

## Research Article

**Review of the genus *Pacuvia* Curtis, 1844 (Coleoptera: Scarabaeidae: Melolonthinae: Diplotaxini)**Revisión del género *Pacuvia* Curtis, 1844 (Coleoptera: Scarabaeidae: Melolonthinae: Diplotaxini)Andrew B. T. Smith<sup>1\*</sup>  and Mariana A. Cherman<sup>2</sup> <sup>1</sup>Research Division, Canadian Museum of Nature, 1740 Chemin Pink, Gatineau, Quebec, J9J 3N7, Canada.<sup>2</sup>Laboratório de Sistemática e Bioecologia de Coleópteros, Departamento de Zoologia, Universidade Federal do Paraná, Caixa Postal 19020, 81531-980, Curitiba, Paraná, Brazil.

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**Abstract.** *Pacuvia* Curtis, 1844 (Coleoptera: Scarabaeidae: Melolonthinae: Diplotaxini) is taxonomically reviewed. The genus includes two species that are endemic to Chile: *Pacuvia castanea* Curtis, 1844 and *Pacuvia philippiana* Gutiérrez, 1951. An identification key is presented for the two species along with detailed distributional data. The brachyptery (flightlessness) of female *Pacuvia philippiana* Gutiérrez, 1951 is reported for the first time. Lectotypes are designated for *Pacuvia castanea* Curtis, 1844 and *Liogenys gayana* Solier, 1851 (a synonym of *P. castanea*).

**Key words:** Brachypterous; Chile; endemism; flightlessness; Scarabaeoidea; taxonomy.

**Resumen.** *Pacuvia* Curtis, 1844 (Coleoptera: Scarabaeidae: Melolonthinae: Diplotaxini) es revisado taxonómicamente. El género incluye dos especies endémicas de Chile: *Pacuvia castanea* Curtis, 1844 y *Pacuvia philippiana* Gutiérrez, 1951. Se presenta una clave de identificación para las dos especies junto con datos detallados de distribución. Se informa por primera vez del braquipterismo (no volador) de la hembra de *Pacuvia philippiana* Gutiérrez, 1951. Se designan lectotipos para *Pacuvia castanea* Curtis, 1844 y *Liogenys gayana* Solier, 1851 (sinónimo de *P. castanea*).

**Palabras clave:** Braquíptero; Chile; endemismo; no volador; Scarabaeoidea; taxonomía.

## Introduction

*Pacuvia* Curtis, 1844 (Coleoptera: Scarabaeidae: Melolonthinae: Diplotaxini) consists of two species: *Pacuvia castanea* Curtis, 1844 and *Pacuvia philippiana* Gutiérrez, 1951. The genus is endemic to Chile, occurring mainly in dry, open habitats. During the course of our research, we discovered that the females of *P. philippiana* have brachypterous wings (slightly shorter than elytra when fully extended) and are flightless. Females of *P. castanea* and males of both species have wings used to fly.

*Pacuvia* was taxonomically reviewed by Gutiérrez (1951). However, some inconsistencies in the diagnostic characters used and incomplete taxonomic and geographical data necessitates a new review. The purpose of this paper is to provide detailed taxonomic and distributional data for the genus and to provide a functional identification key for the two species.

