

***ONTHERUS SULCATOR* FABRICIUS, 1775 (COLEOPTERA: SCARABAEIDAE:
SCARABAEINAE): DESCRIPTIONS OF THE THIRD INSTAR AND PUPA**

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ABSTRACT

The third instar and pupa of *Ontherus sulcator* Fabricius are described and illustrated. The immature stages were reared from eggs laid by adults under laboratory conditions. The morphology of the larva and pupa is analyzed based on characters at the generic level and compared with those of other related genera. Larval morphology is also compared with that of *Ontherus mexicanus* Harold. The larvae of *O. sulcator* and *O. mexicanus* share most of the characters proposed for the genus. These species can be distinguished by differences in chaetotaxy of the epipharynx and mandible. The pupa of *O. sulcator* possesses a system of pupal support projections as occurs in all known scarabeinae pupae. The number and distribution of projections are similar to those of other related genera of Dichotomiini.

Key Words: morphology, immature stages, larva, dung beetle, Dichotomiini

The genus *Ontherus* Erichson, 1847, traditionally included in the tribe Dichotomiini, comprises 59 species distributed throughout Latin America (Génier 1996, 1998). Recent studies suggest that the characterization and generic composition of Dichotomiini, which is probably polyphyletic, requires revision (Scholtz 2009). In a phylogenetic study, Montreuil (1998) proposed that *Ontherus*, along with other genera of Dichotomiini (even *Dichotomius* Hope), belongs in the tribe Coprini and renamed the tribe Dichotomiini as Ateuchini. The study of larval anatomy could provide useful characters to help resolve phylogenetic relationships among the genera of those groups. However, studies of the morphology of the immature stages in support of taxonomic analysis of the tribes of Scarabaeinae have been scarce. Edmonds and Halffter (1978), in a taxonomic review of immature Scarabaeinae that included 25 genera, stated that great gaps in knowledge about larvae prevent establishing coherent suprageneric larval groupings. In particular, within *Ontherus*, only the third instar of *Ontherus (Caelontherus) mexicanus* Harold is

known but has not been described in detail (Edmonds and Halffter 1978).

Ontherus (Ontherus) sulcator Fabricius is a coprophagous species distributed from Trinidad to southern Uruguay (Génier 1996). The nesting behavior of this species conforms to Pattern II (Halffter and Edmonds 1982); its paracoprid and simple nest and the structure of the brood ball were described in detail by Cabrera-Walsh and Gandolfo (1996) and Sánchez and Genise (2008).

The purpose of this study is to describe the third instar and pupa of *O. sulcator* and compare their morphology with that of *O. mexicanus*, as well as the characteristics of immature stages of this genus with those of the corresponding immature stages of related genera.

MATERIAL AND METHODS

The field study was carried out in November 2013 at the Maldonado and Rossotti quarries (S33°51'39", W58°11'25" and S33°56'8", W58°5'56"), Colonia Department, Uruguay. The

soil of the establishments was mainly covered by grasses and abundant dung pads from cows. Adults of *O. sulcator* ($n = 6$) were found inside dung pads that exhibited removed soil on its surface, or below them, in simple tunnels (7.5–20.0 cm deep) with dung packed into the blind end.

Beetles were reared in the laboratory at $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ with a 12:12 photoperiod. Three male-female pairs were placed inside plastic cylindrical terraria (30.0 cm height \times 12.5 cm diameter), which contained a 20.0-cm-deep layer of soil and a gauze lid. Fresh cow dung was placed on the soil surface and renewed twice a week. The terraria were periodically examined (every 4–6 days).

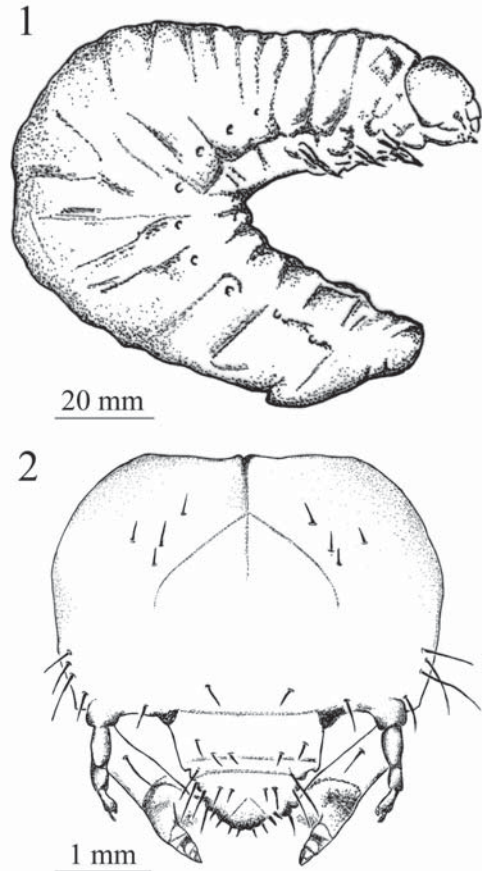
The brood balls were individually placed inside cylindrical containers (12.0 cm height \times 10.0 cm diameter). They were examined once a week until the immature beetles reached the third instar or pupal stage. Three larvae in the third instar and two pupae were removed from the brood balls, fixed by dropping them into boiling water for three minutes, and preserved in 70% ethanol.

