BioOne COMPLETE

The Invasive Beetle Cis bilamellatus (Coleoptera: Ciidae) Arrives in America

Authors: Lopes-Andrade, Cristiano, and Lüer, Alfredo

Source: Florida Entomologist, 97(4) : 1348-1352

Published By: Florida Entomological Society

URL: https://doi.org/10.1653/024.097.0408

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 29 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

THE INVASIVE BEETLE *CIS BILAMELLATUS* (COLEOPTERA: CIIDAE) ARRIVES IN AMERICA

CRISTIANO LOPES-ANDRADE[1,*] AND ALFREDO LÜER[2]
[1]Laboratório de Sistemática e Biologia de Coleoptera, Departamento de Biologia Animal, Universidade Federal de Viçosa (UFV), 36570-900, Viçosa, Minas Gerais, Brasil

[2]Panguilemo 261, Quilicura, Santiago, Chile

*Corresponding author; E-mail: ciidae@gmail.com

ABSTRACT

We report the invasive fungivorous beetle *Cis bilamellatus* Wood (Coleoptera: Ciidae) from Chile for the first time, a species not previously known from any American country. We provide diagnostic characteristics for the species, including those of the male abdominal terminalia, as well as information on its host fungus and the known geographical record in the country.

Key Words: Tenebrionoidea, Andean Region, biological invasion, basidiome, fungus, fungivorous beetles

RESUMEN

El fungívoro invasor *Cis bilamellatus* Wood (Coleoptera: Ciidae), una especie hasta ahora no registrada en ningún país de América, es reportado por primera vez para Chile. El trabajo entrega una descripción diagnóstica de la especie, incluyendo características externas de la terminalia del macho, e información del hongo hospedero y el registro geográfico conocido en el país.

Palabras Clave: Tenebrionoidea, Región Andina, invasión biológica, basidioma, hongos, escarabajos fungívoros

Currently, there are 10 Chilean Ciidae (Insecta: Coleoptera: Polyphaga) species described in 3 genera (Lopes-Andrade 2007, 2010): *Neoapterocis* Lopes-Andrade, with *N. chilensis* Lopes-Andrade; *Orthocis* Casey, with *O. elguetai* Lopes-Andrade; and *Cis* Latreille, with *C. andersoni* Lopes-Andrade, *C. bimaculatus* Germain, *C. campoi* Brèthes, *C. chilensis* Germain, *C. espinosai* Brèthes, *C. fernandezianus* Lesne, *C. peckorum* Lopes-Andrade and *C. rufus* Germain. These species occur in continental Chile and in the Juan Fernández archipelago, comprising parts of the Central Chilean, Subantarctic and Patagonian biogeographic subregions of the Andean region (sensu Morrone 2006).

Recent field collections in the Región de Valparaíso revealed a Ciidae species not previously reported from the country and morphologically unrelated to the known Chilean species. The species was identified as *Cis bilamellatus* Wood, an Australasian ciid recognized as an invasive species in northern Europe (Orledge et al. 2010). This paper constitutes the first report of *C. bilamellatus* from America and the first report of a non-native ciid in Chile. Here we formally report *C. bilamellatus* from Chile and provide information on its morphology, biology and distribution.

MATERIALS AND METHODS

We compared specimens from Chile to named *C. bilamellatus* from England and New Zealand, and dissected one male from each country to compare their male genitalia and pregenital segments. Photography and dissection methods used here are those explained by Oliveira & Lopes-Andrade (2013). Terms used for external morphology of ciids, including those for sclerites of male abdominal terminalia, are explained and discussed in previous works (Lopes-Andrade & Lawrence 2005, 2011; Oliveira et al. 2013). We updated host fungi names cited in this paper by consulting the online database of Index Fungorum (http://www.indexfungorum.org).

Pin label transcriptions are placed within quotations marks, with each label separated by a backslash. The number and gender of specimens bearing these labels are stated immediately before the label data.

