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CERAMBYCIDAE ASSOCIATED WITH HYBRID EUCALYPTUS UROGRANDIS AND NATIVE VEGETATION IN CARBONITA, MINAS GERAIS STATE, BRAZIL

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ABSTRACT

Wood-borers of exotic and native trees are important pests of eucalyptus in many regions of the world. The feeding behavior of these insects causes losses in wood production. The aim of this study was to identify Cerambycidae beetles inhabiting plantations of clonal hybrid (*Eucalyptus grandis* × *E. urophylla* hybrid; Myrtales: Myrtaceae) and native cerrado vegetation in order to improve knowledge about potential wood-borers in these habitats. The insects were collected weekly using baited traps located within eucalyptus stands and in the cerrado vegetation. In total, 3,377 individuals belonging to 13 cerambycid species were caught. The potential wood-borers species in eucalyptus managed plantations should to be monitored during the rainy period.

Key Words: beetles, diversity, eucalyptus, forest insects, survey

RESUMO

Besouros broqueadores exóticos e nativos de espécies florestais são pragas importantes do eucalipto em várias regiões do mundo. O hábito alimentar destes insetos causa perdas na produção de madeira. O objetivo deste estudo foi identificar espécies de Cerambycidae em plantio de híbrido clonal (*Eucalyptus grandis* × *E. urophylla* hybrid; Myrtales: Myrtaceae) e em área de Cerrado nativo para se identificar broqueadores dessas plantas. Os insetos foram coletados, semanalmente, com armadilhas iscadas em talhões de eucalipto e na área de Cerrado nativo. Um total de 3.377 indivíduos de 13 espécies de cerambicídeos foi coletada. Besouros broqueadores em plantios de eucalipto devem ser monitorados, especialmente, em períodos chuvosos.

Palavras Chave: besouros, diversidade, eucalipto, insetos florestais, levantamento

There are approximately 30,000 described species of the Cerambycidae (Monné et al. 2002), many of which are important in terrestrial ecosystems, particularly in the wood biodeterioration (Costello et al. 2011). Adult cerambycids do not usually damage the trees directly, but feed instead on sugary substances such as nectar and fruit juices (Linsley 1959). However, females of the genus *Oncideres* (Cerambycinae: Onciderini) make holes in the branches and twigs of host trees in which they lay eggs (Di Iorio 1994; Paulino Neto et al. 2006).

Damage by cerambycid larvae varies according to the beetle species, but they are commonly represented by galleries in the subcortical region surrounding the trunk or expanded elliptical galleries within the wood (Monné et al. 2002). Larvae of most cerambycids develop in live and decaying trees, in those with advanced wilting, or in trees just harvested (Hanks 1999; Silva Neto et al. 2011).

Cerambycid beetles are important pests and cause damage, especially to perennials, such as fruit and forest species; as such plants provide ideal bioecological conditions for long-lived insects. Cerambycids also damage fruit orchards (Canettieri & Garcia 2000), eucalyptus (Myrtales: Myrtaceae) (Andrade 1961), black wattle (*Acacia*

spp.; Fabales: Fabaceae) (Amante et al. 1976), mate (*Ilex paraguariensis* A. St. Hil.; Aquifoliales: Aquifoliaceae) (Galileo et al. 1993) and rubber (*Hevea brasiliensis* Müll. Arg.; Malpighiales: Euphorbiaceae) (Dall'Oglio & Peres Filho 1997) trees with losses reaching 60% for sawmill logs (Abreu et al. 2002).

Increasing damage by Cerambycidae is being reported in forest systems. Therefore, it is becoming more important to identify species of this family that have the potential to reach pest status and to develop management strategies to control them (Paine & Millar 2002; Grebennikov et al. 2010).

Plants of eucalyptus hybrid (*Eucalyptus urophylla* × *Eucalyptus grandis*) showed signs of damage caused by cerambycids in Carbonita, Minas Gerais State, Brazil. These observations led us to survey and identify species of this beetle family in eucalyptus and in nearby native cerrado vegetation.

