ZOOLOGIA 39: e21024
ISSN 1984-4689 (online)
scielo.br/zool

RESEARCH ARTICLE

Description of the immature stages of the flea beetle *Omophoita personata* (Coleoptera: Chrysomelidae: Galerucinae: Alticini)

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https://zoobank.org/E5DD8979-3474-4753-98C4-47125A5E4047

ABSTRACT. Alticini is the most diverse tribe of Chrysomelidae with approximately 8,000 species. Despite of its high diversity, little is known about their natural history and immature stages. Herein, we describe the immatures of *Omophoita personata* (Illiger, 1807) reared in laboratory from adults sampled in field. We also investigated and compared with immatures of *O. octoguttata* (Fabricius, 1775). Detailed morphology and chaetotaxy are presented. Larvae of *O. personata* have their bodies covered with tubercles and the stemmata are absent. These characteristics are shared with other Oedionychina species, reinforcing the stability of these morphological characteristics as diagnostic of this subtribe. This study provides important descriptive and comparative data that increases the knowledge about Alticini immatures.

KEY WORDS. Larvae, larval morphology, Oedionychina, pupa description, taxonomy.

INTRODUCTION

Alticini are an important component of phytophagous entomofauna in different environments. This tribe has approximately 8,000 species in about 534 genera distributed around the world (Nadein and Bezděk 2014), with 1,410 species recorded for Brazil (Linzmeier 2022). Despite all this diversity, their biology is poorly known, especially when considering the immatures stages. However, there are a few studies describing the immatures of different species (e.g., Virkki and Zambrana 1983, Casari and Duckett 1997, Lee et al. 1998, Duckett and Moyá 1999, Biondi and Nardis 1999, Duckett and Swigoňová 2002, Duckett and Casari 2002, Lesage and Zmudzinska-Krzesinka 2004, Linzmeier et al. 2007, Casari and Teixeira 2011, Hua et al. 2013, Cabrera et al. 2016, Konstantinov et al. 2019).

Alticini's adults have a wide variety of shapes, colors and habits, and species of Oedionychina are among the largest, most colorful, and conspicuous. This subtribe is considered monophyletic and has more than 600 species in 23 genera distributed in the New World, mainly in the Neotropical Region (Ducket and Kjer 2003). They are easily recognized by their smooth or confusedly punctuated elytra, hind legs with femur generally well developed and apical metatarsomere globose (Scherer 1983). Among them *Omophoita* Chevrolat, 1836 has approximately 134 species distributed mainly in Central and South America (Blackwelder 1944, Scherer 1983, Ducket and Kjer 2003), of which 83 are recorded from Brazil (Linzmeier 2022).

Despite the diversity of this genus, few studies have addressed the natural history of its species or have sought to understand its role in natural environments. A few studies deal with host plants (Begossi and Benson 1988, Jolivet 1991), mimicry complex (Del-Claro 1991), chromosomal characterization (Almeida et al. 2009, 2010, Mello et al. 2014, Rosolen et al. 2018), and just a recently published paper give some data about larval morphology and biological aspects of *Omophoita octoguttata* (Fabricius, 1775) (Begha et al. 2021).

Therefore, considering the lack of information regarding immatures of this genus, is important to provide such data that can help in the understanding of its evolutionary history, as well as on the economic and ecological aspects of Alticini. Finally, this study aims to describe the external morphology and chaetotaxy of the immatures of *Omophoita personata* (Illiger, 1807), comparing it with other Alticini species.

MATERIAL AND METHODS

Immatures were obtained from adults sampled in field trips made in 2019 and 2020 at municipality of Realeza (-25.761349, -3.553202), state of Paraná, Brazil and reared in laboratory (26 ± 5 °C; 55–65% humidity, and natural light). The adults (couples) were maintained in transparent plastic containers (1000 ml) with a branch of the host plant – *Ocimum carnosum* (Spreng.) Link & Otto ex Benth. (Lamiaceae). After oviposition eggs were transferred to a new container with 1 cm of sieved and autoclaved soil (to avoid contamination by pathogens), and slightly moistened with distilled water, since this species pupate inside a cocoon in the soil. Adults and larvae were feed with the host plant and observed daily.

Immatures were killed and preserved in AGA (1-part acetic acid 100%; 1-part glycerin; 3-parts distilled water; 7-parts alcohol 100%), with specimens of each immature stages packed and labeled separately.

The external morphology of immatures and chaetotaxy were studied using stereomicroscope and microscope. Specimens were measured with a digital pachymeter. The length and width of larvae and pupa were measured in dorsal view immediately after killed. The eggs were measured before they were fixed in alcohol. The mean size is presented followed by the lowest and highest value and the number of specimens measured.

The first and third instars larvae, pupa, as well as some important taxonomic structures, were illustrated in ink using a stereomicroscope, equipped with camera lucida. The illustrations were scanned and vectorized with the Adobe Illustrator and Paint Tool Sai software. The terminology follows Costa et al. (1988) and Duckett and Swigoňová (2002).

Although the material of the three larval instars were available, the description is based on the third instar larva because the first and second instars are very similar to the third. Thus, differences observed among instars are presented in the remarks section. Furthermore, as we had available immatures of *O. octoguttata* reared in the laboratory they were also analyzed, permitting the direct comparison between species.

Voucher specimens of both species are deposited in the Coleção Entomológica UFFS-RE, of the Universidade Federal da Fronteira Sul, Campus Realeza, Paraná, Brazil.

