Zootaxa 1193: 59–68 (2006)
www.mapress.com/zootaxa/

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

1193

A new dung beetle genus with two new species from Chile (Coleoptera: Scarabaeidae: Scarabaeinae)

FERNANDO Z. VAZ-DE-MELLO & GONZALO HALFFTER

Instituto de Ecología A.C., Departamento de Biodiversidad y Ecología Animal, Km. 2.5 Carretera Antigua a Coatepec, 351, Congregación El Haya, 91070 Xalapa, Veracruz, Mexico, E-mail: vazdemello@gmail.com, halffter@ecologia.edu.mx

Abstract

A new scarabaeine genus (*Tesserodoniella* n. gen.) with two new species (*T. elguetai* **n. sp.** and *T. meridionalis* **n. sp.**) from Chile are described, and provisionally included in the tribe Canthonini. Species in the new genus are most similar to species from two Australian genera and appear not to be closely related to other New World canthonines.

Key words: dung beetle, new genus, new species, Gondwanaland, Scarabaeinae, Chile, *Tesserodon*, *Aptenocanthon*

Resumen

Se describe el género *Tesserodoniella* n. gen., con dos especies nuevas (*T. elguetai* **n. sp.** y *T. meridionalis* **n. sp.**) de Chile, ubicado provisionalmente en la tribu Canthonini. El nuevo género presenta gran similitud con dos géneros australianos, no presentando aparentemente relaciones con el resto de la fauna americana de la tribu.

Introduction

Until now, only three species of scarabaeine dung beetles were reported in Chile, none of which are endemic to that country. In the tribe Canthonini, only *Megathopa villosa* Eschscholtz and *Scybalophagus rugosus* (Blanchard) were known from Chile. *Megathopa villosa* occurs in Chile from Coquimbo (Region IV) to Malleco Province (Region IX), which corresponds to the "precordilleran floor" of the Andes, and extends into similar habitats in Argentina in Río Negro and Chubut provinces (Halffter & Martínez 1966; Ovalle & Solervicens 1980; M. Elgueta, *in litt.*). *Scybalophagus rugosus* is restricted in

Accepted by A. Smith: 5 Apr. 2006; published: 4 May 2006

Chile to the Northern *puna* in Arica Province, Region I, ranging from 3,000 to 4,400 m. The greater distribution of *S. rugosus* extends along the Andes from Cuzco, Peru to Catamarca and Tucumán, Argentina (Halffter & Martínez 1968). Undoubtedly, the presence of these species in Chile represents relatively recent arrivals due to range extensions by Neotropical taxa.

Thanks to Mr. Mario Elgueta, as well as other colleagues (see acknowledgements), we were able to study two new species of Chilean Scarabaeinae belonging to a new genus with Australian affinities. Here we tentatively place this genus within the tribe Canthonini, a largely heterogeneous group, and present observations on its affinities to other genera and discuss biogeographical implications of its distribution.

Specimens studied

The specimens studied belong to the following collections (acronyms and contact personnel in parenthesis):

Canadian Museum of Nature, Ottawa, Canada (CMNC — François Génier)

Fernando Vaz-de-Mello private collection, Lavras, Brasil (FVMC)

Gonzalo and Violeta Halffter private collection, Coatepec, Mexico (GVHC)

José Mondaca private collection, Santiago, Chile (JMEC)

Museo Nacional de Historia Natural, Santiago, Chile (MNNC — Mario Elgueta)

Pedro Vidal private collection, Santiago, Chile (PVC)

University of Nebraska State Museum, Lincoln, Nebraska, U.S.A. (UNSM — Federico Ocampo)

***Tesserodoniella* gen. nov.**

(Figs. 1–10)

Type species

Tesserodoniella elguetai **sp. nov.**

Etymology

Tesserodon, a similar genus, and *–iella*, small, refers to the proximity of this genus to the Australian genus *Tesserodon* Hope and to its small size relative to other Chilean Scarabaeinae. The name of this genus is feminine in gender.

Diagnosis

The new genus is distinguished from all other New World Scarabaeinae by the following combination of characters: Eyes small, feebly visible dorsally when head is retracted (Figs. 1, 6); anterior trochantofemoral pit (as defined by Génier & Kohlmann

2003) present; elytra with wide pseudepipleuron externally to seventh discal stria; mesosternal disc with a transverse depression; abdomen with ventrites articulated, sixth abdominal ventrite as long as ventrites 3–5 together; pygidium with a basal transverse sulcus.