The terminology used in the description of the larva is that of Böving (1936) and Ritcher (1966). The characters proposed by Edmonds and Halfiter (1978) to distinguish among Scarabaeinae genera were especially considered. The studied material was deposited in Colección de Entomología, Facultad de Ciencias (Montevideo, Uruguay).

RESULTS

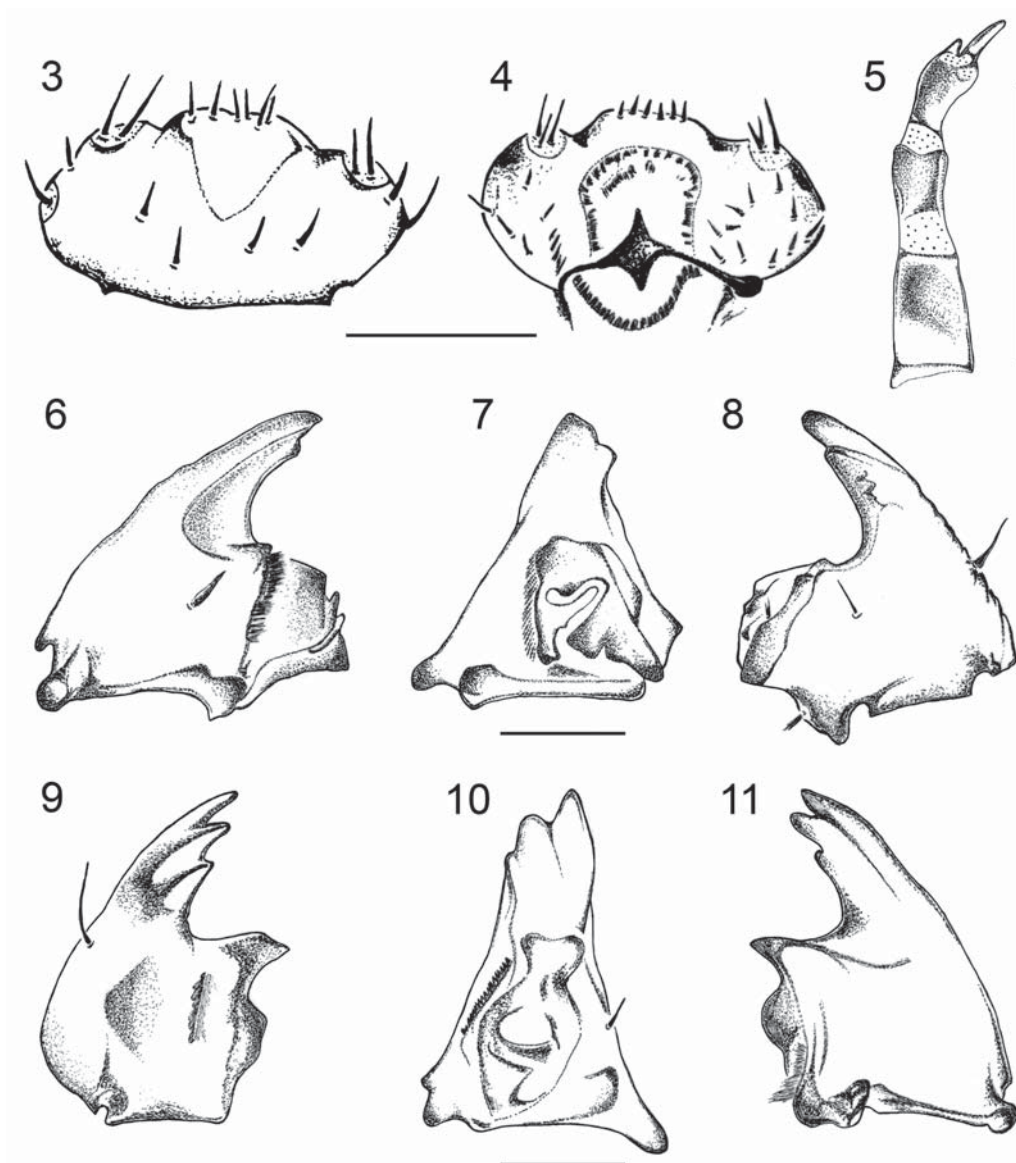
Ontherus sulcator Fabricius, 1775 third instar (Figs. 1–15)

