrences of *G. brimblecombei*, in brown the states with occurrences of *B. occidentalis*, and in pink the states with occurrences of both insect pests. The municipalities in Pará state where the two species were first recorded (this study) are indicated in red. States with no records of these species are indicated in white.

Even though the literature about *B. occidentalis* is still limited, mostly regarding to its control, techniques on ecological pest management can be used to prevent its dissemination. Santana (2008) observed that natural enemies of *Ctenarytaina spatulata* (Taylor, 1971) also prey on *B. occidentalis*. The objective of this study was to report the first occurrence of *G. brimblecombei* and *B. occidentalis* in plantations of *Eucalyptus* spp. in Pará state and to increase information about these insect pests geographical distribution in Brazil.

The two species monitoring was carried out from January 2015 to December 2016 by the use of monthly collections in four municipalities in southeast Pará: Paragominas (03°20'07.08"S; 47°11'21.54"W),

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