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aff. paraguayanus Balthasar (Coleoptera: Scarabaeidae:
Scarabaeinae)**

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SCIENTIFIC NOTE

THE NEST AND BROOD BALL OF *CANTHON (CANTHON) VIRENS* AFF. *PARAGUAYANUS* BALTHASAR (COLEOPTERA: SCARABAEIDAE: SCARABAEINAE)

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Behavioral traits, such as nest and brood ball structure, remain poorly studied among the species of the genus *Canthon* Hoffmannsegg. Within the *Canthon virens* species-group (Halffter and Martínez 1977), *Canthon (Canthon) virens virens* (Mannerheim) makes brood balls provisioned with queens of leaf-cutter ants, crickets, and cockroaches and buries them at a shallow depth (Forti *et al.* 2012; Halffter *et al.* 2013). The nesting behavior of the remaining species of this group is completely unknown.

Previous reports on *Canthon (Canthon) virens aff. paraguayanus* Balthasar have focused on geographic distribution (Paraguay, Argentina, Brazil, and Peru) and taxonomic issues (Balthasar 1939; Pereira and Martínez 1956; Martínez 1959; Halffter and Martínez 1977). Observations on the species' nest and brood ball structure are described herein for the first time.

In December 2012, a total of 11 adults (five females and six males) were found on the edge of the Atlantic forest at the Karadya Bioserve (25°52'14" S 53°58'10" W), located in northeastern Misiones province, Argentina. The adults were collected from a bird carcass (*Tachyphonus coronatus* Vieillot, Fig. 1A), dog feces, and rotten orange fruits. Adults were divided into two plastic cylindrical terraria, 12.5 cm in diameter, which contained tuna or orange fruits on the surface of a 6 cm deep layer of humid soil taken from the forest. The provisions were renewed regularly when they became too decayed or dry. Water was sprayed daily onto the soil to maintain moisture.

About 4–7 days later, the superficial layers of soil material were removed for searching for nests. One nesting chamber that contained a brood ball was exposed. The brood ball was of the bispherical type (Cantil *et al.* 2013). The diameter was measured as the largest width of each sphere. The height was measured orthogonal to the diameter. A longitudinal section was made to determine the internal structure and measure the wall thickness and the size of the egg chamber located inside the protuberance. The brood ball and the dung

beetles were deposited in the Museo Argentino de Ciencias Naturales “Bernardino Rivadavia” (Buenos Aires, Argentina).

At the time the nesting activities were interrupted, a spheroid oblate nesting chamber 26 mm long, 11 mm wide, and approximately 20 mm high was found at the bottom of the terrarium. The nest contained a female and a vertically oriented brood ball (Fig. 1B). The carrion-provisioned brood ball displays a protuberance, which is separated from the provision chamber by a constriction (Fig. 1B, C). The provision chamber is 9 mm in diameter and height, whereas the protuberance is 4 mm in diameter and 5 mm high. Internally, the protuberance shows an upper plug of loose soil 1 mm thick and an egg chamber, 3 mm in diameter, at its base (Fig. 1C). The egg chamber is isolated from the provisions by a partition of soil material and shows no lining (Fig. 1C). A pale yellow egg, 2.5 mm long and 1.5 mm wide, was obliquely oriented inside this chamber. The wall thickness of the brood ball ranges from 0.5 mm at the sides of the egg chamber to 1.5 mm at the sides of the provision chamber. The balls rolled on the surface of the terrarium, which were not used for nesting, ranged from 5 to 10 mm in diameter.

Individuals of *C. virens aff. paraguayanus* were attracted to a bird carcass, dog feces, and rotten orange fruits. The adults might be attracted and potentially feed on any of these resources, although their mouthparts are only capable of ingesting juices and microorganisms from them (Halffter and Halffter 2009; Scholtz *et al.* 2009). Pereira and Martínez (1956) reported the presence of this species on mature fruits of *Butia* Beccari (Arecaceae) in Brazil. Actual feeding on fruits could not be confirmed by direct observations in the terrarium. It is difficult to distinguish between tourists and actual users of the resource (Krell *et al.* 2003). There may be a clear distinction between the resources visited by adults and the provisions of brood balls, which are undoubtedly the food for the larvae (Halffter and Halffter 2009). Literature is somewhat confusing when qualifying “dung” beetle feeding habits,