Description

Body: oval and short, size small (5.1–6.1 mm). Dorsal surface microgranulate; head and pronotum covered by irregular, dense, conspicuous punctures. *Head*: as long as wide, without visible dorsal carinae or sutures. Clypeus with two teeth separated by short U-shaped emargination, and external lobe beside each tooth. Dorsal eye surface reduced, triangular, or elongated. Head without occipital bead. Clypeal ventral process cariniform, bordering clypeal emargination. Mentum anteriorly concave. Labial palpus with first segment subcylindrical, widened medially; second segment almost spherical, slightly longer than first; third segment short, cylindrical, narrower than others. *Prothorax*: subrectangular or rhomboidal. Anterior angles acute. Laterally with ventrally directed carina in posterior two-thirds; carina externally directed in anterior third, originating at strong angle in lateral border, subparallel in posterior two-thirds, convergent in anterior third. Posterior margin straight. Hypomeron with acute transverse carina, extending from external side of procoxal cavity to anterior third of lateral pronotal carina. Hypomeral surface concave anterior to transverse carina, flat to feebly convex posterior to transverse carina, with longitudinal keel parallel to external margin. *Elytra*: Disc convex, with seven double striae; striae with small umbilicate punctures separated by five or more diameters. Humerus without conspicuous calli. Pseudoepipleuron with two inconspicuous striae; one dividing pseudoepipleuron in almost equivalent halves, conspicuous only medially; second stria juxtaposed to epipleural carina, conspicuously impressed from basal fifth to pseudoepipleural apex. Epipleuron wide, gradually narrowed to apex, except for strongly widened basal region. Microgranulations on elytral disk and pseudoepipleuron more conspicuous than on remaining body parts. Hind wings reduced. *Mesosternum*: long, narrowed medially. Surface covered by large, dense, ocellate punctures. Disc with evident, transverse concavity; convex at each side of depression. Mesoepimeron trapezoidal with strong carina parallel to anterior margin. Meso-metasternal suture straight, inconspicuous, effaced, in obtuse angle. *Metasternum*: covered by large, dense ocellate punctures; punctures larger laterally, denser, deeper, smaller on disc. Anterior lobe narrower at base than apically, apically 4/3 as wide as basal width; with small lateral round depression at base, depressions linked to each other by concave, inconspicuous U-shaped sulcus; sulcus with vertex posteriorly directed. *Legs*: apico-anterior femoral pit present, rounded. Protibia conspicuously curved internally, externally less curved due to apical expansion; externally with three conspicuous teeth in apical half, median tooth closer to apical tooth. Ventral median longitudinal carina with strong tubercle at tarsal insertion. Spur conical, narrow, as long as tarsal segments 1–3 combined. Protarsus feebly longer than apical tibial width;

segments 1–4 subequal, subcylindrical, as long as wide; tarsomere 5 as long as tarsomeres 2–4 together, laterally flattened, distally widened. Claws small, simple, falciform. Mesofemur elongated. Mesotibia triangular with straight sides, evenly widened to apex, as long as mesofemur. Larger mesotibial spur subconical, just shorter than mesotarsomeres 1–2 combined. Mesotarsomeres 1–4 decreasing in size towards claw; tarsomere 5 with claw as long as tarsomeres 3–4 combined. Metafemur evenly and strongly widened at middle, with strong posterior ventral carina; posterior margin prolonged into conspicuous lobe in apical fourth. Metatibia long, narrow, weakly widened apically; externally serrate in apical two thirds; apex strongly widened externally, obliquely truncate. Metatibial spur subconical, as long as tarsomeres 1–2 combined. Metatarsi similar to that of middle legs. *Abdomen* with ventrites 2–4 of equal length, ventrite 5 one third the length of ventrite 4; ventrite 6 as long as 3–5 combined, not narrowed medially. Pygidium almost twice as wide as long; disc strongly convex with ocellate punctures medially; bordered complete, with strong basal sulcus. *Male genitalia* with asymmetric parameres, left paramere (in dorsal view) longer and wider at apex.

Sexual dimorphism

Male protibia with strong internal apical tooth directed foreward and downward, external teeth narrower than in females; male metatibiae with larger external serrations; and male abdominal ventrite 5 narrowed medially (width even in females).