Materials and Methods

Cerambycids were collected from a hybrid eucalyptus plantation and from native cerrado in the municipality of Carbonita, Minas Gerais State, Brazil (S 17° 31' 37" W 43° 0' 57") from Feb to Apr 2005.

Samples were taken weekly from 67 traps made of 2-L PET (polyethylene terephthalate) bottles with, approximately 2-cm diam holes located in the middle of the bottle, and baited with a 10% honey solution without any preservative or toxic chemical. The traps were randomly distributed throughout each study area and were installed 1 m above the ground on eucalyptus or on native plants. Thus 19 traps were installed in 140 ha of cerrado and 48 traps were installed in 74 ha of 8 *Eucalyptus urograndis* stands. The insects were removed from the traps weekly and the honey solution replaced. The insects were sent to the Laboratory of Forest Entomology at the Federal University of Lavras (UFLA) in Lavras, Minas Gerais State, Brazil, where they were sorted and counted. An individual of each morphospecies was sent to Dr. Ubirajara Ribeiro de Souza Martins of the Museum of Zoology of the University of São Paulo (MZUSP) for identification. Voucher specimens were deposited in the collection of the Entomology Department of UFLA.

Temperature, relative humidity and rainfall data were obtained from the Arcelor Mittal Forest Meteorological Station in Carbonita, Minas Gerais State, Brazil. This enabled us to evaluate the influence of these factors on the cerambycid population. These data were correlated with the number of insects collected (Pearson's r, $P < 0.05$).

Results

A total of 3,377 individuals of 13 cerambycid species (Table 1) was collected over the study period, with an average of 50.4 insects per trap. *Coleoxestia vittata* (Thomson) was the most abundant species, with 75.9% of the total specimens collected, followed by *Retrachydes thoracicus* (Olivier) (11.1%), *Chydarteres striatus* (Fabricius) (4.1%), *Oxymerus basalis* (Dalman) (3.5%), *Oxymerus aculeatus* Dupont (3.0%) and *Sphallotrichus setosus* (Germar) (1.1%), and with the others having frequencies of < 1% (Table 1).

The number of cerambycid individuals collected did not correlate with the weekly average temperature (22.0-24.4 °C) or RH (67.7-84.9%) (r = 0.0167, P =0.9635; r = 0.5389, P = 0.1079, respectively). However, the abundance of the 13 cerambycid species was correlated with the average weekly rainfall (r = 0.6554, P = 0.0396) with higher number of individuals recorded after periods of increased rainfall (Fig. 1). Both the number of cerambycids and the quantity of rainfall increased progressively during the first 4 weeks of the study. In subsequent weeks the amounts of rainfall progressively decreased and initially the number of cerambycid declined sharply, and then oscillated while trending toward a low level (Fig. 1). The peak number of cerambycids captured coincided with the maximum rainfall during the time period analyzed (Fig. 1).

Discussion

The species caught can be considered partially representative of the local cerambycid diversity attracted by the fermenting honey solution. This is so because the trap type, the bait used and the trap position in the vertical strata, can more strongly attract some cerambycid species than others (Dodds et al. 2010; Graham & Poland 2012). Monoculture forest plantations are known to affect community structure, such as abundance, but not species richness (Taki et al. 2010). However, the diversity of this group might be greater in native vegetation than in the mosaic of native and planted forests (Yamaura et al. 2011).