Description. Body: Length 28 mm; maximum width of the abdomen 8 mm (Fig. 1); color white. **Cranium:** Maximum width of head capsule 6 mm. Surface smooth. Epicranial suture distinct, with apical end extending beyond frontal suture (Fig. 2). Each side of epicranium with 4 small dorsoepicranial setae, 3 of them grouped next to frontal suture. Frons on each side with 1 anterior frontal seta, 1 angular anterior frontal seta, and 4 elongated lateral setae, 1 of them next to antennal base. One pair of anterior clypeal setae; postclypeal surface with 2 setae on each side. **Labrum:** Wide, asymmetric with 1 broad, central lobe and with rounded lateral edges (Fig. 3); 4 short setae on the apex; 4 lateral setae and 2 central setae on each side. **Epipharynx:** Asymmetrical, wider than long, with rounded margins and apical margin with slight central depression (Fig. 4); corypha simple; acroparia with 6 short setae, 3 long setae, and 1 external seta; epizygum absent; pedium bearing setae in right apical corner; acanthoparia with 3 aligned setae on underneath margin and 2 distal setae; gymnoparia wide, right



Figs. 1–2. *Ontherus sulcator*, third instar 1) Habitus; 2) Head, frontal view.

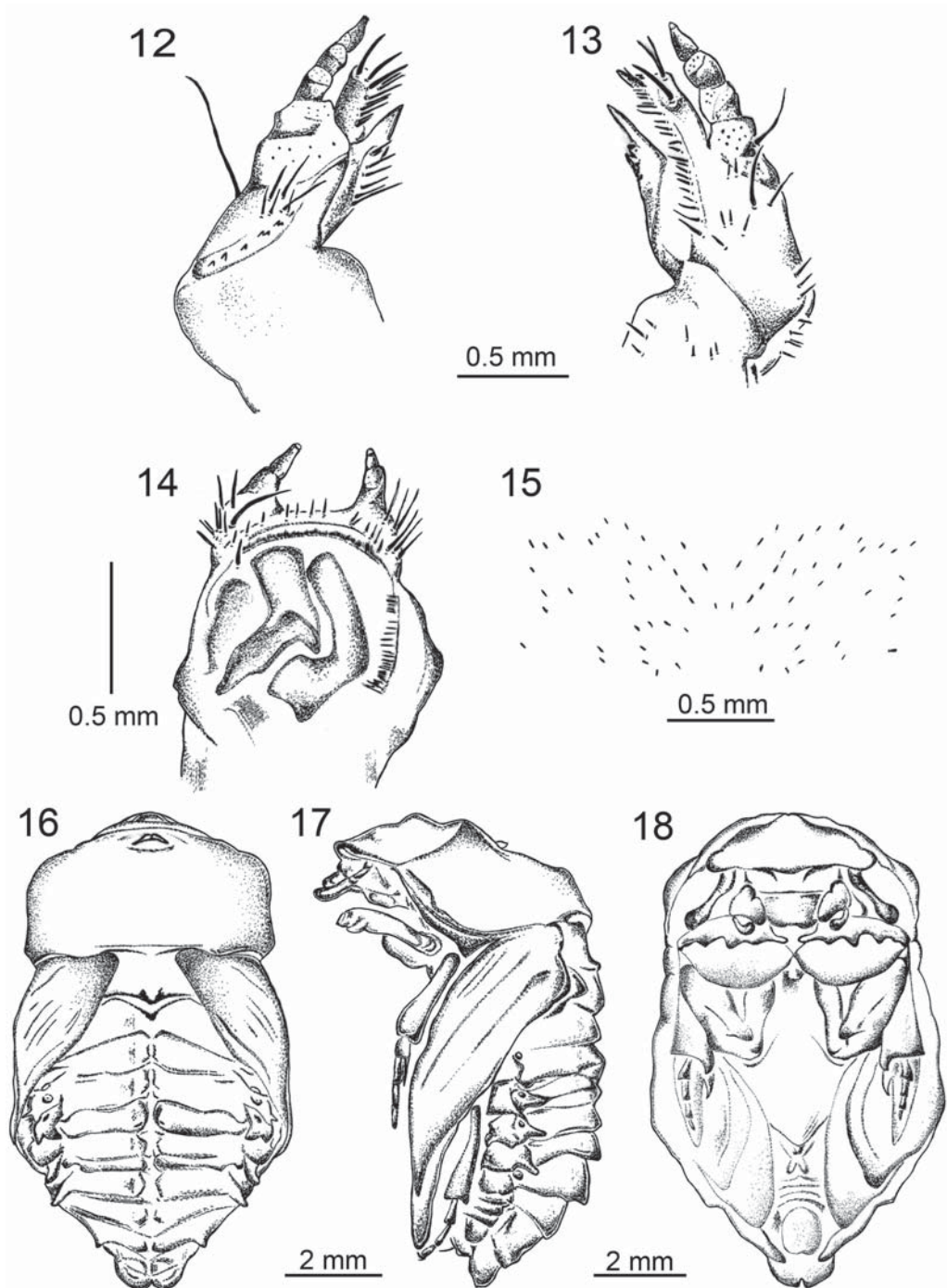
chaetoparia with 6–8 short setae in a group, left chaetoparia with 6–8 short setae aligned; plegmatia and proplegmatia absent; laeotorma and dextiotorma long and thin; haptolachus complete; epitorma conspicuous, anterior and posterior epitorma arrow-head-shaped, pterotorma absent; dexiophoba with 12–14 microsetae aligned; protophoba rounded, with 28–30 microsetae aligned; laeophoba similar to dexiophoba. **Antenna:** Short, 4-segmented with intersegmental edges indefinite (Fig. 5); antennomeres 1–2 subequal, 3 shorter than others, with 1 sensorial conical projection, 4 elongate. **Mandibles:** Asymmetric, strongly sclerotized. Right mandible (Figs. 6–8) with 2 scissorial blunt teeth (S_1 , S_2), S_2 short, separated from S_1 by a scissorial notch; molar area strongly and irregularly lobed, with 2 teeth; scrobe with 1 elongate seta, 1 median seta well-developed, and brustia with 2 short setae; ventral surface with a well-marked stridulatory area with a row of short setae (18–20). Left mandible (Figs. 9–11) with 3 scissorial teeth, S_3 smallest;