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 29 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

We deposited voucher specimens in the following scientific collections:

CPAL—Colección Particular Alfredo Lüer, Santiago, Chile
LAPC—Cristiano Lopes-Andrade Private Collection, Viçosa, MG, Brasil
MNHC—Museo Nacional de Historia Natural, Sección Entomología, Santiago, Chile
UMCE—Instituto de Entomología, Universidad Metropolitana de Ciencias de la Educación, Santiago, Chile

Results

A total of 18 specimens of *Cis bilamellatus* (Figs. 1-7) were collected, as follows: 12 males and 6 females (CPAL 5 males and 2 females; LAPC 3 males and 2 females; MNHC 2 males and 1 female; UMCE 2 males and 1 female) labeled "Chile, Provincia de Quillota, sector Rabuco, 12 April 2013, leg. A. Lüer \ *Ganoderma australe* \ 32° 53' 46" S–71° 06' 23" W, 335 m.a.s.l.". Specimens were found in 3 basidiomes of *Ganoderma australe* (Fr.) Pat. (Polyporales: Ganodermataceae) (Fig. 8). All collected *C. bilamellatus* were dead apart from one female. A few specimens are teneral adults.

Diagnosis

Cis bilamellatus can be diagnosed as follows: Males with elongated body, subparallel-sided and subcylindrical (Figs. 1-3), length 1.5 to 1.9 mm; surface color uniform, individually varying from light to dark brown; dorsal surface covered with yellowish light brown, short, suberect bristles. Head with frontoclypeal ridge raised and produced forming a wide subquadrate lamina with rounded sides, its anterior margin slightly to strongly sinuous. Each antenna with 10 antennomeres, with approximate lengths (in mm; left antenna of a male measured from the basal to the apical antennomere) as follows: 0.07, 0.05, 0.04, 0.02, 0.02, 0.02, 0.02, 0.04, 0.05, 0.07; each antennomere of the club bearing 4 sensillifers. Eyes coarsely facetted. Pronotum convex; punctation coarse, with punctures separated by approximately a puncture-width and surface between them microreticulated; anterior edge projected forward as a raised plate, sinuous at apex and slightly curved in lateral view (Fig. 2). Scutellum triangular (Fig. 4). Elytra approximately twice as long as pronotum (not including anterior pronotal projection); surface finely rugose; punctation confused, dual and dense, consisting of shallow punctures; the smallest punctures bearing decumbent bristles and the largest ones without conspicuous seta (Fig. 4). Hind wings developed. First abdominal ventrite with a circular, margined sex patch at middle (Fig. 5, arrow). Male abdominal terminalia with subtrapezoidal, short sternite VIII (Fig. 6), its posterior angles bearing long seta; tegmen (Fig. 7, above) elongate, narrowest at the basal one-third, its lateral margins conspicuously sinuous and apical portion tapering to a narrow apex; penis (Fig. 7, below) subcylindrical, very narrow and as long as tegmen, its anterior half approximately twice as wide as posterior half. Females similar to males, but devoid of secondary sexual characteristics (frontoclypeal horn, pronotal plate and abdominal sex patch) on head, pronotum or abdomen; the prothorax is narrower at the anterior portion, its anterior edge broadly rounded and anterior angles more obtuse than those of males.