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## Materials and Methods

**Specimens.** 304 specimens of *Pacuvia* were examined from the following collection (with curators / collections managers): AMNH—American Museum of Natural History, New York, New York, United States of America (Lee Herman); BMNH—The Natural History Museum, London, United Kingdom (Maxwell Barclay); CASC—California Academy of Sciences, San Francisco, California, United States of America (Christopher Grinter); CMNC—Canadian Museum of Nature, Ottawa, Ontario, Canada (Robert Anderson, François Génier); CMNH—Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, United States of America (Robert Davidson); CNCI—Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, Canada (Patrice Bouchard, Serge Laplante); EMEC—Essig Museum of Entomology, University of California, Berkeley, California, United States of America (Cheryl Barr, Peter Oboyski); FMNH—Field Museum of Natural History, Chicago, Illinois, United States of America (Alfred Newton, Margaret Thayer); FRFC—Francisco Ramírez F. Collection, Santiago, Chile; LEMQ—Lyman Entomological Museum, McGill University, Sainte-Anne-de-Bellevue, Québec, Canada (Stéphanie Boucher); MNHN—Muséum National d'Histoire Naturelle, Paris, France (Olivier Montreuil); MNNC—Museo Nacional de Historia Natural, Santiago, Chile (Mario Elgueta); PKLC—Paul K. Lago Collection, University, Mississippi, United States of America; UCCC—Museo de Zoología, Universidad de Concepción, Concepción, Chile; UMCE—Instituto de Entomología, Universidad Metropolitana de Ciencias de la Educación, Santiago, Chile (Patricia Estrada, Jaime Solervicens); UMRM—Enns Entomology Museum, University of Missouri, Columbia, Missouri, United States of America (Kristin Simpson, Robert Sites); UNSM—University of Nebraska State Museum, Lincoln, Nebraska, United States of America (M.J. Paulsen, Brett Ratcliffe); USNM—United States National Museum, Lincoln, Nebraska, United States of America (long-term offsite enhancement) (M.J. Paulsen, Brett Ratcliffe); VMDM—V. Manuel Diéguez Collection, Santiago, Chile.

**Designation of lectotypes.** In order to fix the concepts of these species to a single, name-bearing type, lectotypes are designated for the names *Pacuvia castanea* Curtis, 1844 and *Liogenys gayana* Solier, 1851. The original descriptions for both names were unclear as to how many specimens comprised the type series and there is a possibility that more than one species may be represented. Lectotype were selected to eliminate taxonomic uncertainty.

**Label data.** The verbatim label data is given for type specimens in quotation marks with slashes “/” to indicate a new line of text on the label. All specimens are in the Scarabs of Southern South America database with appropriate labels stating their unique database number either in the “AS26xxxx” or “SSSA300xxxx” format. Database labels for specimens with the “SSSA-” prefix also have a data matrix barcode on the label.

## Results

### Genus *Pacuvia* Curtis, 1844

*Pacuvia* Curtis 1844: 199. Type species: *Pacuvia castanea* Curtis, 1844 by monotypy.

**Diagnosis.** Length 8.5–13.0 mm (males), 8.0–12.0 mm (females); width 4.0–6.5 mm (males), 4.0–6.5 mm (females). Frons coplanar with clypeus; galea of maxillae with four teeth or less; labium longer than it is wide, anterior margin of ligula straight, distal labial palpomere globose; pronotum equal in length to the tarsomeres I, II, and III together; pronotum narrower than the base of elytra; innermost gap between elytral ridges wider than the adjacent; distance

between mesocoxae and metacoxae more than two-fold the metacoxa length; external margin of protibia barely excavated (*P. castanea*) or smooth (*P. philippiana*); medial and apical teeth of protibia oblique; protarsomere I almost equal to the protarsomere II in length; metatarsomere I less than one-half the size of metatarsomere II; metatibiae of males narrowed subapically and inner margin not produced.