Figs. 3–11. *Ontherus sulcator*, third instar. **3)** Labrum; **4)** Epipharynx; **5)** Antenna; **6)** Right mandible, ventral view; **7)** Right mandible, frontal view; **8)** Right mandible, dorsal view; **9)** Left mandible, dorsal view; **10)** Left mandible, frontal view; **11)** Left mandible, ventral view.

ventral stridulatory area shorter than that of right mandible, with 8–12 setae; scrobe with 1 seta; brustia with a row of tight setae. **Maxilla:** Galea and lacinia separated (Figs. 12, 13); galea with apical uncus surrounded by 6–8 thick apical setae; uncus of lacinia with 2 basal teeth and inner edge of lacinia with 6–7 short setae. Maxillary palp 4-segmented, palpomeres 2–3 subequal, 4 conical with small sensorial area. Stridulatory area with

8 short teeth (Fig. 12). **Labium-hypopharynx:** Hypopharyngeal with quadrangular glossa (Fig. 14); central lobe of glossa with 8–10 aligned setae, lateral lobes with 6–8 elongate setae; 20–30 microsensillae skirting sclerome; 2 oncyli asymmetrical, strongly sclerotized; a row of elongate, silky setae on each side. **Thorax:** Whitish; segments with 2 lateral setae. Prothoracic shield with 5 setae on each side. Prothoracic spiracle 0.26 mm long, 0.24 mm wide;



Figs. 12–18. *Ontherus sulcator*. Third instar: 12) Left maxilla, dorsal view; 13) Left maxilla, ventral view; 14) Hypopharynx, dorsal view; 15) Raster. Pupa: 16) Dorsal view; 17) Lateral view; 18) Ventral view.

respiratory plate C-shaped, with concave margin directed ventrally, arms not constricted; plate with 12 holes across diameter at middle, holes with irregular edges. Legs with terminal papillae; prothoracic legs slightly shorter than meso- and metathoracic legs. **Abdomen:** Segment I: prescutum with 2–4 small setae; scutum with 6–8 long setae; pleural lobe with 1 short seta on each side. Segment II: prescutum glabrous; scutum with 7–8 elongate setae, scutellum with 8–10 elongate, separated setae. Segment III: prescutum with 28–30 short setae; scutellum with 20–22 short setae. Segments IV–VI with chaetotaxia similar to segment III. Segments VII–IX with 8–10 elongate setae. Segment X without dorsal setae. Raster (Fig. 15) distinct, with a broad, median patch of short setae arranged in 2 loose fields.