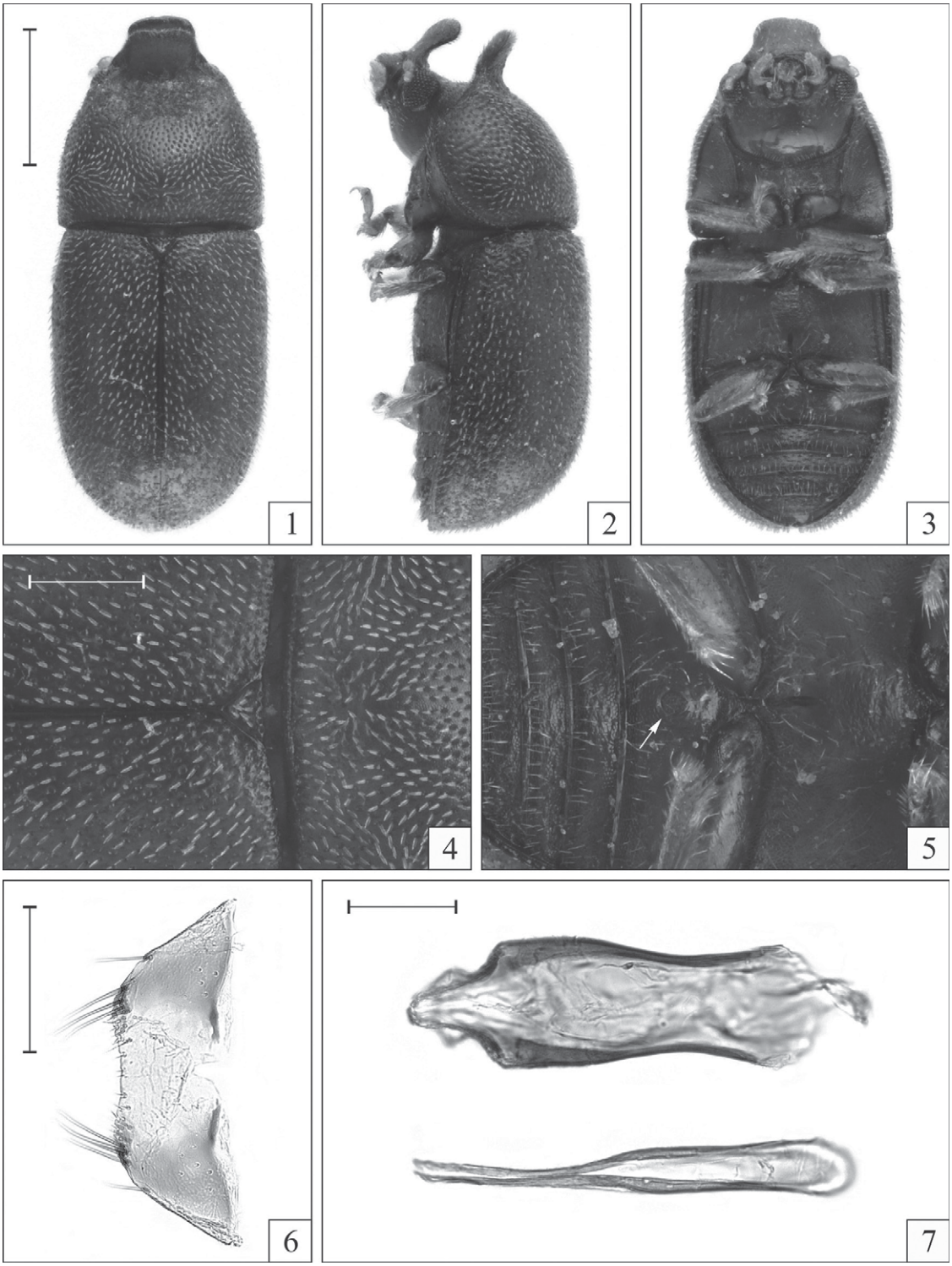
Comparative Notes

Sclerites of male abdominal terminalia are morphologically similar between specimens from Chile, England and New Zealand. Based on the morphology of male abdominal terminalia and other external morphological features, we concluded that specimens of the examined populations are conspecific. *Cis bilamellatus* differs from the morphologically similar *C. clarki* Blair, from Australia, and *C. pickeri* Lopes-Andrade et al., from South Africa, in the comparatively wider frontoclypeal lamina and confused elytral punctation. These 3 species are included in the *bilamellatus* species-group (Lopes-Andrade et al. 2009) and may constitute a clade within the genus *Cis*. In the described native Chilean species of *Cis*, males are devoid of pronotal projections (Lopes-Andrade 2010).