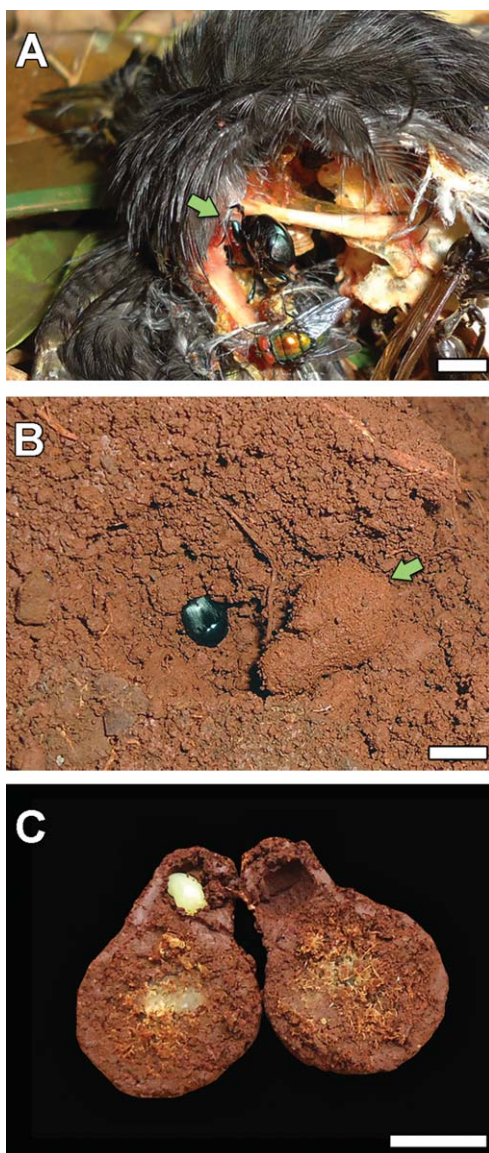


Fig. 1. Food resource, nest, and brood ball of *Canthon virens* aff. *paraguayanus*. A) Adult (arrow) in remains of *Tachyphonus coronatus*, scale bar = 5 mm, B) Nesting chamber containing one brood ball (arrow), which originally was vertically oriented, and a female, scale bar = 5 mm, C) Internal view of a brood ball showing the egg chamber housing an egg and the provision chamber containing tuna, scale bar = 5 mm.

such as coprophagous, necrophagous, and frugivorous, without mentioning if adults or larvae are involved, or if adults were actually feeding on the resource or were “tourists”. In contrast, larvae are restricted to their provisions, leaving no doubts

as to their true feeding habits. *Canthon virens* aff. *paraguayanus*, even when found on fruits or dog feces, used tuna for provisioning the nest, indicating true larval necrophagous habits.

The brood ball shows a protuberance containing the egg chamber, which allows the complete isolation of the egg from provisions. Also, the egg chamber shows no organic lining to nourish the newly hatched larvae; an aeration filter of loose soil is located at the roof. The first two characters, together with the ejection of larval fecal pellets outside the ball (not recorded for *C. virens* aff. *paraguayanus*), were proposed as a set of adaptive characters of necrophagous species to their food (Cantil *et al.* 2014). They are present in extant brood balls constructed by *C. virens virens*, *Canthon cyanellus cyanellus* LeConte, *Canthon bispinus* Germar, and *Canthon quinque maculatus* Laporte de Castelneau (Fabre 1899; Judulien 1899; Halffter and Matthews 1966; Halffter *et al.* 1983; Favila 2001; Halffter *et al.* 2013, Cantil *et al.* 2014). They are also known in fossil brood balls *Coprinisphaera akatanka* Cantil, Sánchez, Bellosi, González, Sarzetti, and Genise from the Early Pleistocene outcrops of Argentina (Cantil *et al.* 2013).

Necrophagy is not limited to vertebrate animal remains. Some species of *Canthon* and *Deltochilum* Eschscholtz use dead arthropods as ball provisions (Halffter and Matthews 1966; Hanski and Cambefort 1991). *Canthon virens virens* preys on queens of leaf-cutter ants, *Atta laevigata* (Smith), to provision the brood balls and feed the larvae (Navajas 1950; Halffter and Matthews 1966; Hertel and Colli 1998; Vaz-de-Mello *et al.* 1998; Silveira *et al.* 2006; Forti *et al.* 2012). In the laboratory, they accepted slightly decomposed fish, but crickets and cockroaches (dead or alive) were preferred as provision (Halffter *et al.* 2013). This species makes 2–3 brood balls and buries them at a shallow depth (Navajas 1950; Halffter and Matthews 1966; Forti *et al.* 2012; Halffter *et al.* 2013). At least externally, the brood balls of *C. virens virens* (Forti *et al.* 2012, fig. 2H; Halffter *et al.* 2013, figs. 16 and 18) seem to be similar to those of *C. virens* aff. *paraguayanus*. Both nests were found within 15 cm of topsoil, and parental care was also present (Forti *et al.* 2012). However, is still unknown whether the nest of *C. virens* aff. *paraguayanus* is compound or simple because the nesting activities were interrupted in the early stages of development.