TAXONOMY

Omophoita personata (Illiger, 1807)

Figs 1–11

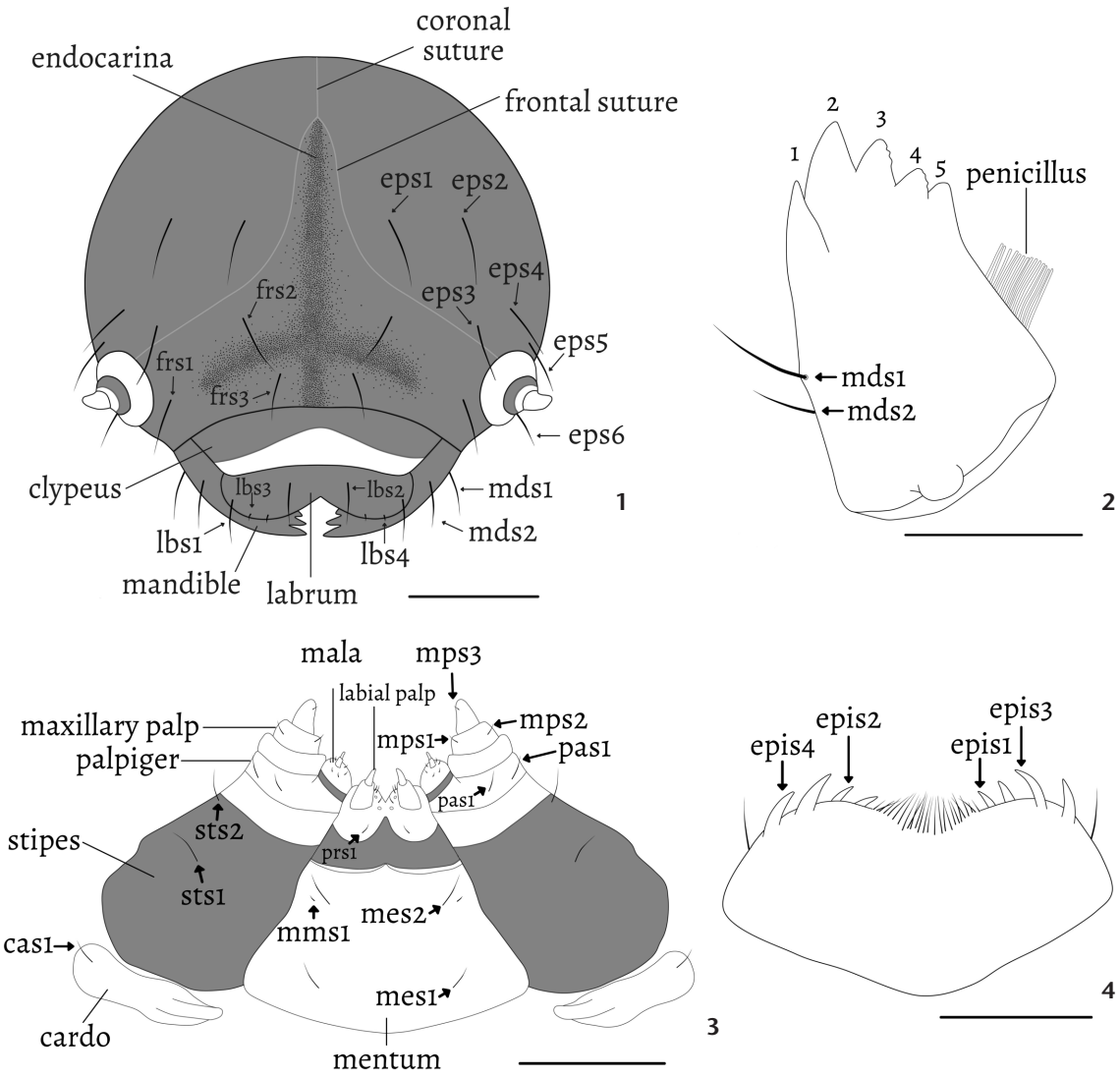
Egg (measurements in mm). Length 2.55 (2.26–2.66; N = 18), width 0.75 (0.64–0.87; N = 18). Color light brown, darker at the apex, elongated, fusiform, wider medially, narrower at the apex. Presence of micropyle at the apex. Chorion with grainy texture.

Third instar larva (measurements in mm). Body length: 12.93 (11.56–13.82; N = 4). Body width: 3.36 (3.22–3.52; N = 4).

Coloration. Head and legs black. All thoracic and abdominal segments orange in vivo, cream in AGA.