Remarks

The new genus is readily distinguishable from other New World canthonine genera. The genus is quite similar to two Australian genera: *Tesserodon* Hope and *Aptenocanthon* Matthews. These three genera are all characterized by the presence of the anterior trochantofemoral pit and the position and form of the pseudoepipleuron. Based on our study of dung beetle genera, we predict that these characters are phylogenetically informative and that the three genera form a clade. The three genera may be related, although more distantly, to the South American genera *Zonocopris* Arrow, *Cryptocanthon* Balthasar, *Paracryptocanthon* Howden & Cook, as well as the New Zealand genus *Saphobius* Broun, because they all share the trochantofemoral pit structure. However, *Zonocopris*, *Cryptocanthon*, *Paracryptocanthon*, and *Saphobius* all have a somewhat distinct pseudoepipleuron. *Tesserodoniella* differs from both Australian genera in the form of the prothorax, elytral striae, and in having the first metatarsomere slightly larger than the second.

Key to the species of *Tesserodoniella*

1 Clypeo-genal margin with sharp denticle (Fig. 6); interstriae 3–5 and 7 with apical tubercles (Fig. 7) ..... *T. meridionalis* **sp. nov.**

- Clypeo-genal margin rounded (Fig. 1); interstriae 3–5 and 7 without apical tubercles (Fig. 2).....*T. elguetai* **sp. nov.**

***Tesserodoniella elguetai* sp. nov.**
(Figs. 1–5, 10)

Holotype

♂. CHILE: Región Metropolitana de Santiago: Maipo, Rangue, 5–11 June 2004, M. E lgueta & M. Guerrero leg., "trampa barber, bosque higrófilo + esclerófilo" (MNNC).

Paratypes

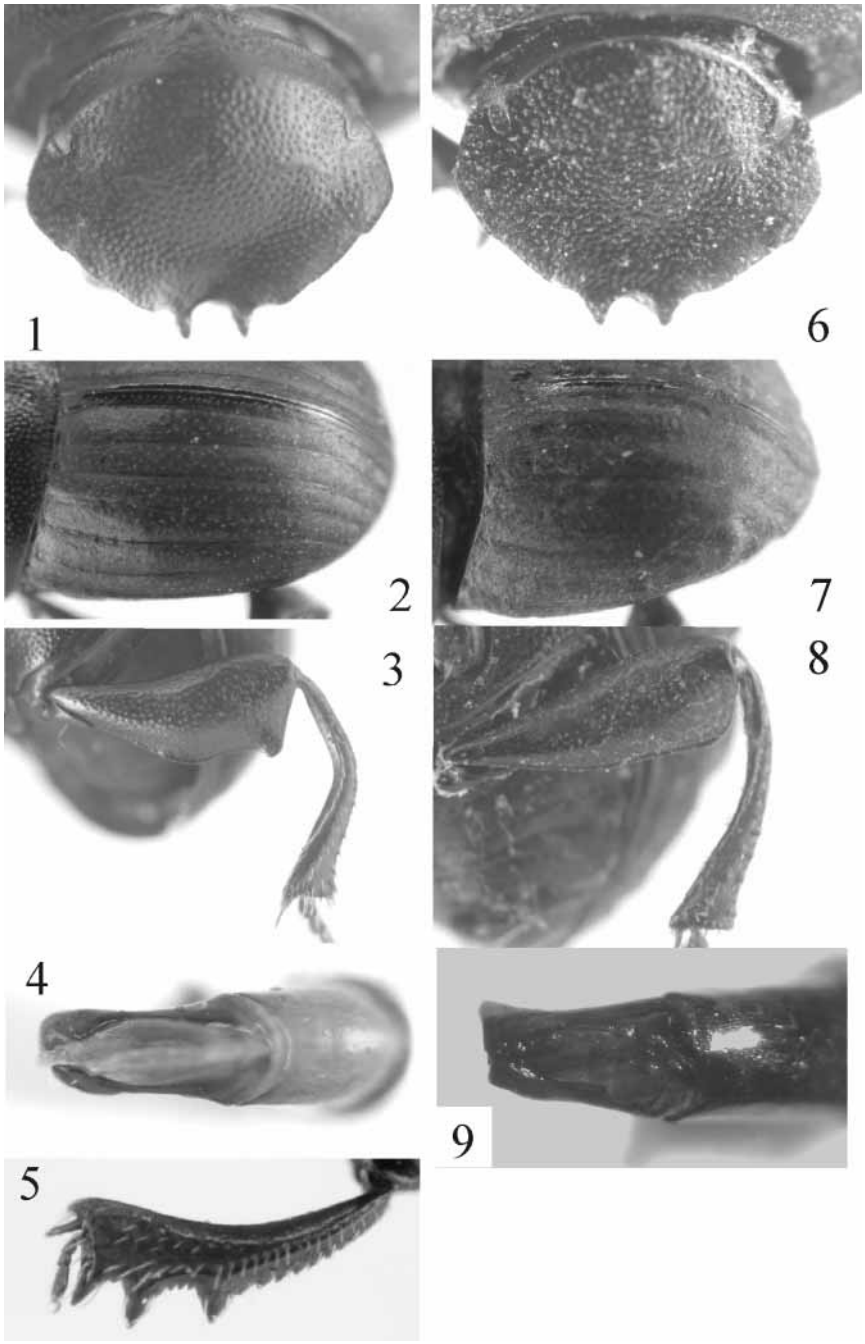
4♂, 4♀. CHILE: Región Metropolitana de Santiago: same as holotype except "bajo excrementos de caballo, suelo arcillo arenoso" (1♀ FVMC**,** ♀ MNNC, 1♀ UNSM); Maipo, Rangue, 2–8 August 2000, A. Fierro leg., barber trap. (1♂ GVHC); SW Santiago, Alto Cantillana, Alhué, 3 September 2000, Vidal leg. (1♂, 1♀ PVC); Cachapoal, R. N. Roblerías de Loncha, 20-XI-2004, J. Mondaca, "en trampa barber" (1♂ JMEC, 1♂ CMNC).