Ontherus sulcator Fabricius, 1775

pupa

(Figs. 16–18)

Description. Exarate, oval and stout. Body length 9.2 mm, maximum width 4.5 mm. Surface glabrous. **Head:** Antennae, clypeus, mandibles, maxillae, and labium well-discernible. **Thorax:** Pronotum quadrangular, approximately twice as wide as long, with rounded anterior angles; with 2 short, antero-median finger-like projections close together at base and divergent apically. Mesonotum narrow with a short, papillate, median projection at posterior margin. Metanotum with a longitudinal median ridge. Elytral and hind wing tecae closely appressed. Forelegs partially concealed by labium. Hind legs hidden by pterotecae, only tarsomeres visible. **Abdomen:** Dorsal tergal projections in each abdominal segment collectively forming a median ridge extending along the abdomen. Segments III–V with lateral finger-like projections with blunt apices; segments VII–IX coalesced; bilobate caudal projection present.

DISCUSSION

In their taxonomic review of immature dung beetles of Scarabaeinae, Edmonds and Halffter (1978) proposed combinations of the nine characters most useful in distinguishing genera. According to that study, the larvae of *O. sulcator* and *O. mexicanus* share most of the characters proposed for the genus. The shared characters are: sensory area of third antennomere conical; pedium bearing setae in right apical corner; uncus of lacinia with two basal teeth; pronotum with distinct shields bearing anterior angles; legs with terminal papillae; third abdominal segment lacking dorsomedian prominence; raster distinct, with broad median patch of widely scattered setae. The bidentate lacinial

uncus is so far unique to *Ontherus*, whereas the setose pedium is shared only with *Dichotomius*, *Heliocopris* Hope, and *Canthidium* Erichson (Edmonds and Halffter 1978). Finally, the arrangement of the setae in the raster of *Ontherus* species is very similar to that described in *Canthidium* species (Halffter and Edmonds 1978; González-Vainer and Morelli 1998). On the other hand, the third instar of *O. sulcator* can be distinguished from the larva of *O. mexicanus* by differences in chaetotaxy of the epipharynx and mandible: the chaetoparia of *O. sulcator* has 6–8 setae in contrast to the 12 in *O. mexicanus*; the lateral margin of the mandible of *O. sulcator* has one seta versus two in *O. mexicanus*.

Thus far, the pupa of *O. sulcator* is the only one described for the genus. Like all known scarabaeine pupae, it possesses a system of pupal support projections, which serve to minimize contact between the pupa and the wall of its pupation chamber (Edmonds and Halffter 1978). The set of support projections of the pupa of *O. sulcator* is comprised of a pair of short pronotal projections, pteronotal projections, mid-longitudinal dorsal ridges on each abdominal segment, three pairs of lateral tergal projections on abdominal segments III–V, and a caudal bilobate projection. The simultaneous presence of pro-, meso-, and metanotal projections on the pupa of *O. sulcator* is a character shared with other traditional genera of Dichotomiini, such as *Uroxys* Westwood (Morelli and González-Vainer 2007), *Canthidium* (Edmonds and Halffter 1978; González-Vainer and Morelli 1998), *Neocanthidium* Martínez, Halffter, and Pereira, and *Ateuchus* Weber (Edmonds and Halffter 1978). However, differences in the form and development of these projections can be observed among these genera. On the other hand, the number and distribution of lateral tergal projections on abdominal segments III–V is equal to that observed only in *Uroxys* (Morelli and González-Vainer 2007); the remaining known pupae of Dichotomiini have four pairs on segments III–VI. Finally, the median ridge extending along the abdomen and the callous-like caudal projection are common characters shared by most pupae of Scarabaeinae (Edmonds and Halffter 1978).

More detailed studies on the morphology of immature *Ontherus* are needed to establish the main diagnostic characters to separate the species of this group and compare them with other related genera.

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