Head (Fig. 1). Hypognathous, rounded in frontal view, well sclerotized; slightly inserted into prothorax; epicranial suture Y-shaped; coronal suture short; frontal sutures pale, reaching antennal sockets. Endocarina long, robust, extending from base of frontal sutures to clypeus, externally represented by a slight depression, internally ridge-shaped. Each epicranial plate with one pair of filiform setae medially (eps1–2) and two pairs of filiform setae near antenna (eps3–6). Frons with three pairs of filiform setae (frs1–3), one pair near antenna (frs1), one pair medially (frs2), and one medially, near the frontoclypeal suture (frs3). Antennae small, glabrous, two-segmented; antennal sockets membranous, well-developed; base of first antennomere well sclerotized, wider than long; second antennomere cylindrical with conical apex. Stemmata absent. Clypeus transverse, sclerotized basally, membranous apically mainly in the median region. Labrum sclerotized, transverse, slightly wider than clypeus, with four pairs of filiform setae: two pairs of long setae, one laterally (lbs1) and one medially (lbs2), and two pairs of short setae (lbs3–4) near the anterior margin; anterior angles rounded, anterior margin notched medially. Mandibles (Fig. 2) symmetrical, palmate, strongly sclerotized, with five teeth: teeth 1 and 2 the longest, similar in length, teeth 3 and 4 slightly serrated, teeth 4 and 5 short; external face with two prominent filiform setae, one near tooth 1 (mds1) and other dorsomedially (mds2); condyle present, well developed; penicillus with a row of 14 short and thick setae. Maxilla (Fig. 3): cardo narrow, transverse, with one filiform setae (cas1) near outer margin; stipes elongated, wider basally, sclerotized, apically membranous, with two filiform setae (sts1–2); palpiger with two setae ventrally (pas1); mala pronounced, basally sclerotized, with a projection palpiform containing two segments, surrounded by six thick setae, followed by a line of flattened setae on the internal region; maxillary palp three-segmented: first palpomere glabrous, second palpomere with one ventral seta (mps1) and one ventrolateral seta (mps2); third palpomere with one ventral filiform microseta (mps3). Labium: postmentum greater than the prementum, weakly sclerotized, with two pairs of long filiform setae, one in the anterior region (mes1) and one in the posterolateral region (mes2), and one pair of short filiform setae anterolaterally (mms1); prementum basally sclerotized, with one pair of filiform setae near the base (prs1), three pairs of short setae (prs2–4) between the labial palps and two pairs of sensilla between the labial palps; labial palpi two-segmented. Hypopharynx densely covered with short and wide setae. Epipharynx (Fig. 4) with four pairs of thick and short setae (epis1–4) in the anterior angles and a dense set of thin setae in anterior margin, medially.

Prothorax (Fig. 5). Slightly smaller than following thoracic segments; pronotum with 20 short tubercles, each bearing one filiform setae, distributed as follows: two rows in the pronotum, one row on anterior margin with 12 tubercles (apt1–6) followed by one row with four tubercles (ppt1–2) (Fig. 5), one lateral pair

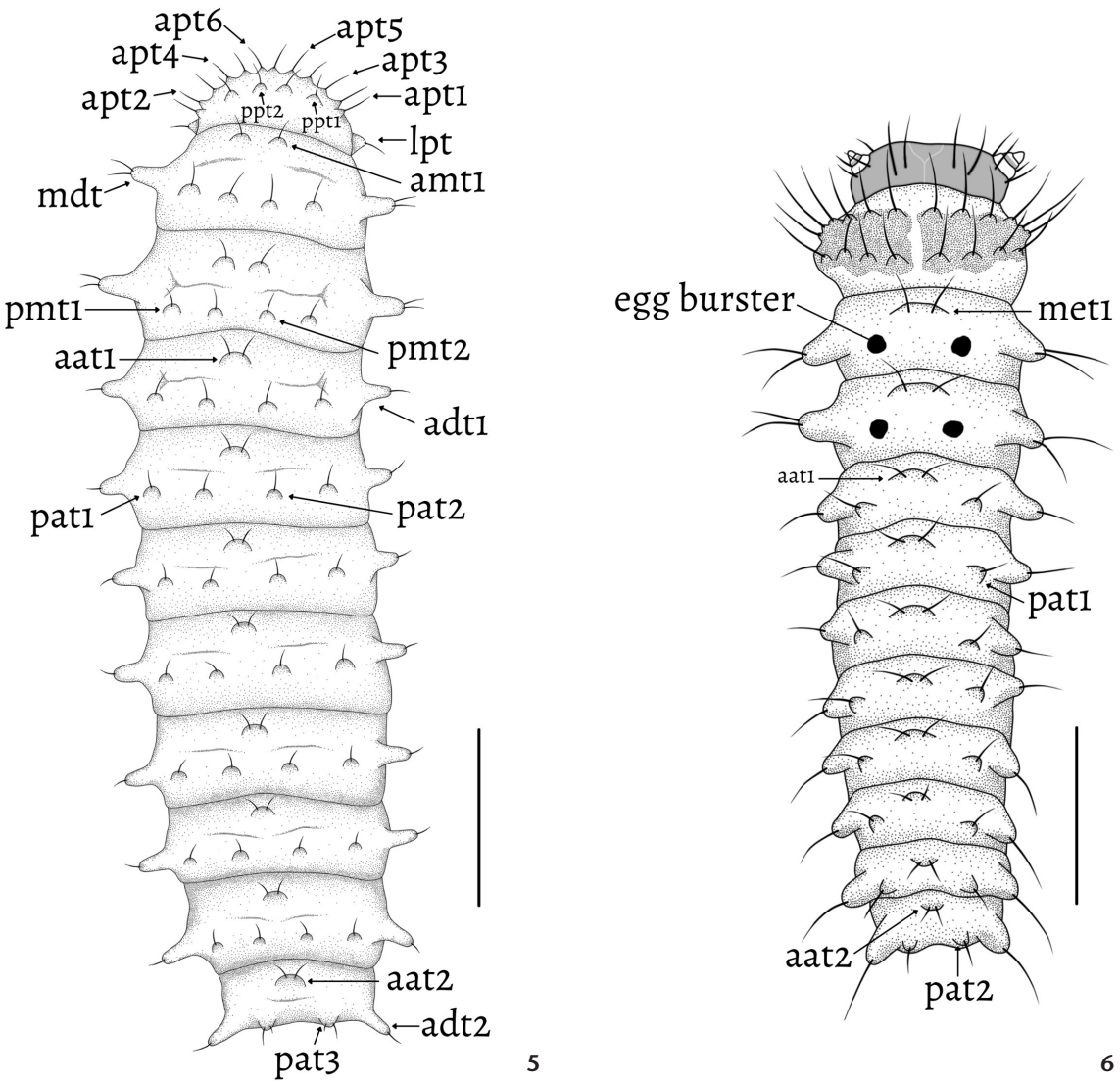


Figures 1–4. Head and mouthparts of third instar larva of *Omophoita personata*: (1) head, frontal view; (2) mandible, ventral view; (3) maxillae and labium, ventral view; (4) epipharynx, ventral view. Scale bars: 1 = 0.3 mm; 2–4 = 0.25 mm.