Etymology

A patronym honoring Mario Elgueta, MNNC, Santiago, Chile, who kindly offered specimens of both species of this genus for study.

Description

Holotype male. *Head* (Fig. 1) clypeus with two narrow, parallel-sided, elongated teeth; teeth separated by short, wide U-shaped emargination, each tooth with external angulate lobe. Dorsal eye surface reduced, triangular, visible only when head protracted; interocular dorsal region wider than 20 times one eye width. *Prothorax* subrectangular, almost twice as wide as long medially. Medium longitudinal line feebly indicated in posterior half by impunctate region. Posterior angles obtusely rounded. *Elytra* (Fig. 2) with discal striae conspicuous. Interstriae without discal tubercles, with two irregular rows of inconspicuous punctures; some punctures with short, erect setae; punctures and setae denser apically. Lateral carina sharp, juxtaposed and external to seventh stria, extended from elytral base to just before apex of sixth stria. *Legs* with protibia (Fig. 5) internally curved; external border with 3 well-defined teeth, narrower apically; internally with strong apical tooth, tooth anteroventrally directed. Metafemur (Fig. 3) with posterior, ventral carina forming rounded lobe in median third; with acute subapical lobe. Metatibia with external row of five conspicuous serrations. *Venter* with mesosternum twice as long as wide. *Pygidium* basal sulcus with obtusely rounded, median angle. *Parameres* (Fig. 4) as long as two-thirds of phallobase.



FIGURES 1–9. 1–5. *Tesserodoniella elguetai* **n. sp.**: 1. head; 2. elytron; 3. hind leg; 4. parameres; 5. protibia; 6–9. *Tesserodoniella meridionalis* **n. sp**.: 6. head; 7. elytron; 8. hind leg; 9. parameres.

Variation

Paratypes vary in size (5.1–6.0 mm) and width (widest at prothorax) 3.0–3.3 mm. Females differ from males in the following respects: protibial teeth wider and stronger,

apical internal tooth almost lacking; hind femur with posterior apical lobe rounded; metatibia straighter, widened apically, with less conspicuous external serrations; abdominal ventrite 5 feebly narrowed medially.

Remarks

All specimens are from the Cordillera de la Costa mountain system close to the Central Chilean Coast, parallel to the Andes (Fig. 10). Apart from anthropogenic habitats, the area has dry savannas and sclerophyllous, hygrophyllous, and *Nothofagus* forests. This area is within the Santiago Biogeographical Province as defined by Morrone (2001, 2006).

***Tesserodoniella meridionalis* sp. nov.**
(Figs. 6–10)

Holotype

♂. CHILE: VII Región del Maule**:** Constitución, Pantanillos, 17 December 2003, "Tramp barber bosque de *Nothophagus* (sic) *glauca*", leg. W. Navarrete leg. (MNNC).

Paratypes

4♂, 2♀. CHILE: VII Región del Maule**:** same as holotype (2 ♂ JMEC, 1 ♀ MNNC, 1♂ UNSM); Constitución, Pantanillo, Empedrado, September 2002, Wilson Navarrete leg., barber trap. (1♂ FVMC). CHILE: VIII Región del Biobío: Ñuble: Cerro Cayumanqui, 5 December 2004, 36º42'08'' S, 72º30'36'' W, "barber", J. Mondaca E. leg. (1 ♀ CMNC).

