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First record of *Chalcodermus bicolor* (Coleoptera: Curculionidae) enemies in South America

P. Emilio Cedeño^{1,2,*}, N. Anjos¹, and V. A. Costa³

Weevils (Coleoptera: Curculionidae) are an ecologically and economically important group of eucalypt pests, and outbreaks have increased in the recent years, mainly of species in the subfamily Molitinae (Garlet et al. 2011; Souza 2011; Cedeño & Flowers 2012; Sweeney et al. 2012; Mafia et al. 2013). Damage by Molitinae weevils in general includes defoliation and chewing holes and pruning the apical sprout and lateral branches, which affects tree growth and wood quality.

The Brazilian eucalypt pruner, *Chalcodermus bicolor* Fiedler (Coleoptera: Curculionidae), causes high levels of damage to the Brazilian eucalypt plantations (Souza et al. 2011). After the female has cut through main and lateral tree sprouts, further damage is caused when the female oviposits in the branch tips.

Chemical insecticide treatment is required to control this species, but pesticides cannot be used by eucalypt producers because many forest enterprises are certified by international forest regulations (e.g., Forest Stewardship Council), which restrict pesticide use. The aim of this work was to find natural enemies affecting *C. bicolor* immature stages.

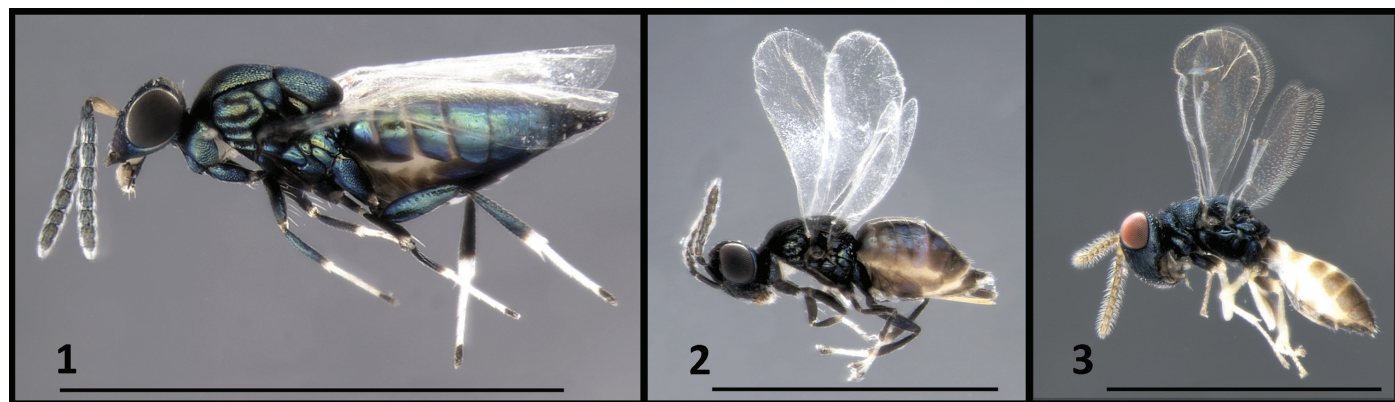
This study was carried out in Mucuri County, in the southern region of Bahia State, Brazil. To survey for natural enemies of the eucalypt pruner, we collected 440 tips from hybrid *Eucalyptus urophylla* × *E. grandis* (Myrtaceae) trees that had been pruned by the weevils. Samples from the approximately 1 ha site were collected in 2011 on 24 Feb, 4 Mar, and 19 Mar. In the laboratory, branch tips were stored in 18 cm Petri dishes until parasitoids emerged, which were collected daily and stored in 70% ethanol. Specimens were identified by V. A. Costa.

Photos were taken using a Leica M165C stereomicroscope equipped with a Leica DFC420 camera and the Leica Application Suite software.

We obtained 257 adult parasitoids from the collected tips. Among these insects, we could identify 3 morphospecies in the genus *Euderus* Haliday (Hymenoptera: Eulophidae) (Figs. 1 and 2); these morphospecies represented 98.4% ($n = 253$) of all parasitoids that emerged. Four specimens were identified as *Eurydinoteloides* sp. Girault (Hymenoptera: Pteromalidae) (Fig. 3). Specimens were deposited in the Biological Institute Museum, São Paulo County, São Paulo State, Brazil. Percentage of adult parasitoid emergence from the sampled branch tips were: 63.2% ($n = 120$; 24 Feb), 57.0% ($n = 87$; 4 Mar), and 50.0% ($n = 50$; 19 Mar), which suggests an estimate of the natural parasitism level in *C. bicolor* populations of 56.7%, mainly caused by the 3 *Euderus* species.

Previous reports of *Euderus* parasitism of Curculionidae species include *Cylindrocopturus eatoni* Buchanan and *Ceutorhynchus rapae* (Gyllenhal) (Yoshimoto 1971); *Ceutorhynchus obstrictus* (Marshall) (Doddall et al. 2009; Mason et al. 2011); *Cylas formicarius* (F.) (Jansson & Lecrone 1991), and *Gonipterus scutellatus* Gyllenhal (Loch 2008). Similarly, *Eurydinoteloides* species attack various Curculionidae species, including *Eutinobothrus brasiliensis* (Hambleton) (Hambleton & Sauer 1938; Monte 1944; Sauer 1946), species of *Chalcodermus* Schönherr, and 10 additional genera (Noyes 2015).

In summary, we report for the first time that 3 *Euderus* species and 1 species in the genus *Eurydinoteloides* are acting as natural enemies of *C. bicolor* in Brazilian eucalypt plantations. We suggest that *Euderus* species should be studied further as candidates for biological control



Figs. 1–3. Hymenoptera natural enemies of *Chalcodermus bicolor*. **1 and 2:** *Euderus* spp. (Eulophidae), scale bars = 1.33 mm; and **3:** *Eurydinoteloides* sp. (Pteromalidae), scale bar = 1.40 mm.

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programs against the eucalypt pruner. Mass rearing and inundative release of adults of *Euderus* may be a useful strategy against this important weevil in the Brazilian eucalypt plantations.

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Summary

Chalcodemus bicolor Fiedler (Coleoptera: Curculionidae) is the most recent pest in Brazilian *Eucalyptus* (Myrtaceae) plantations. Sampling in 2011 for parasitoids of this weevil recovered 4 Hymenoptera species, 3 in the genus *Euderus* (Eulophidae), comprising 98.4% of specimens, and *Eurydinoteloides* sp. (Pteromalidae). This is the first report of natural enemies of *C. bicolor*.

Key Words: forest entomology; eucalypt pruner; biological control; *Euderus*; *Eurydinoteloides*

Sumario

Chalcodemus bicolor Fiedler (Coleoptera: Curculionidae) es la más reciente plaga en las plantaciones de *Eucalyptus* (Myrtaceae) en Brasil. Este gorgojo poda las ramas principales y laterales de los eucaliptos para poner sus huevos. Un muestreo en 2011 evaluó la incidencia de parásitos este gorgojo. Incidencia de géneros de parásitos fueron evaluados. Se observó que 58,29% de los cortes (o ramas cortadas) contenía enemigos naturales del podador-del-eucalipto. Entre ellos, tres especies del género *Euderus* (Hymenoptera: Eulophidae) comprendido 98,46% de los parásitos; otros eran una especie del género *Eurydinoteloides* Girault (Hymenoptera: Pteromalidae). Este es el primer reporte sobre la presencia de enemigos natural de *C. bicolor*.

Palabras Clave: entomología forestal; podador de eucalipto; control biológico; *Euderus*; *Eurydinoteloides*

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