(lpt) and one anteroventrolateral pair (alt); prosternum with median Y-inverted-shaped sclerotization, containing two pairs of short setae (vpt1–2) medially (Fig. 7).

Mesothorax and metathorax (Figs 5, 7). With one pair of dorsolateral digitiform tubercles (mdt), bearing two filiform setae (from here called bisetose tubercles) and 10 short tubercles, bearing one filiform setae (from here called unisetose tubercles), distributed as follows: two transverse dorsal rows, the anterior row with one pair of tubercles (amt1) and the posterior row with two pairs of tubercles (pmt1–2) (Fig. 5), one anterolateral pair (lmt) and one ventral pair (vmt1) (Fig. 7); presence of one ventral bisetose tubercle (vmt2) (Fig. 7), anteriorlly to the pair of unisetose tubercles. Mesothorax with one pair of annuliform spiracles above the anterolateral tubercle.

Legs (Fig. 8). Partially sclerotized; coxa partially sclerotized, with trapezoidal shape, with ten filiform setae, distributed as follows: three long setae (cs1–3) in the posterior margin of the sclerotized region, one long setae (cs4) and one short seta (cms1) on the ventral inner margin, three short setae (cms2–4) in the anterior margin of the sclerotized region and two short setae (cms5–6) on the dorsal outer margin; trochanter with four filiform setae (ts1–4) ventrally; apex of femur with six filiform setae (fs1–6), the ventral seta (fs1) is the longest; tibia with seven filiform setae (tis1–7): five medially (tis1–5) and two short setae (tis6–7) at the apex. Tarsungulus elongated, almost straight, with one filiform seta (tas1) basally.



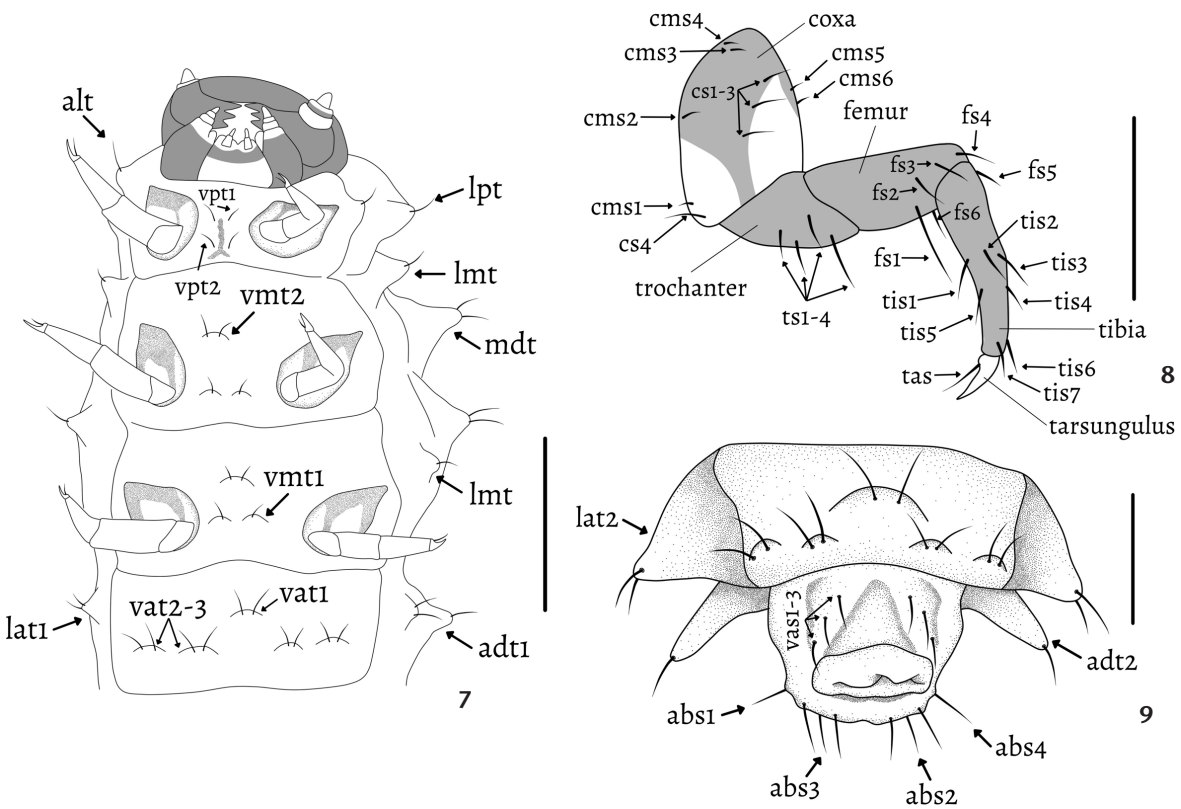
Figures 5–6. Larvae of *Omophoita personata*: (5) third instar larva, dorsal view; (6) first instar larva, dorsal view. Scale bars: 5 = 2.25 mm; 6 = 0.75 mm.