Of the 13 species collected in the eucalyptus plantations and in the native cerrado, 10 had been reported on Myrtaceae plants and eight on *Eucalyptus* spp. (Table 1). *Chlorida festiva* (Linnaeus), *C. striatus*, *Dorcadocerus barbatus* (Olivier), *Phoracantha recurva* Newman and *R. thoracicus* (Olivier) had been previously reported in *Eucalyptus* spp. plantations and captured in light and ethanol traps in Rio Grande do Sul State, Brazil (Bernardi et al. 2010). All of these species, with the exception of *C. festiva*, bore into dry *Eucalyptus* spp. wood (Berti Filho 1997). In addition, *C. striatus* and *R. thoracicus* had been previously collected in trap logs in *Eucalyptus globulus* La-

TABLE 1. NUMBER OF INDIVIDUALS (NO.), FREQUENCY (FREQ.%) AND KNOWN MYRTACEAE HOST OF CERAMBYCIDAE SPECIES COLLECTED WITH TRAPS IN EUCALYPTUS PLANTATIONS AND IN THE ADJACENT NATIVE CERRADO VEGETATION. FEB TO APR 2005 IN CARBONITA MUNICIPALITY, MINAS GERAIS STATE, BRAZIL.

Species	No.	Freq.	Host
Coleoxestia vittata (Thomson, 1860)	2,563	75.9%	*Psidium guajava*
Retrachydes thoracicus (Olivier, 1790)	375	11.1%	*Eucalyptus* spp.
Chydarteres striatus (Fabricius, 1787)	138	4.1%	*Eucalyptus* spp.
Oxymerus basalis (Dalman, 1823)	118	3.5%	*Eucalyptus* spp.
Oxymerus aculeatus Dupont, 1838	101	3.0%	*Eucalyptus* spp.
Sphallotrichus setosus (Germar, 1824)	37	1.1%	*Psidium guajava*
Phoracantha recurva Newman, 1840	17	0.5%	*Eucalyptus* spp.
Chlorida festiva (Linnaeus, 1758)	13	0.4%	*Eucalyptus* spp.
Dorcadocerus barbatus (Olivier, 1790)	4	0.1%	*Eucalyptus* spp.
Chydarteres dimidiatus (Fabricius, 1787)	3	< 0.1%	*Eucalyptus* spp.
Eurysthea lacordairei (Lacordaire, 1869)	3	< 0.1%	Unknown
Juiaparus batus lacordairei (Gahan, 1892)	3	< 0.1%	Unknown
Pteracantha agrestis Monné & Monné, 2002	2	< 0.1%	Unknown
Total	3,377	100.0	—
Average/trap during Feb to Apr 2005	50.4	—	—

bill. and *E. grandis* plantations in Uruguay (Monné et al. 2002). Thirty-three cerambycid species have been recorded in logs of *Eucalyptus* spp., including *Chydarteres dimidiatus* (Fabricius), *C. striatus* and *R. thoracicus* (Berti Filho 1997). *Chydarteres striatus* is known to damage branches of *Schinus terebinthifolius* (Sapindales: Anacardiaceae) (Graf & Marzagão 1999) and *R. thoracicus* has been reported in *Corymbia citriodora* (Hook.) K. D. Hill & L. A. S. Johnson (Myrtales: Myrtaceae), *Eucalyptus tereticornis* Sm., *Eucalyptus viminalis* Labill., and twigs and branches of *Eucalyptus* spp. (Moraes & Berti Filho 1974). The diversity of Cerambycidae can differ between regions, as *C. festiva*, *D. barbatus*, *Oxymerus* sp. and other cerambycids not recorded in this study

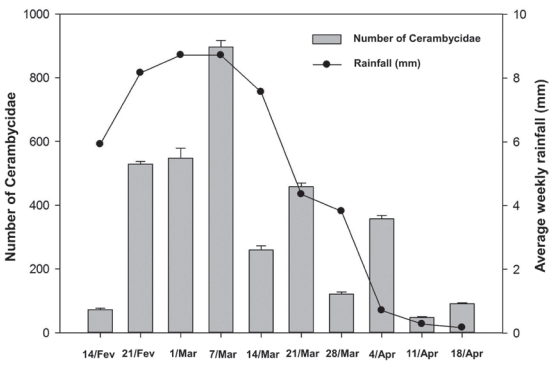

Fig. 1. Average weekly rainfall (mm) and number of cerambycid beetles collected with traps in the eucalyptus plantations and in the adjacent native cerrado vegetation from Feb to Apr 2005 in Carbonita municipality, Minas Gerais State, Brazil.