**Composition.** *Pacuvia castanea* Curtis, 1844 and *P. philippiana* Gutiérrez, 1951.

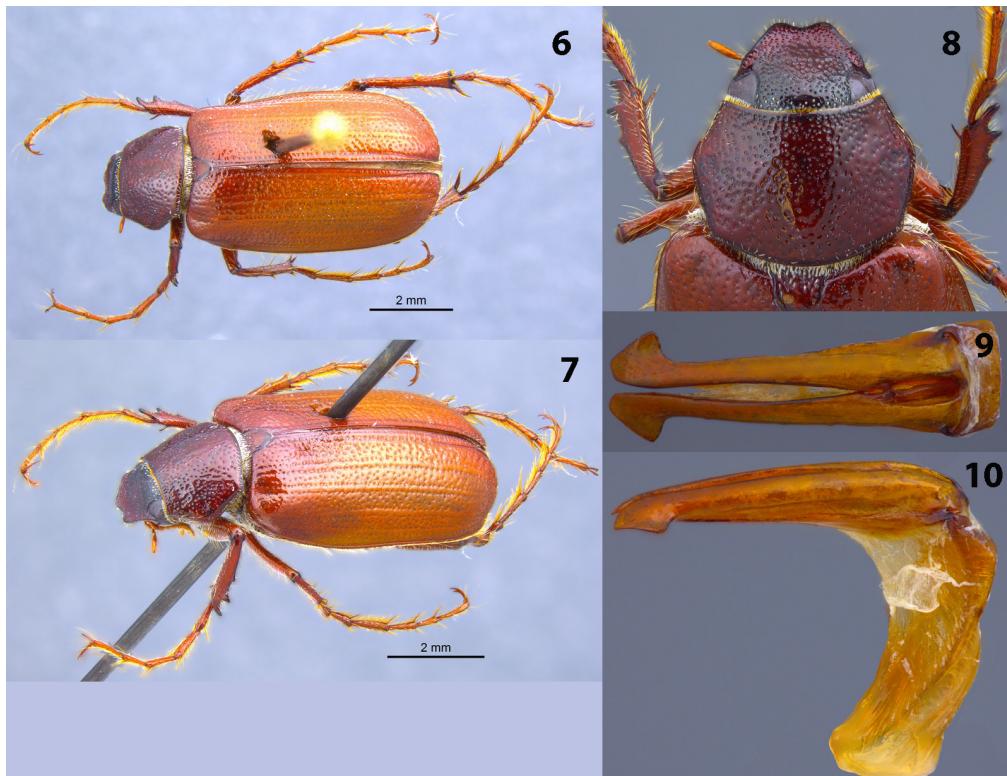
**Comments.** Both species have sexually dimorphic protarsi and mesotarsi. Males have distinctly widened and flattened protarsi and mesotarsi when viewed dorsally, females have protarsi and mesotarsi that are completely cylindrical when viewed dorsally.

#### Key to species of *Pacuvia* Curtis

1. Pronotum with smaller and denser punctures (compare Figs. 1–2, 6–7); antennae with 9–10 antennomeres; male antennal club distinctly shorter than the pedicel; females with fully developed wings, body elongate ..... *Pacuvia castanea* Curtis, 1844
- Pronotum with larger and sparser punctures (compare Figs. 1–2, 6–7); antennae with 10 antennomeres; male antennal club longer than the pedicel; females brachypterous with fully extended wings shorter than elytra, body oval ..... *Pacuvia philippiana* Gutiérrez, 1951



**Figures 1–5.** *Pacuvia castanea* Curtis, 1844. 1. Dorsal habitus. 2. Oblique habitus. 3. Head and pronotum. 4. Parameres in dorsal view. 5. Parameres and phallobase in lateral view.



**Figures 6–10.** *Pacuvia philippiana* Gutiérrez, 1951. 6. Dorsal habitus. 7. Oblique habitus. 8. Head and pronotum. 9. Parameres in dorsal view. 10. Parameres and phallobase in lateral view.

#### *Pacuvia castanea* Curtis, 1844

*Pacuvia castanea* Curtis 1844: 199. Type locality: "Valparaiso." Type series: lectotype male at BMNH labeled 1) "Type" (typeset round label with red border), "Valparaiso / 63.49" (handwritten), "Pacuvia / castanea, Curt." (handwritten), "86 Pacuvia / castanea / Curt" (handwritten), "PACUVIA / CASTANEA / CURTIS ♂ / LECTOTYPE / A.B.T. SMITH" (handwritten and typeset red label), "Southern Neotropical Scarabs / database # AS2615667 / *Pacuvia castanea* / Curtis, 1844 ♂ / DET: A.B.T.SMITH 2008" (typeset). **Lectotype here designated.**

**Synonym.** *Liogenys gayana* Solier 1851: 100. Type locality: "Santiago, Santa Rosa, Illapel, etc." Type series: lectotype male at MNHN labeled "L. Gayanus / Cat. Mus. / Chili. / M. Gay." (handwritten green label), "15 / 43" (handwritten on underside, green on upperside), "MUSEUM PARIS / Chili / Gay" (typeset and handwritten), "LIOGENYS GAYANA / SOLIER ♂ / LECTOTYPE / A.B.T. SMITH" (handwritten and typeset red label), "Southern Neotropical Scarabs / database # AS2614768 / *Pacuvia castanea* / Curtis, 1844 ♂ / DET: A.B.T.SMITH 2008" (typeset). **Lectotype here designated.**