Abdomen (Figs 5, 6, 9). Segments I–VII with one pair of dorsolateral digitiform tubercles (adt1), unisetose, with filiform setae (Figs 5, 7) and 12 short tubercles, with filiform setae, distributed as follows: dorsally one anteromedially bisetose tubercle (aat1), followed by a row of two pairs of unisetose tubercles (pat1–2) (Fig. 5); laterally one bisetose pair of tubercles (lat1); ventrally five bisetose tubercles, one of them medially (vat1) and the others in a posterior transverse row (vat2–3) (Fig. 7). Segment VIII quadrangular, with one pair of dorsolateral digitiform tubercles (adt2), unisetose, directed posteriorly (Figs 5, 9); three bisetose dorsal tubercles with one short anterodorsal tubercle (aat2) and one pair of more developed tubercles (pat3) near the posterior margin (in these tubercles the basal seta is shorter) (Fig. 5); one pair of short lateral bisetose tubercles (lat2) (Fig. 9); ventral tubercles as in the previous segments (Fig. 9). Segment IX (Fig. 9) with 14 filiform setae, four dorsal pairs (abs1–4), near the posterior margin and three ventral pairs (vas1–3) arranged diagonally (Fig. 9). Segment X not visible in dorsal view; it emerges from segment IX, forming the anal pseudopod, fusiform (Fig. 9). Annuliform spiracles present in segments I–VIII, above the lateral tubercles.

Pupa (measurements in mm). Body length: 7.33 (6.17–8.27; N = 26). Body width: 3.73 (3.13–4.38; N = 26).

Coloration. Yellow in vivo, pale yellow in AGA.

Head (Fig. 10). Rounded, not visible dorsally, with three pairs of filiform setae (hs1–3) as follows: one interantennal pair



Figures 7–9. Third instar larva of *Omophoita personata:* (7) head, thorax and abdomen, ventral view; (8) leg, ventral view; (9) abdominal segments VIII–X, ventral view. Scale bars: 7 = 1.2 mm; 8 = 0.45 mm; 9 = 0.5 mm.

on frons, near the median line (hs1) and two pairs (hs2–3) at the vertex; mouthparts developed and visible; labrum with a pair of microsetae (lms1) in the anterior angles; antennae developed, with 11 antennomeres.

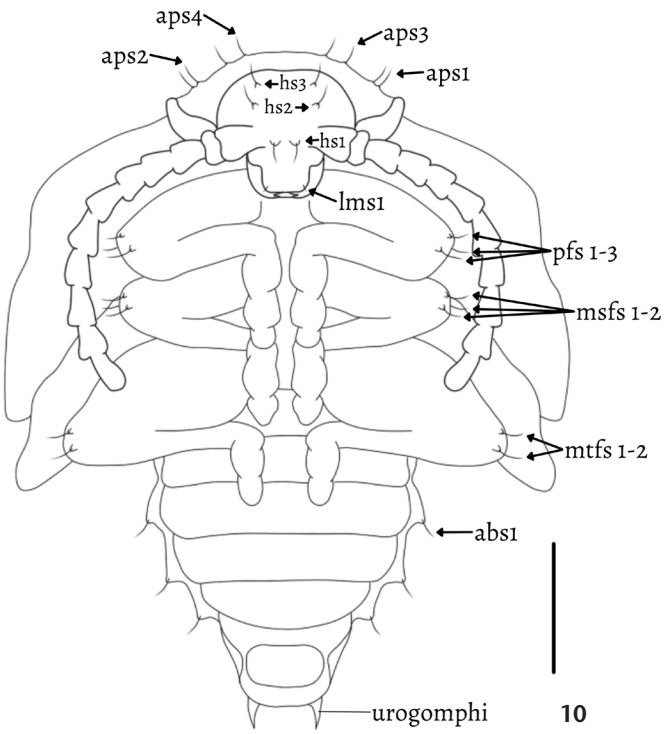
Prothorax (Figs 10, 11). With eight pairs of setae, four pairs anteriorly (aps1–4), two pairs medially (mps1–2) and two pairs (pps1–2) near the posterior margin.

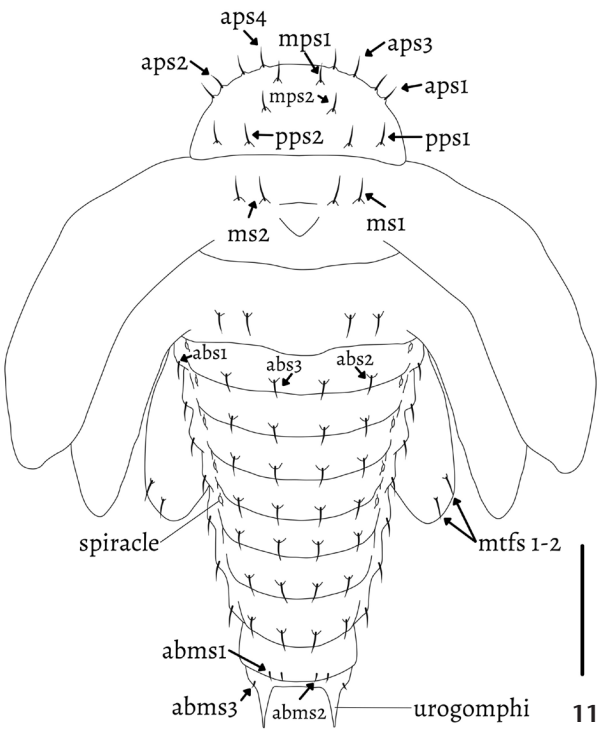
Mesothorax and metathorax. Mesonotum and metanotum (Fig. 11) with two pairs of setae (ms1–2) medially. Mesothorax with one pair of annuliform spiracles. Fore and mid-legs (Figs 10, 11) with three filiform setae at the apex of femur (pfs1–3; msfs1–3); hind legs with two setae at apex of femur (mtfs1–2).