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REFERENCES CITED

- Balthasar, V. 1939.** Eine vorstudie zur monographie der gattung *Canthon* Hffsg. Folia Zoologica et Hydrobiologica 9(2): 179–238.
- Cantil, L. F., M. V. Sánchez, E. S. Bellosi, M. G. González, L. C. Sarzetti, and J. F. Genise. 2013.** *Coprinisphaera akatanka* isp. nov. the first fossil brood ball attributable to necrophagous dung beetles associated with the Early Pleistocene environmental stress in the Pampean region (Argentina). Palaeogeography, Palaeoclimatology, Palaeoecology 386: 541–554.
- Cantil, L. F., M. V. Sánchez, P. A. Dinghi, and J. F. Genise. 2014.** Food relocation behavior, nests, and brood balls of *Canthon quinque maculatus* Laporte de Castelnau (Coleoptera: Scarabaeidae: Scarabaeinae). The Coleopterists Bulletin 68(2): 199–208.
- Fabre, J. M. 1899.** Souvenirs Entomologiques (Sixième série). Librairie Delagrave, Paris, France.
- Favila, M. E. 2001.** Historia de vida y comportamiento de un escarabajo necrófago: *Canthon cyanellus cyanellus* LeConte (Coleoptera: Scarabaeinae). Folia Entomológica Mexicana 40(2): 245–278.
- Forti, L. C., I. M. P. Rinaldi, R. D. S. Camargo, and R. T. Fujihara. 2012.** Predatory behavior of *Canthon virens* (Coleoptera: Scarabaeidae): a predator of leafcutter ants. Psyche: Journal of Entomology 2: 1–5.
- Halffter, G., V. Cortez, E. J. Gómez, C. M. Rueda, W. Ciares, and J. R. Verdú. 2013.** A Review of Subsocial Behavior in Scarabaeinae Rollers (Insecta: Coleoptera): An Evolutionary Approach. Monografías del Tercer Milenio, vol. 9. S.E.A. & INECOL, Zaragoza, Spain.
- Halffter, G., and V. Halffter. 2009.** Why and where coprophagous beetles (Coleoptera: Scarabaeinae) eat seeds, fruits or vegetable detritus. Boletín de la Sociedad Entomológica Aragonesa 45: 1–22.
- Halffter, G., V. Halffter, and C. Huerta. 1983.** Comportement sexuel et nidification chez *Canthon cyanellus cyanellus* LeConte (Col. Scarabaeidae). Bulletin de la Société entomologique de France 88: 585–594.
- Halffter, G., and A. Martínez. 1977.** Revisión monográfica de los *Canthonina* americanos, IV parte. Clave para géneros y subgéneros. Folia Entomológica Mexicana 38: 29–107.
- Halffter, G., and E. G. Matthews. 1966.** The natural history of dung beetles of the subfamily Scarabaeinae (Coleoptera: Scarabaeidae). Folia Entomológica Mexicana 12–14: 1–312.
- Hanski, I., and Y. Cambefort. 1991.** Dung Beetle Ecology. Princeton University Press, Princeton, NJ.
- Hertel, F., and G. R. Colli. 1998.** The use of leafcutter ants, *Atta laevigata* (Smith) (Hymenoptera: Formicidae), as a substrate for oviposition by the dung beetle *Canthon virens* Mannerheim (Coleoptera: Scarabaeidae) in central Brazil. The Coleopterists Bulletin 52(2): 105–108.
- Judulien, F. 1899.** Quelques notes sur plusieurs coprophages de Buenos Aires. Revista del Museo de la Plata (Argentina) 9: 371–380.
- Krell, F. T., J. Korb, and P. Walter. 2003.** The beetle fauna of hyaena latrines: coprocenoses consisting of necrophagous beetles (Coleoptera: Trogidae: Scarabaeidae). Tropical Zoology 16: 145–152.
- Martínez, A. 1959.** Catálogo de los Scarabaeidae argentinos (Coleoptera). Revista del Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Ciencias Zoológicas 5(1): 1–126.
- Navajas, E. 1950.** Manifestações de predatismo em Scarabaeidae do Brasil e alguns dados bionômicos de *Canthon virens* (Mannh.) (Col. Scarabaeidae). Ciencia e Cultura 2(4): 284–285.
- Pereira, F. S., and A. Martínez. 1956.** Os géneros de *Canthonini* americanos (Col. Scarabaeidae). Revista Brasileira de Entomologia 6: 91–192.
- Scholtz, C. H., A. L. V. Davis, and U. Kryger. 2009.** Evolutionary Biology and Conservation of Dung Beetles. Pensoft Publishers, Sofia, Bulgaria.
- Silveira, F. A. O., J. C. Santos, L. R. Viana, S. A. Falqueto, F. Z. Vaz-de-Mello, and G. W. Fernandes. 2006.** Predation on *Atta laevigata* (Smith 1858) (Formicidae Attini) by *Canthon virens* (Mannerheim 1829) (Coleoptera Scarabaeidae). Tropical Zoology 19(1): 1–7.
- Vaz-de-Mello, F. Z., J. N. Louzada, and J. H. Schoederer. 1998.** New data and comments on Scarabaeidae (Coleoptera: Scarabaeoidea) associated with Attini (Hymenoptera: Formicidae). The Coleopterists Bulletin 52(3): 209–216.

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