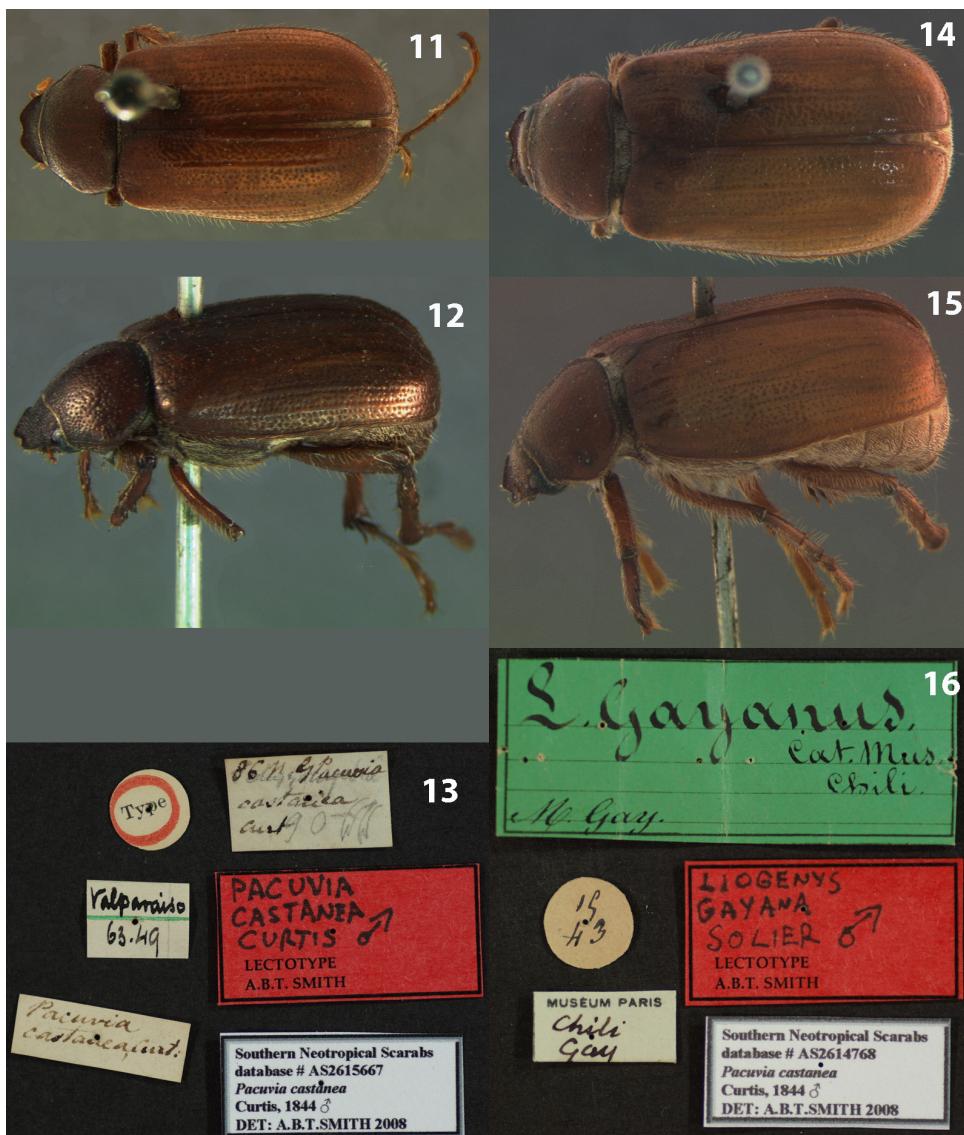
Paralectotype male at MNHN labeled "15 / 43" (handwritten on underside, green on upperside), "MUSEUM PARIS / CHILI / GAY 1843" (typeset), "Liogenys / gayanus / DET. / L. W. SAYLOR" (handwritten and typeset), "LIOGENYS GAYANA / SOLIER ♂ / PARALECTOTYPE / A.B.T. SMITH" (handwritten and typeset yellow label), "Southern Neotropical Scarabs / database # AS2614769 / *Pacuvia castanea* / Curtis, 1844 ♂ / DET: A.B.T.SMITH 2008" (typeset).