Abdomen (Figs 10, 11). Segments I–VII with three pairs of setae inserted in small tubercles (abs1–3), evenly spaced, with two dorsal pairs and one lateral pair. Segment VIII with two pairs of short setae (abms1–2), thinner than those of the previous segments. Segment IX bearing one pair of urogomphi with apex directed posteriorly; base of each urogomphus with one microseta (abms3). Segments I–V with one pair of annuliform spiracles.

Remarks. The first-instar larva (Fig. 6) of *O. personata* has differences from advanced larval instars. Beyond the size (body length: 3.62 mm, 3.24–3.99 mm, N = 7; body width: 0.76 mm, 0.72–0.89 mm, N = 7), the following differences were observed, with characteristics of second and third instars shown between parenthesis: head visible in dorsal view (not visible), pronotum with darker coloration (lighter); prosternum with one pair of median setae (two pairs); mesonotum and metanotum with one pair of egg bursters (egg burster absent), one short bisetose tubercle (met1) in the anterior dorsal row (one pair of short unisetose tubercles in the anterior dorsal row); mesosternum and metasternum with one pair of setae posterior to the bisetose tubercle (one pair of unisetose tubercles posterior to the bisetose tubercle); abdominal segments I–VII with one dorsomedially bisetose tubercle (aat1), followed by one pair of unisetose tubercles (pat1) (one dorsal anteromedially bisetose tubercle, followed by a row of two pairs of unisetose tubercles); segment VIII with one bisetose anteromedially tubercle (aat2) and two posterior unisetose tubercles (pat2) (posterior tubercles bisetose). The second larval instar of *O. personata* was almost identical to the third instar, with differences in the body size (length: 6.91 mm, 6.00–7.82 mm, width: 1.70 mm, 1.60–1.80 mm; N = 2).

In general, the main differences from the first to second instar are the loss of egg bursters, replaced by two pairs of unisetose tubercles and the addition of tubercles and setae in the dorsal region of abdominal segments I–VIII.





Figures 10–11. Pupa of *Omophoita personata*: (10) ventral view; (11) dorsal view. Scale bars: 1.5 mm.

Analyzing the immatures of *O. octoguttata* no differences were found in external morphology and chaetotaxy in comparison to *O. personata*. Only differences in size were recognized as follows (measurements in mm): egg length: 2.40 (N = 1); width: 0.72 (N = 1). First instar body length: 3.75 (3.10–5.12; N = 4); body width: 0.82 (0.69–0.95; N = 4). Second instar body length: 7.62 (N = 1); body width: 1.54 (N = 1). Third instar body length: 12.73 (12.23–13.97; N = 4); body width: 4.26 (3.85–4.51; N = 4). Pupae body length: 7.15 (6.08–8.21; N = 5), body width: 3.90 (3.54–4.31; N = 5).

Material examined. Adults (10 males, 16 females): BRAZIL, Paraná state: 3 males, 3 females, Realeza municipality -25.761349, -3.553202, 27.I.2020, Rech, T., col./*Omophoita personata*, Linzmeier det. 2020; 2 males, 3 females, same data but 10.III.2020; 3 males, 2 females, same data but 13.III.2020; 1 male, 1 female, same data but 10.I.2020/*Omophoita octoguttata*; 1 male, 7 females, same data but 15.V.2019, Copini, C., col./*Omophoita octoguttata*.

Immatures (17 eggs, 10 first instar larvae, 2 second instar larvae, 6 third instar larvae, 30 pupae): All immatures were obtained from adults from same locality already mentioned and reared in laboratory. *Omophoita personata*: 16 eggs; 6 first instar larvae; 2 second instar larvae; 3 third instar larvae; 25 pupae. *Omophoita octoguttata*: 1 egg; 4 first instar larvae; 3 third instar larvae; 5 pupae. All immatures were preserved inside the same container, identified as "Material voucher 001".

DISCUSSION

The immatures of *Omophoita personata* here described and the immatures of *Omophoita octoguttata* also analyzed are very similar and the larvae cannot be differentiated based on their external morphology and chaetotaxy. Larvae of these species have thoracic and abdominal segments with prominent tubercles and no stemmata. According to Duckett and Swigoňová (2002), such characteristics can be used to distinguish larvae of the Oedionychina subtribe from the other Alticini, since they are found in different species as *Walterianella bucki* Bechyné, 1956, *Alagoasa parana* Samuelson, 1985, *Alagoasa januaria* Bechyné, 1955 and *Kuschelina gibbitarsa* (Say, 1824). The absence of stemmata is pointed out as a characteristic of miner or subterranean species and would also be a characteristic of individuals in the process of recolonizing arboreal environments (Reid 1995, Duckett and Swigoňová 2002). Although *O. personata* and *O. octoguttata* feed externally, larvae were found spending much of their time under the soil or protected under leaves, which could, somehow, be related to the absence of stemmata.