Description

Holotype male. *Head* (Fig. 6) clypeus with two elongated triangular teeth separated by U-shaped emargination; each tooth with small, obtuse, external lobe. Clypeo-genal border sharply angulate. Dorsal eye surface ovoid, twice as long as wide; interocular region more than 15 eye widths wide. *Prothorax* rhomboidal, almost one and a half times wider than long. Median longitudinal line absent. Posterior angles completely rounded. *Elytra* (Fig. 7) with discal striae weak but conspicuous. Interstriae with small rounded shiny spots on microgranulated surface. Seventh interstria with conspicuous discal tubercle, tubercle located where seventh interstria meets sixth. Fifth interstria with tubercle in apical third, third and fourth interstriae each with one conspicuous apical tubercle. Lateral carina absent, but pseudoepipleuron conspicuously delimited. *Legs*. Protibia internally curved with external border bearing three conspicuous and apically narrowed teeth, internal border with apical tooth directed forward and downward. Metaemur (Fig. 8) with posterior ventral carina subapically forming rounded lobe. Internal border of metatibiae without tubercles. *Venter* with mesosternum approximately twice as long as wide. *Pygidium* with basal sulcus obtusely angulate medially. *Parameres* (Fig. 9) half the length of phallobase.

Variation

Paratypes vary in size (5.1–6.1 mm) and width (widest at prothorax: 3.2–4.1 mm). Females differ from males in the following respects: protibial teeth wider and stronger, apical internal tooth almost lacking; hind femur with posterior apical lobe rounded; metatibia straighter and more widened apically, external serrations less conspicuous; abdominal ventrite 5 feebly narrowed medially.

FIGURE 10. Map of central Chile showing distribution of *Tesserodoniella elguetai* **n. sp.** (circles) and *T. meridionalis* **n. sp.** (triangles).

Remarks

Specimens were caught in a region originally covered by *Nothofagus* forests, and both sclerophyllous (in arid areas) and hygrophyllous riparian vegetation. This distribution is within the Maule Biogeographical Province (as defined by Morrone 2001, 2006). The northernmost distributions of austral biotic elements are found in this region (Fig. 10).

Biogeography of *Tesserodoniella*

The discovery of *Tesserodoniella* in South America and its hypothesized close relationship

with the Australian genera *Tesserodon* and *Aptenocanthon* leads to a series of interesting biogeographical considerations:

1. As pointed out before, the other two canthonine species occurring in Chile belong to predominantly Neotropical genera. *Scybalophagus* has four species distributed in the Patagonian biogeographical subregion (as defined by Morrone 2001, 2006). A fifth species, occurring in Chile, occurs in what Morrone (2006) called the South American Transition Zone. *Megathopa* (with two species) is occurs from Regions IV to IX in Chile, from Córdoba to Chubut in Argentina, and in Uruguay. Neither *Scybalophagus* or *Megathopa* are closely related to or sympatric with *Tesserodoniella*.

2. The presence of *Tesserodoniella* in the Santiago and Maule biogeographic provinces supports Morrone's (2001, 2006) proposals on the composition and biogeographic affinities of those areas. Morrone (2001, 2006) divided South America into two regions (Neotropical and Andean) with a transition zone that roughly corresponds with the Andes. The Andean Region is included in the Austral kingdom, originating from Western Gondwana, which also includes the Antarctic, Cape (or Afrotemperate), Neoguinean, Temperate Australian, and Neozealandic regions. The Andean Region was divided by Morrone into subregions and provinces. Santiago Province is included in the Central Chilean subregion, and Maule Province in the Subantarctic subregion. However, both provinces are strongly related, as Maule is the southern limit of many distributional areas. Interestingly, the Santiago Province contains the highest number of endemic species in the southern part of South America (Morrone *et al.* 1997).

3. Of the closely related Australian genera, *Tesserodon* is widely distributed in northern and western Australia, with two species in New Guinea; while *Aptenocanthon* is distributed in eastern and northern Australia (Matthews 1974, Storey 1984, Paulian 1985, Storey 1991, Storey & Monteith 2000). The biogeographical affinities between southern South America, Australia, and New Zealand, known as the southern Gondwana distributional pattern (Sanmartín & Ronquist 2004), have been illustrated by many plant and insect examples (Crisci *et al*. 1991, Sequeira & Farrell 2001, Sanmartín & Ronquist 2004).