**Material examined.** Chile: **Coquimbo:** Agua Dulce, (31°33'39.32"S, 71°32'57.34"W), 22 May 1986, A. Henry — 1 male (UMCE); Canela Baja, (31°24'2"S, 71°27'16"W), 13–24 October 1961, L.E. Peña — 1 male (FMNH); Illapel-Canelillo, 20 May 2003, D. Jackson — 5 males (UMCE); Los Vilos, (31°54'42"S, 71°30'47"W), 1–31 May 1984, L.E. Peña — 2 males, 1 female (CMNC), 2 males, 1 female (LEMQ); N Pichidangui, (32°8'.89"S, 71°32'.38"W), 6–12 August 1960 — 1 male (FMNH). **Valparaíso:** Costa Pucalán, (32°45'16.68"S, 71°20'50.98"W), 5 October 1967, L.E. Peña — 1 female (CMNC); El Sauce (15 km E San Antonio), (33°36'24.84"S, 71°28'13.9"W), 1–31 May 1946, L. Peña Guzman — 9 males (FMNH); Valparaíso, (33°2'43.83"S, 71°37'12.78"W), 1 male (MNHN); Valparaíso, (33°2'43.83"S, 71°37'12.78"W), C. Darwin — 1 male (BMNH); Valparaíso, (33°2'43.83"S, 71°37'12.78"W), 1–31 October 1926 — 1 male (UMCE); Villa Alemana, (33°2'51.08"S, 71°22'22.89"W), 8 August 1970, J. Solervicens — 1 male (UMCE). **Metropolitana:** 20 km W Rungue, (33°3'43.05"S, 70°59'46.98"W), 26 November 1967, L. O'Brien, C.W. O'Brien — 1 female (EMEC); Apoquindo, (33°24'S, 70°31'59"W), 1–31 December 1979, L.E. Peña — 2 males (CMNC), 1 male (FMNH), 1 male (LEMQ); Caleu, (32°59'52.69"S, 70°58'38.68"W), 17 September 1986, M. Cerda — 1 male (UMCE); Cerro Calera, (33°39'50.4"S, 70°48'18"W), 25 June 2005, A. Vera — 17 males, 1 female (MNNC); Colina, (33°12'S, 70°40'59"W), 10 July 1979, L.E. Peña — 2 males (CMNC), 2 males (LEMQ); Colina, (33°12'S, 70°40'60"W), 10 August 1979, L.E. Peña — 27 males (LEMQ); Colina, El Portezuelo, (33°12'0.62"S, 70°40'10.16"W), 31 July 1979 — 15 males, 1 female (FMNH); Colina, El Portezuelo, (33°12'0.62"S, 70°40'10.16"W), 12 July 1985, L.E. Peña — 1 male, 1 female (CMNC), 33 males (LEMQ); El Arrayán, (33°20'33.06"S, 70°28'18.64"W), 1–30 September 1979, L.E. Peña — 6 males (LEMQ); El Canelo, (33°34'59"S, 70°27'0"W), 1–31 October 1951 — 1 male (CMNC), 1 male (FMNH); El Canelo, (33°34'59"S, 70°27'0"W), 1–31 October 1952 — 5 males (UMRM); El Canelo, (33°34'59"S, 70°27'0"W), 1–30 November 1952, L.E. Peña — 2 males (FMNH); El Canelo, (33°34'59"S, 70°27'0"W), 1 October–31 December 1978, L.E. Peña — 4 males (CMNC), 29 males (CMNH); El Manzano, (33°35'S, 70°24'W), 10 October 1993, R.D. Ward — 1 male (CMNH); El Manzano, (33°34'59.99"S, 70°24'0"W), 1–31 October 2003, Barrera Medina — 1 male (PKLC); El Portezuelo, (33°12'S, 70°40'12"W), 1–31 August 1979, L.E. Peña — 1 male (CMNC), 3 male (LEMQ); El Roble, 1900 m (32°58'33.6"S, 71°0'36"W), 1–30 November 1992, L.E. Peña — 4 male (CMNC); Lampa, (33°17'S, 70°54'0"W), Zapata — 2 male (UMCE); Las Condes, (33°22'S, 70°31'0"W), 4 May 2004, M. Guerrero — 5 male (MNNC), 1 male, 1 female (CMNC); Las Condes, (33°22'S, 70°31'0"W), 12 May 2005, M. Guerrero — 2 males (MNNC); Lo Curro, (33°22'S, 70°34'59"W), 17–18 August 1968, L. Alfaro — 1 female (CMNC); Maipu, (33°30'40.96"S, 70°48'6.24"W), 1–28 February 1906, F.V. Ibarro — 1 male (USNM); Peñalolen, Camino Las Pircas, (33°29'55.87"S, 70°31'44.69"W), 31 July 2015, V.M. Diéguez — 1 male (VMDM); Río Clarillo, (33°39'S, 70°37'60"W), 20 August–3 October 1991, J. Solervicens — 1 female (UMCE); Santiago, (33°27'S, 70°40'0"W) — 1 male (BMNH), 6 males (CASC); Santiago, (33°27'S, 70°40'0"W), 1 October–31 December 1978, L.E. Peña — 3 males (CMNH). **O'Higgins:** Los Arrayanes, NW Rangacua, 1500 m (34°3'37.86"S, 70°52'46.78"W), 1–30 November 1981, M. Marin — 1 male (FMNH). **Maule:** Linares, (35°51'S, 71°36'0"W), 1–31 December 1946 — 5 male (UMRM); Los Cipreses, (35°3'S, 70°36'0"W), 14 January 1968, L.E. Peña — 1 male (FMNH). **Ñuble:** Cordillera Ñuble, 1–28 February 1983, L.E. Peña — 1 male (CMNC), 8 males (LEMQ); **BioBío:** Concepción, (36°49'60"S, 73°3'0"W), 15 December 1962, O. Fletes — 2 males (CNCI); Contulmo, (38°0'36"S, 73°13'48"W), 9 December 1967, T. Cekalovic — 5 females, 1 male (CNCI); La Laja, (37°16'S, 72°42'0"W), 25 January 1987 — 3 females (UNSM); Penco, (36°43'60"S, 72°58'60"W), 1–31 May 1967, Fierro — 2 males, 2 females (CNCI); no data — 1 male (BMNH). **No data:** 8 males, 1 female (BMNH), 2 males (MNHN), 1 male (MNNC); Reed — 3 females (BMNH).