The eggs of *O. personata* are also similar to those of other Oedionychina species, both in their shape and by the fact that they are laid in clusters, with variations only in size.

The first instar larvae of *O. personata* and *O. octoguttata* are also similar to those of *Alagoasa bicolor* (Linnaeus, 1767), *A. januaria*, *W. bucki* and *Kuschelina bergi* (Harold, 1881) (Virkki

and Zambrana 1983, Duckett and Swigoňová 2002, Duckett and Casari 2002, Cabrera et al. 2016). *Omophoita personata*, *O. octoguttata*, *A. januaria* and *K. bergi* share egg bursters on meso and metanotum. This feature is absent in *W. bucki*, and for *A. bicolor* there is no information about this structure (Virkki and Zambrana 1983). The first instar of the two *Omophoita*' species can be differed from *A. bicolor* by the filiform setae in all tubercles (in *A. bicolor* the setae of the main tubercles are club-shaped) and absence of prothoracic and anal shields (prothoracic and anal shields present in all *A. bicolor* larval instars); from *A. januaria* by the head setae filiform (in *A. januaria* setae of frons and vertex are spatulate); from *W. bucki* by the digitiform dorsolateral tubercles (in *W. bucki* the tubercles are large, lobe-like) and presence of filiform setae in all tubercles (in *W. bucki* the setae are club-shaped).

Regarding the third instar larvae, the two *Omophoita*' species are very similar to *A. januaria* in morphology and chaetotaxy. However, in the abdominal segment VIII, that have the same morphology, a difference was found in terminology: the unisetose dorsolateral digitiform tubercles of *O. personata* were considered as two dorsal unisetose tubercles by Duckett and Swigoňová (2002). Furthermore, in the description of segments IX and X of *O. personata*, the segment X was considered as being formed by the anal pseudopod. In *A. januaria*, Duckett and Swigoňová (2002) describe the segment X as being formed by the anal pseudopod and another part with four pairs of setae arranged in a longitudinal row. This row was considered part of segment IX in *O. personata* as observed in the description of *W. bucki* (Duckett and Casari 2002) and has three pair of setae.

Comparing *O. personata* and *K. bergi* some differences were found such as: 16 unisetose tubercles on pronotum arranged in two rows, the anterior with 12 unisetose tubercles and the posterior with four unisetose tubercles (15 unisetose tubercles on pronotum, nine anterior and six posterior unisetose tubercles in *K. bergi*), meso and metasternum with a bisetose median anterior tubercle and two unisetose posterior tubercles (two bisetose median tubercles in meso and metasternum in *K. bergi*), and mandibles with five teeth, one pair of filiform setae and penicillus formed by a row of 14 short and thick setae (mandibles with four teeth, one seta and penicillus formed by two thick setae in *K. bergi*). More conspicuous differences were observed in relation to *Walterianella bucki*. *Omophoita personata* has frons with filiform setae (in *W. bucki* the setae on frons are stout), filiform setae on pronotum (in *W. bucki* the pronotal setae are club-like), segment IX with seven pairs of setae arranged closer to each (in *W. bucki* the pairs of setae are arranged more sparsely), dorsolateral tubercles digitiform (in *W. bucki* tubercles are much more developed.

The pupae of *O. personata* and *A. januaria* have similar chaetotaxy of the head and pronotum (mesonotum, metanotum and legs not described by Duckett and Swigoňová (2002), but were illustrated), and those of *O. personata* can be differentiate by one pair of setae on anterior angles of labrum (absent in *A. januaria*), segment VIII with two pairs of setae (glabrous in *A. januaria*), apex of urogomphi directed posteriorly with one pair of microsetae (apex directed inward to the center, glabrous in *A. januaria*). To *K. bergi* and *W. bucki* the pupa's description was not included in the studies (Duckett and Casari 2002, Cabrera et al. 2016), and to *Alagoasa bicolor* Virkki and Zambrana (1983) shows the development, but also does not describe the morphology.

It is important to mention that comparing larvae and pupa of *O. octoguttata* with the description presented by Begha et al. (2021), we were able to give complementary information since more detailed data about first and second instar larvae, mouthparts morphology, and pupa chaetotaxy were added. Moreover, some inconsistences related with morphological misinterpretations were also observed. Among them are the position of thoracic spiracles in mesothorax (not in prothorax as reported by the authors) as found in the vast majority of the Coleoptera (Costa et al. 2006), number of antennomeres and palpomeres, two and three respectively (not three and four, respectively), abdominal segments I–VII with two dorsolateral digitiform tubercles and 12 short tubercles (not eight tubercles), 16 filiform setae on pronotum (not ten setae), number of seta on each tubercle, since some are bisetose and other are unisetose (not all tubercles bisetose), and legs chaetotaxy.

Descriptions of immatures of Alticini species (Table 1) that do not belong to the Oedionychina, such as *Pseudolampsis darwini* (Scherer, 1964), *Pseudolampsis guttata* (LeConte, 1884), *Megistops vandepolli* Duviver, 1889 and *Distigmoptera borealis* Blake, 1943, have more conspicuous morphological differences compared to *O. personata*. Among them are the absence of prominent tubercles, the presence of sclerites throughout the body, presence of stemmata and distinct chaetotaxy pattern. These characteristics may be related to the environmental niches they occupy and their eating habits (external feeders of Angiosperms, leaf miners, moss inhabiting, etc) reflecting the evolutionary history of these groups, since such species are positioned in different clades within Alticini (Duckett and Kjer 2003). As for larvae, more conspicuous differences are observed between the pupae of *O. personata*, *Pseudolampsis darwini* and *P. gutatta*, which differ in chaetotaxy as well as in the presence of urogomphi (absent is *Pseudolampsis*' species). The urogomphi are found in *O. personata*, *O. octoguttata* and *Megistops vandepolli* which differs from the *Omophoita*' species by the urogomphi facing inward, legs glabrous and body covered with more setae.