Discussion

In Europe, *Cis bilamellatus* is known to be polyphagous and has been found in basidiomes of *Laetiporus sulphureus* and *Piptoporus betulinus* (Fomitopsidaceae), *Ganoderma applanatum*, *G. lucidum and G. resinaceum* (Ganodermataceae), *Pseudoinonotus dryadeus* (Hymenochaetaceae), *Bjerkandera adusta* and *Irpex* sp. (Meruliaceae), *Pleurotus cornucopiae* (Pleurotaceae), *Polyporus squamosus*, *Trametes hirsuta* and *T. versicolor* (Polyporaceae) (Paviour-Smith 1968a; Whitehead 1999; Orledge et al. 2010). Occasionally, it has been found in dead wood (Paviour-Smith 1968a). In Australasia it is known that the species may exploit a wide range of hosts (Orledge et al. 2010), although there are no published data on its host fungi. The few natural enemies that are known include the parasitic hymenopterans *Cephalonomia formiciformis* Westwood (Bethylidae) and *Astichus arithmeticus* (Förster) (Eulophidae), and there is a record of a parasitic dipteran larva of *Lestodiplosis* sp. (Cecidomyiidae) (Paviour-Smith 1968a; Orledge et al. 2010). In Chile, *C. bilamel-*

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 29 Mar 2024
Terms of Use: https://bioone.org/terms-of-use



Figs. 1-7. Male *Cis bilamellatus* Wood, 1884, from Chile. 1. Dorsal view. 2. Lateral view. 3. Ventral view. 4. Dorsal view showing scutellum, and part of elytra and pronotum. 5. Ventral view showing part of abdomen with a circular sex patch at the first ventrite (arrow), part of the posterior legs and the metaventrite. 6. Sternite VIII of male. 7. Male aedeagus, showing tegmen (above) and penis (below). Basal piece not shown. Scale bars: 0.5mm (1-3), 0.2mm (4-5), 0.1mm (6) and 0.05mm (7).

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 29 Mar 2024
Terms of Use: https://bioone.org/terms-of-use





Figs. 8-9. Host fungus and distribution of *Cis bilamellatus* Wood, 1884 in Chile. 8. A basidiome of *Ganoderma australe*, used as host. 9. The single distribution record (full circle) in the country.

latus were found inside basidiomes of *Ganoderma australe* (Fig. 8) developing on live tree trunks of water oak (*Quercus nigra* L.), an introduced tree, which formed a grove located on the edge of a country road.

Cis bilamellatus is cited as being native to Australasia (Orledge et al. 2010). In the nineteenth century, it was accidently introduced into southeast England. Since its introduction, its distribution has been expanding and today includes most of England and Wales, also occurring in localities of Scotland, Ireland and northwest France (Orledge et al. 2010). In Chile (Fig. 9), the only record to date comes from a small rural area in Región de Valparaíso, Provincia de Quillota.

The range expansion of *C. bilamellatus* in northern Europe has been favored by its tolerance of both wet and dry conditions, great rate of increase, low rate of parasitoid attack and ability to breed in many different host fungi, but limited by freezing weather and low availability of basidiomes in the coldest temperate forests (Paviour-Smith 1968b, Orledge et al. 2010). Diet breadth is one of the key features of invasive ciid species, for instance observed in the invasive *C. chinensis* Lawrence in Europe and Brazil (Lopes-Andrade 2008) and *Ceracis tabellifer* Mellié in continental Africa, islands of western Indian Ocean, south and southeast Asia (Antunes-Carvalho & Lopes-Andrade 2013). It is plausible to expect that the Chilean populations of *C. bilamellatus* will retain these same characteristics. The number of males and females and observations of teneral adults shows that *C. bilamellatus* has found adequate conditions to live in Chile. The temperate climate in the majority of the country allows us to suppose that the species has all conditions for a successful establishment and expansion to the central areas, being limited by freezing weather to the east and southernmost portions of the country. The introduction pathway of *C. bilamellatus* in Chile is unknown, but it could have been favored by the presence of a highway used for transportation of commercial products passing through the rural area where it occurs.