Acknowledgements

This work is part of the first author's Ph.D. thesis at Instituto de Ecologia A. C., Xalapa, Mexico, which is supported by a Capes grant (BEX 1208020). Thanks to Pedro Vidal G.-H., Andrés Fierro T., Marcelo Guerrero, José Mondaca E., and Wilson Navarrete V.; all from Santiago, Chile; who collected and prepared part of the examined specimens. Some of the examined specimens were collected during a field trip granted by NSF-BS&I project (DEB-0342189) to Andrew B. T. Smith (Canadian Museum of Nature) and Federico C. Ocampo (University of Nebraska State Museum). Mario Elgueta (Natural History Museum, Santiago, Chile) facilitated the examination of all Chilean specimens

cited in this paper, while G. Monteith (Queensland Museum), and O. Montreuil (National Museum of Natural History, Paris) sent us important Australian material for comparison. Andrew Smith and François Génier made valuable comments on specimens shown to them and helped with some of the photos presented here. Finally, we acknowledge Silvia A. Falqueto who typed a first draft and Esther Quintero who revised the English manuscript.

References

Crisci, J.V., Cigliano, M.M., Morrone, J.J. & Roig-Juñent, S. (1991) Historical biogeography of southern South America. *Systematic Zoology*, 40(2), 152–171.

Génier, F. & Kohlmann, B. (2003) Revision of the Neotropical dung beetle genera *Scatimus* Erichson and *Scatrichus* gen. nov. (Coleoptera: Scarabaeidae: Scarabaeinae). *Fabreries*, 28(2), 57–111.

Halffter, G. & Martínez, A. (1966) Revisión monográfica de los Canthonina americanos (Coleoptera, Scarabaeidae). 1ª. Parte. *Revista de la Sociedad Mexicana de Historia Natural*, 27, 89–177.

Halffter, G. & Martínez, A. (1968) Revisión monográfica de los Canthonina americanos (Coleoptera, Scarabaeidae). 3ª. Parte. *Revista de la Sociedad Mexicana de Historia Natural*, 29, 209–299.

Matthews, E.G. (1974) A revision of the scarabaeinae dung beetles of Australia II. Tribe Scarabaeini. *Australian Journal of Zoology, Supplementary Series*, 24, 1–211.

Morrone, J.J. (2001) *Biogeografía de América Latina y el Caribe. Manueales y Thesis SEA*, volume 3. Sociedad Entomológica Aragonesa, Zaragoza, 148 pp.

Morrone, J.J. (2006) Biogeographic areas and transition zones of Latin America and the Caribbean islands based on panbiogeographic and cladistic analyses of the entomofauna. *Annual Review of Entomology*, 51, 467–494.

Morrone, J.J., Katinas, L. & Crisci, J.V. (1997) A cladistic biogeographic analysis of Central Chile. *Journal of Comparative Biology*, 2(1), 25–42.

Ovalle,V.M. & Solervicens, J. (1980) Observaciones sobre la biología de *Megathopa villosa* E schscholtz, 1822 (Coleoptera, Scarabaeidae, Scarabaeinae). *Boletín del Museo Nacional de Historia Natural (Chile)*, 37, 235–246.

Paulian, R. (1985) Les coléoptères Scarabaeidae canthonines de Nouvelle-Guinée. *Annales de la Société Entomologique de France*, 21(2), 219–238.

Sanmartín, I & Ronquist, F. (2004) Southern hemisphere biogeography inferred by event-based models: plant versus animal patterns. *Systematic Biology*, 53(2), 216–243.

Sequeira, A.S. & Farrell, B.D. (2001) Evolutionary origin of Gondwana interactions: how old are *Araucaria* beetle herbivores? *Biological Journal of the Linnean Society*, 74, 459–474.

Storey, R. (1984) A new species of *Aptenocanthon* Matthews from north Queensland. (Coleoptera: Scarabaeidae: Scarabaeinae). *Memoirs of the Queensland Museum*, 21(2), 387–390.

Storey, R. (1991) New species and new records of *Tesserodon* Hope (Coleoptera: Scarabaeidae) from northern Australia. *Memoirs of the Queensland Museum*, 30(3), 577–588.

Storey, R. & Monteith, G.B. (2000) Five new species of *Aptenocanthon* Matthews (Coleoptera: Scarabaeidae: Scarabaeinae) from tropical Australia, with notes on distribution. *Memoirs of the Queensland Museum*, 46(1), 349–358.