Not all species addressed in this study have the pupa described. The lack of information and incomplete or superficial descriptions may be due to the lack of specimens in pupal stage, the difficulty of finding them in nature, conservation of the material and the disregard of pupae' characteristics for species characterizations.

Overall, the immatures of *O. personata* and *O. octoguttata*, as well as the other immatures of Oedionychina, have very similar morphological characteristics, reinforcing the morphological stability of immatures of this group. These immatures

Table 1. Morphological characteristics of larval first and third instar, and pupa of Alticini species.

	Oedionychina				Monoplatina			Dibolina
	Omophoita personata	*Alagoasa januaria*	*Walterianella bucki*	*Kuschelina bergi*	*Pseudolampsis darwini*	*Pseudolampsis guttata*	*Distigmoptera borealis*	*Megistops vandepolli*
First instar larva								
Egg burster	1 pair on meso and metanotum	1 pair on meso and metanotum	Absent	Present on meso and metathorax[1]	Absent	Absent	Absent	Absent
Third instar larva								
Prominent tubercles	Dorsolateral only	Dorsolateral only	Dorsolateral only	Dorsolateral only	No prominent tubercle	No prominent tubercle	No prominent tubercle	No prominent tubercle
Stemmata	Absent	Absent	Absent	Absent	Present	Present	Absent	Absent
Head	Hypognathous	Hypognathous	Hypognathous	Hypognathous	Hypognathous	Hypognathous	Hypognathous	Prognathous
Endocarina	Long	Long	Long	Long	Short	Short	Long	Long
Clypeus sclerotization	Basally sclerotized on the sides	Basally sclerotized on the sides	No information	No information	Basal half sclerotized	Basal half sclerotized	No information	No clypeus
Labrum – setae	4 pairs	8 pairs	2 pairs	2 pairs	2 pairs	2 pairs	2 pairs	2 pairs
Mandible – shape and teeth	Palmate – 5 teeth	Palmate – 5 teeth	Palmate – 5 teeth	Not described – 4 teeth	Palmate – 5 teeth	Palmate – 5 teeth	Palmate – 4 teeth	Not described – 4 teeth
Pronotum – setae	8 pairs	8 pairs	8 pairs	15 setae	7 pairs	7 pairs	10 pairs	9 pairs
Medial setae on prosternum	2 pairs	2 pairs	1 pair	2 pairs	Not described	1 pair	Absent	Absent
Body sclerites	Absent	Absent	Present	Present	Present	Present	Present	Absent
Spiracles	Annuliform	Annuliform	Annuliform	Annuliform	Annuliform	Annuliform	Annuliform	Annuliform
Segment IX – setae	7 pairs	4 pairs	7 pairs	8 pairs	5 pairs	5 pairs	3 pairs	4 pairs
Pupa								
Head – setae	3 pairs	3 pairs	Not described	Not described	6 pairs	5 pairs	Not described[2]	4 pairs
Pronotum – setae	8 pairs	8 pairs	Not described	Not described	7 pairs	7 pairs	4 pairs	11 pairs
Dorsal abdominal segs I–VII – setae	2 pairs	2 pairs	Not described	Not described	4 pairs	4 pairs	Not described	3 pairs
Spiracles	6 pairs – annuliform	6 pairs – annuliform rounded	Not described	Not described	6 pairs (last vestigial) rounded	6 pairs (last vestigial) rounded	Not described	6 pairs – rounded
Reference	Present paper	Duckett and Swigoňová (2002)	Duckett and Casari (2002)	Cabrera et al. (2016)	Casari and Duckett (1997)	Casari and Duckett (1997)	Konstantinov et al. (2019)	Linzmeier et al. (2007)

[1]Not report the number of egg bursters. [2]Have only the information "Presents short and long setae in tubercles".

characteristics along with those of adults, help to better characterize Oedionychina and could help clarify relationships between the groups.

ACKNOWLEDGMENTS

The authors wish to thank the reviewers for their valuable comments and contributions. TR thanks to Coordenação de Aperfeiçoamento de Pessoal de Nível Superior for the doctoral scholarship (process 88882.457426/2019-01). We also thank to H. Doerrier from HD translations for the language translation. Any proficiency inadequacies in the final English version are responsibility of the authors.

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Submitted: September 13, 2021
Accepted: June 3, 2022
Editorial responsibility: Ângelo Parise Pinto

Author Contributions

AIA TR and AML designed the study; TR obtained the immatures; AIA conducted the descriptions, made the illustrations and prepared the table; AIA TR and AML discuss, analyzed the data, and wrote the paper; AIA and AML revised the versions of the paper.

Competing Interests

The authors have declared that no competing interests exist.

How to cite this article

Antonio AI, Rech T, Linzmeier AM (2022) Description of the immature stages of the flea beetle *Omophoita personata* (Coleoptera: Chrysomelidae: Galerucinae: Alticini). Zoologia (Curitiba) 39: e21024. https://doi.org/10.1590/S1984-4689.v39.e21024

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