were captured using light and ethanol traps in eucalyptus plantations in the municipalities of São Mateus and Aracruz in Espirito Santo State, Brazil (Zanuncio et al. 1993). *Oxymerus basalis* (Dalman) has the potential to damage corn (*Zea mays* subsp. *mays* L.; Poales: Poaceae) plants (Pires et al. 2011), and has also been recorded as killing plants in a 200 ha *E. urograndis* plantation (Zanuncio et al. 2009).

The small number of *P. recurva* individuals recorded by the current study does not reflect the importance of this species, which is an exotic eucalyptus wood-borer pest in many countries (Wang & Thornthon 1999). Only a small number of *P. recurva* were captured probably because *Phoracantha* spp. are more efficiently collected by sticky traps on ring-barked trees (Seaton 2012) than with the honey solution-baited traps used in this study. In Brazil, this pest has been found in *C. citriodora* logs in São Paulo (Wilcken et al. 2002) and in *E. urophylla* in Minas Gerais State (Santos et al. 2007).

Coleoxestia vittata, *Eurysthea lacordairei* (Lacordaire), *Juiaparus batus lacordairei* (Gahan), *Pteracantha agrestis* Monné & Monné and *S. setosus* have not been previously reported as associated with the *Eucalyptus* genus, and they may infest long-dead trees or wind fallen branches. *Coleoxestia vittata*, similar to most of the species collected, is known to injure *Psidium guajava* (Monné 2004). *Chlorida festiva* and *D. barbatus* are also known to have various species of Myrtaceae among their native hosts (Monné 2004), as well as being adapted to *Eucalyptus* spp. *Sphallotrichus setosus* is a wood-borer of *P. guajava*, *Cajanus indicus* (L.) Millsp. (Fabales: Fabaceae) and *Annona* sp. trunks (Costa Lima 1955).

Juiaparus batus lacordairei is a species that is polyphagous on *Schinopsis balansae* (Anacardiaceae), *Aspidosperma* sp. (Apocynaceae), *Piptadenia* sp. and *Prosopis* sp. (Mimosaceae) (Monné 2004). Native host plants of *E. lacordairei* and *P. agrestis* are not yet known.

The correlation with environmental variables is related to abundance of adult Cerambycidae, because the quantity of rainfall does not limit local species richness. Indeed local species richness is more dependent on food availability (Baselga 2008) and the intensity of plantation management (Mueller et al. 2008). However, this can vary with the species, as the emergence of *C. striatus*, *O. aculeatus* and *R. thoracicus* was positively correlated with rainfall in *Citrus* spp. (Garcia 1987) and in the case of *D. barbatus* in a *Myrciaria cauliflora* orchard (Garcia et al. 1992). By contrast, populations of *C. dimidiatus* peaked during the dry season (Fernandes et al. 2010). The abundance of *P. recurva* was not found to be correlated with environmental variables in either desert or temperate regions (Bybee et al. 2004).

The population peak of cerambycid species in periods of higher rainfall found in this and other studies (Paz et al. 2008) indicates that monitoring programs for species of this family with the potential to reach pest status should be concentrated in the rainy season, i.e., when their adult emergence is at its highest (Linsley 1959). Monitoring should also be done in different growth stages of the plantation, because the diversity of Cerambycidae increases in monocultures over longer periods of time (Ohsawa & Shimokawa 2011). These results suggest that the approach proposed can be useful as a rapid protocol for cerambycid sampling in eucalyptus plantations.

Conclusions

Individuals of 13 cerambycid species were collected in a eucalyptus plantation and in the adjacent native cerrado vegetation in Minas Gerais State, Brazil. Eight of these species have been reported as causing damage to eucalyptus and/or other Myrtaceae plant species in other regions. The peak number of cerambycids captured coincided with the maximum rainfall during the time period analyzed.

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