**Diagnosis.** Length 8.5–12.5 mm (males), 8.5–12.0 mm (females); width 4.0–6.5 mm (males), 4.5–6.5 mm (females). Antennae with 9–10 antennomeres, male and female antennal club distinctly shorter than the pedicel. Pronotum with small, dense punctures (Figs. 1–2). Males and females not brachypterous and fully extended wing longer than elytra.

**Distribution.** Chile: Coquimbo, Valparaíso, Metropolitana de Santiago, O'Higgins, Maule, Ñuble, Biobío (Fig. 17).

**Comments.** Gutiérrez (1951) stated that he only observed two specimens out of 220 that had 10 antennomeres and characterized them as aberrant. We observed a far higher percentage of specimens we examined with 10 antennomeres, so clearly the number of antennomeres in this species is variable and an unreliable diagnostic character.



**Figures 11–16.** *Pacuvia* lectotypes. 11. *Pacuvia castanea* Curtis, 1844 dorsal habitus. 12. *Pacuvia castanea* oblique habitus. 13. *Pacuvia castanea* labels. 14. *Pacuvia gayana* Solier, 1851 dorsal habitus. 15. *Pacuvia gayana* oblique habitus. 16. *Pacuvia gayana* labels.

***Pacuvia philippiana* Gutiérrez, 1951**

*Pacuvia philippiana* Gutiérrez 1951: 144. Type locality: "Coquimbo: Fray Jorge." Type series: holotype male at UCCC labeled "HOLOTYPE ♀" (typeset and handwritten orange label), "Chile.XI-47 / Fray Jorge / Coquimbo / L. Peña" (handwritten), "Pacuvia / philippiana Gut / ♀ R. Gutiérrez-Det 51" (handwritten and typeset), "Colección / R. Gutiérrez / 1958" (typeset in blue ink). Although we only have low-resolution photographs, we believe that the holotype is a male based on the elongate body form and slightly thickened protarsomeres.

