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Source: The Journal of the Lepidopterists' Society, 70(1) : 61-71

Published By: The Lepidopterists' Society

URL: https://doi.org/10.18473/lepi.70i1.a7

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Journal of the Lepidopterists' Society
70(1), 2016, 61–71

DISMORPHIA MELIA (GODART, [1824]) (PIERIDAE: DISMORPHIINAE): EXTERNAL MORPHOLOGY OF THE LAST INSTAR AND PUPA, WITH NOTES ON ITS TAXONOMY, VARIATION AND DISTRIBUTION

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ABSTRACT. The external morphology of the last instar and pupa of *Dismorphia melia* (Godart, [1824]) are described from specimens collected at São Bento do Sul, Santa Catarina, Brazil. Morphological descriptions and illustrations are provided on the basis of observations through stereoscopic microscope attached to camera lucida; results are compared and discussed with immature stages of other species of Dismorphiinae, Coliadinae and some tribes of Pierinae with the "type I" pupae. Moreover, the taxonomy of the species is discussed, on the basis of informations and illustrations of the intraspecific variability of the imagoes, the morphology of the genitalia of both sexes, and the geographic distribution.

Additional key words: *Inga*, Fabaceae, pupa, *Actinote*, mimicry

Dismorphiinae is a well-defined and mostly Neotropical subfamily of Pieridae, with about sixty species (Lamas 2004a, Braby et al. 2006). Species of this subfamily are characterized by the long, trisulcate antennae, particularly developed in the distal antennomers; flavones as pigments in the wings; tegumen much shorter than uncus or absent, uncus bilobed; valvae fused; and corpus bursae single, and several species are involved in mimicry with species of Nymphalidae (DeVries 1987, Ackery et al. 1998, Lamas 2004b). In a recent molecular phylogenetic analysis, Dismorphiinae was recognized as sister to the remaining subfamilies of Pieridae (Wahlberg et al. 2014), despite its presumed long association with the Pseudopontiinae. Of the seven recognized genera of Dismorphiinae, six are exclusively Neotropical (Braby et al. 2006); among these, *Dismorphia* Hübner, 1816 encompasses 30 recognized species. The Dismorphiinae genera can be distinguished chiefly by wing venation and characters of the male genitalia (Lamas 1979, Lamas 2004b), and *Dismorphia* was comprehensively diagnosed by Llorente (1984).

Dismorphia melia (Godart, [1824]) (Figs 1–8) is a species regarded as "rare" and indicative of well preserved forests (Brown 1992; Brown & Freitas 2000). This species is distributed in the Atlantic forests of Southeastern and Southern Brazil, from Rio de Janeiro to Rio Grande do Sul (e.g. Teston & Corseuil 2000, Iserhard et al. 2010, Monteiro et al. 2010). The male (Figs 1–2, 5–6) is mostly bright yellow or orange and dark brown, and the dimorphic female (Figs 3–4, 7–8) mimics species of *Actinote* Hübner, [1819], a fact that yielded a number of synonyms (Lamas 2004a).

Despite most species of Pieridae being common and abundant, their immature stages are surprisingly poorly known in the Neotropics, with the exception of a handful of species of agricultural interest. The immature stages of Pieridae could be generally described as follows: eggs are spindle-shaped and ribbed; larva usually with six annulets in the abdominal segments and protuberances of any type (i.e. scoli) absent, except for chalazae (Toliver 1987); pupa slender and tapered at the ends, usually keeled, with a single cephalic projection, and the metathoracic wing cases not visible ventrally (Mosher 1916); the pupa is attached to the substrate by a silk girdle and the cremaster attached to a silk pad. Some recent efforts shed some light on the biology and morphology of Neotropical species of the family (Braby & Nishida 2007, Freitas 2008, Braby & Nishida 2010, Kaminski et al. 2012), nevertheless, focusing in subfamilies other than Dismorphiinae. To illustrate the lack of knowledge of immature stages of Dismorphiinae, the host plant is known to less than one third of the species of *Dismorphia* (Beccaloni et al. 2008) — the largest and most known genus of the subfamily — and even less species were properly described. D'Almeida (1944) and DeVries (1986, 1987) offer brief accounts on the biology and morphology of some species of *Dismorphia*, but only three species were described in more detail. Most species of *Dismorphia* use *Inga* (Fabaceae: Mimosoideae) as host plants, but there are records for some other species of legumes (Beccaloni et al. 2008). This paper aims to describe the external morphology of the last instar and pupa of this species, since information provided by immature stages are referred as important

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to the taxonomy of Pieridae (Braby et al. 2006) and Dismorphiinae (Lamas 1979, Llorente 1984); additionally, notes on the taxonomy of the species based on the intraspecific variability of the imagoes, the genitalia morphology and geographic distribution are provided.