Acknowledgments

We are grateful to Richard Honour and an anonymous reviewer for their comments and suggestions that improved this manuscript. Glenda M. Orledge and Stephen Thorpe kindly sent specimens of *Cis bilamellatus* to CLA some years ago. Financial support to CLA was provided by Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG: Universal APQ-00653-12; PPM-00026-14) and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq: PROTAX 52/2010 n° 562229/2010-8; Universal nº 479737/2012-6; research grant to CLA nº 302480/2012-9), Secretaria de Estado de Ciência, Tecnologia e Ensino Superior de Minas Gerais (SECTES-MG) and Projeto Floresta-Escola.

References Cited

Antunes-Carvalho, C., and Lopes-Andrade, C. 2013. Two invaders instead of one: the true identity of species under the name *Ceracis cucullatus* (Coleoptera: Ciidae). PLoS One 8(8): e72319.

Lopes-Andrade, C. 2007. *Neoapterocis*, a new genus of apterous Ciidae (Coleoptera: Tenebrionoidea) from Chile and Mexico. Zootaxa 1481: 35-47.

Lopes-Andrade, C. 2008. The first record of *Cis chinensis* Lawrence from Brazil, with the delimitation of the *Cis multidentatus* species-group (Coleoptera: Ciidae). Zootaxa 1755: 35-46.

Lopes-Andrade, C. 2010. Two new species of *Cis* Latreille (Coleoptera: Ciidae) from Chile. Zootaxa 2441: 53-62.

Lopes-Andrade, C., and Lawrence, J. F. 2005. *Phellinocis*, a new genus of Neotropical Ciidae (Coleoptera: Tenebrionoidea). Zootaxa 1034: 43-60.

Lopes-Andrade, C., and Lawrence, J. F. 2011. Synopsis of *Falsocis* Pic (Coleoptera, Ciidae), new species, new records and an identification key. ZooKeys 145: 59-78.

Lopes-Andrade, C., and Matushkina, N., Buder, G. and Klass, K-D. 2009. *Cis pickeri* sp. nov. (Coleop-

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 29 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

tera: Ciidae) from Southern Africa. Zootaxa 2117: 56-64.

MORRONE, J. J. 2006. Biogeographic Areas and Transition Zones of Latin America and the Caribbean Islands based on panbiogeographic and cladistics analyses of the entomofauna. Ann. Rev. .Entomol. 51: 467-494.

OLIVEIRA, E. H., AND LOPES-ANDRADE, C. 2013. Redescription of *Cis taurus* (Reitter, 1878) (Coleoptera: Ciidae). Zootaxa 3599(5): 483-489.

OLIVEIRA, E. H., LOPES-ANDRADE, C. AND LAWRENCE, J. F. 2013. Review of the Neotropical Ciidae (Insecta: Coleoptera) in the *Cis taurus* species-group. Arthropod Syst. Phylogeny 71(3): 181-210.

ORLEDGE, G. M., SMITH, P. A. AND REYNOLDS, S. E. 2010. The non-pest Australasian fungivore *Cis bilamellatus* Wood (Coleoptera: Ciidae) in northern Europe: spread dynamics, invasion success and ecological impact. Biol. Invasions 12: 515-530.

PAVIOUR-SMITH, K. 1968a. A population study of *Cis bilamellatus* Wood (Coleoptera, Ciidae). J. Anim. Ecol. 37: 205-228.

PAVIOUR-SMITH, K. 1968b. Mortality in *Cis bilamellatus* Wood (Col., Ciidae) in the severe British winter of 1962-63. Entomol. Mon. Mag. 104: 233-236.

WHITEHEAD, P. F. 1999. Observations on Ciidae (Coleoptera) with particular reference to mycophagy. Entomol. Mon. Mag. 135: 123-132.

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 29 Mar 2024
Terms of Use: https://bioone.org/terms-of-use