**Material examined.** Chile: Atacama: Puerto Huasco, (28°28'S, 71°14'W), 30 June 1966, M.E. Irwin, Nelson Hitchins O. — 6 males (CASC). Coquimbo: 70 km N La Serena, (29°23'54.87"S, 71°10'12.05"W), 20 September 1965, L.E. Peña — 1 male (FMNH); El Divisadero, (30°50'47.88"S, 71°9'9.69"W), 31 July 1971, G. Arriagada — 1 male (CMNC); Guanaqueros, (30°10'23.48"S, 71°27'.11"W), 25–27 June 2004, J. Mondaca, M. Gálvez — 4 males (CMNC), 6 males (MNNC); Herradura a Guanaqueros, (30°6'S, 71°21'36"W), 1–3 September 1947, L.E. Peña — 2 males (FMNH); La Serena, (29°54'28"S, 71°15'15"W), 23–28 July 2004, light, V.M. Diéguez — 1 male (CMNC); Tofo, (29°26'30.85"S, 71°14'14.48"W), 30 September 1916, T. Hallinan — 1 male (AMNH); Tofo, (29°26'30.85"S, 71°14'14.48"W), 2 October 1916, T. Hallinan — 1 male (AMNH); Tofo, (29°26'30.85"S, 71°14'14.48"W), 11 June 1917, T. Hallinan — 1 male (AMNH); Tofo, (29°26'30.85"S, 71°14'14.48"W), 18 August 1917, T. Hallinan — 2 males (AMNH); Tongoy, Hacienda El Tangue, Qda. El Almendro, (30°15'7.58"S, 71°29'59.24"W), 16 August 1996, F. Ramírez — 1 female (FRFC); Tongoy, Sector Aeródromo, 50 m (30°6'5.65"S, 71°21'48.42"W), 24 September 2005, F. Ramírez — 1 female (CMNC); Vicuña, (30°2'S, 70°42'W), 1–30 November 2004, G. Castillo — 2 males (CMNC), 5 males (MNNC). No data: — 1 male (BMNH).

**Diagnosis.** Length 9.0–13.0 mm (males), 8.0–8.5 mm (females); width 4.0–6.0 mm (males), 4.0–4.5 mm (females). Antennae with 10 antennomeres, male antennal club longer than the pedicel, female antennal club much shorter than the pedicel. Pronotum with large, sparse punctures (Figs. 6–7). Males with fully extended wing longer than elytra, and females brachypterous with fully extended wings shorten than elytra.

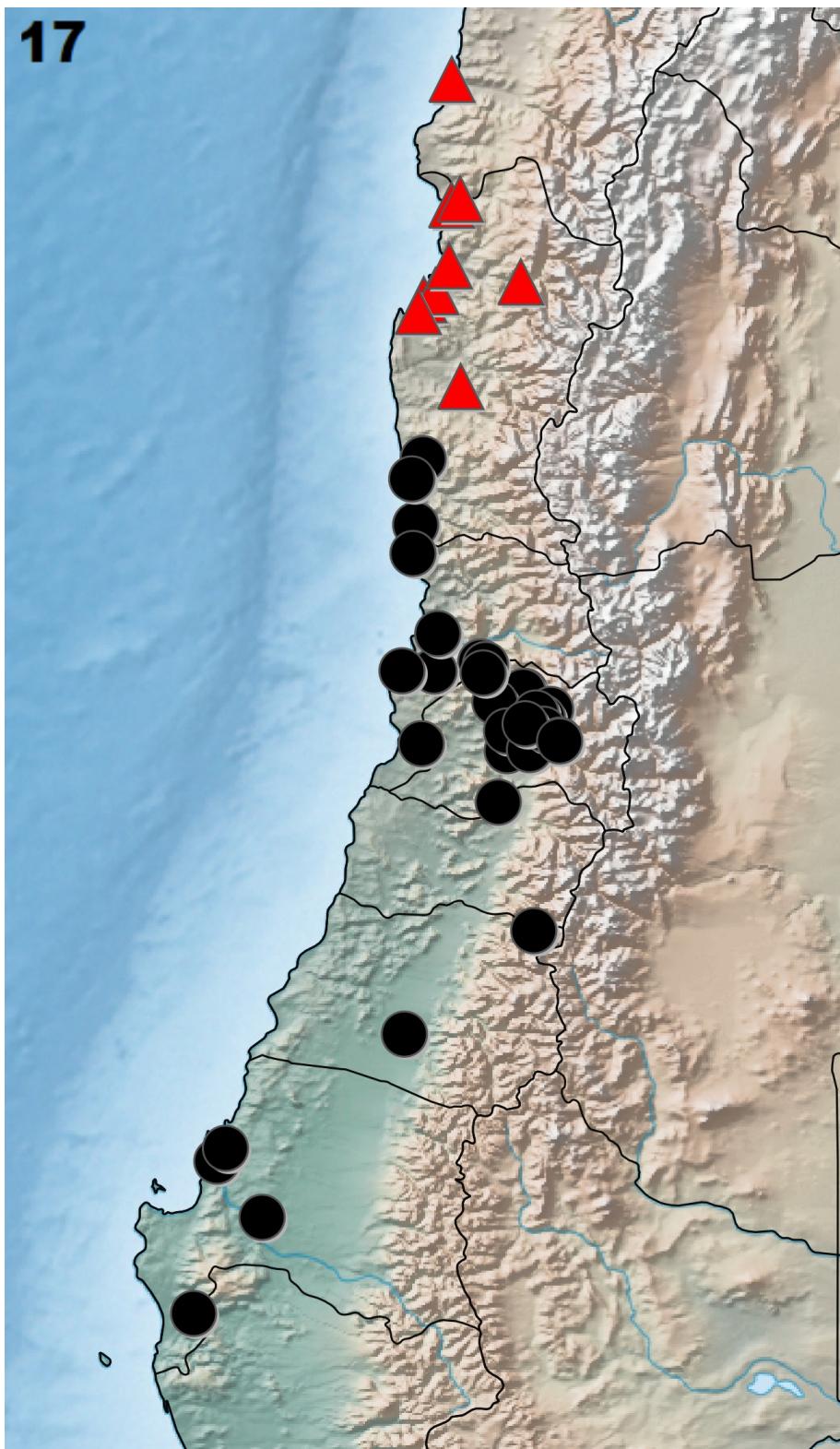
**Distribution.** Chile: southern Atacama through central Coquimbo (Fig. 17).

**Comments.** The elongate male antennal clubs seen only in this species are possibly an adaptation to better detect pheromones emitted by the flightless females. This adaptation is seen in many other species of scarabaeoids with flightless females, based on our observations of *Pleocoma* LeConte, 1856 (Coleoptera: Pleocomidae), *Acoma* Casey, 1889 (Coleoptera: Scarabaeidae: Melolonthinae: Acomini), *Polyphylla* Harris, 1841 (Coleoptera: Scarabaeidae: Melolonthinae: Melolonthini), and other genera (see also Scholtz 2000).

Pizarro-Araya *et al.* (2015) found that this was the second most abundant species captured in transitional coastal deserts of Coquimbo, Chile.

### Acknowledgments

We thank José Mondaca for his help in confirming the flightlessness of *P. philippiana* females and Juares Fuhrmann and an anonymous reviewer for helpful suggestions.



**Figure 17.** Distributional map for *Pacuvia castanea* (black circles) and *Pacuvia philippiana* (red triangles) in central Chile.

## Literature Cited

- Curtis, J. (1844)** Descriptions of the insects collected by Capt. P.P. King, R.N., F.R.S., F.L.S. &c., in the survey of the Straits of Magellan. *Proceedings of the Linnean Society of London*, 1(21): 196-202.
- Gutiérrez, R. (1951)** El genero *Liogenys* en Chile (Coleoptera. Scarabaeidae). *Revista Chilena de Entomología*, 1: 129-145.
- Pizarro-Araya, J., Cepeda-Pizarro, J., Mondaca, J. and Cortés-Contreras, M. (2015)** A population outbreak of *Lichnia gallardoi* Gutiérrez, 1943 (Coleoptera: Scarabaeidae) in the matorral shrublands of the transitional coastal desert of Chile. *The Coleopterists Bulletin*, 69: 337-340.
- Scholtz, C.H. (2000)** Evolution of flightlessness in Scarabaeoidea (Insecta, Coleoptera). *Deutsche Entomologische Zeitschrift*, 47: 5-28.
- Solier, A. J. J. (1851)** Orden III. Coleopteros, pp. 5-285. In: C. Gay (ed.), *Historia Física y Política de Chile. Zoología*, vol. 5. C. Gay, Paris, France. 564 pp.