MATERIAL AND METHODS

Immature stages. Eggs of *D. melia* were observed in São Bento do Sul, Santa Catarina, Brazil, immediately after they were laid in an unidentified species of *Inga* by the female and reared on the host plant until the last instar. Last instars were collected and brought to the "Laboratório de Estudos em Lepidoptera Neotropical", Universidade Federal do Paraná (LELN-UFPR) and kept in laboratory under ambient conditions in a branch of the host plant inside a plastic bag. Immature stages were measured and observed in detail with the aid of a stereoscopic microscope equipped with micrometric lenses and camera lucida. Nomenclature follows Mosher (1916), Peterson (1962), and Stehr (1987) for larval and pupal morphology. Eggs, head capsules and pupal skins were dehydrated and preserved; voucher specimens were retained at the Coleção Entomológica Pe. Jesus Santiago Moure, Departamento de Zoologia, Universidade Federal do Paraná, Coleção de Imaturos de Lepidoptera (DZUP-IL).

Taxonomy, distribution and variation. Adult specimens were photographed and are illustrated in actual size; scale bars provided for other structures. Dissected specimens had their abdomens detached and placed in a test tube with potassium hydroxide 10% solution (KOH 10%). The test tube was heated in a bain-marie inside a beaker filled with water for 2–5 minutes; the genitalia were removed, dissected, and analyzed under stereoscopic microscope. Illustrations were prepared with the aid of a camera lucida. Full lines represent sclerotized structures, thin lines represent membranous structures, and dotted lines represent structures visible through transparent body parts. Distribution maps were prepared using DIVA-GIS 7.3.0 (Hijmans et al. 2011) software; distributional data are from specimens deposited at the DZUP and data available in the literature (Zikán & Zikán 1968, Brown 1992, Brown & Freitas 2000, Iserhard & Romanowski 2004, Zacca 2009, Iserhard et al. 2010, Monteiro 2010, Dolibaina 2011, Francini et al. 2011, Beltrami et al. 2014, Marchiori et al. 2014, Piovesan 2014); in the examined material section, this data are presented in increasing order of precision, such that the most precise piece of information is presented last. Species level and higher taxonomy follows Lamas (2004a) and Wahlberg et al. (2014), respectively.

RESULTS AND DISCUSSION

Immature stages. Last instar. (Figs 9–13, 17–18) Head capsule mostly green, slightly lighter than the body, rounded, with tapered translucent light brown setae over light brown chalazae; on the dorsal and lateral areas of the epicrania, the chalazae are larger and connected by light brown lines in a reticulated pattern (Fig. 11); epicanial suture yellowish green; frontoclypeus green, narrow, about three thirds the height of the head capsule (Fig. 17), clypeal area bulged; adfrontal areas narrow, but wider and nearer to the epicranial notch; labrum transluscent yellowish green, somewhat rectangular, with a deep ventral triangular indentation (Fig. 17); mandibles strong, heavily sclerotized along the smooth cutting edge, without cuspids; stemmata 1–4 lateral and anteriorly directed, equidistant and arranged in a semicircle, stemmata 2–4 elevated, 5 slightly elevated; stemma 5 ventral and ventrally directed; stemma 6 lateral and laterally directed, posterior to and somewhat in the same line of the stemmata 3–4 (Figs 17–18). Body (Figs 9–10, 12–13) nearly cylindrical, tapering posteriad after A6 and conspicuously at A9+10 (Figs 12–13); dorsal, subdorsal and supraspiracular areas green, spiracular area with a lighter yellowish green stripe that runs from T1 to A8, somewhat faded on T1 and A9+10; subspiracular area green, subventral and ventral areas light green; digestive tube visible through transparency, as a darker green shade along the dorsal area; spiracles bordered in light brown, with yellowish green peritrema; dorsal, subdorsal and supraspiracular areas covered by rows of translucent yellowish green truncated, knobby setae, which give the larva a velvety appearance; setae long and tapered on the subventral and ventral areas, longer over the thoracic legs and abdominal prolegs; thorax with four annulets per segment; thoracic legs translucent yellowish green, with brownish tarsal claws; T1 shield indistinct; prothoracic gland ventral, between the head capsule and T1; T1 spiracle ellipsoidal, on the subspiracular area (i.e. slightly ventral to the spiracular stripe) of the second annulet, larger than others; abdomen with six annulets per segment from A1–A6, A7 with five annulets, A8 with three annulets; no annulets are clearly discernible on A9+10; the first annulet of each segment is somewhat larger than the others; spiracles on A1–A6 more rounded and smaller, spiracle on A7 ellipsoidal and larger, but not as large as T1 and A8 spiracles, A8 similar in size to T1 spiracle; spiracles on the second annulet (A1, A7–A8) or between the second and third annulet (A2–A6); A9+10 posteriorly projected dorsally (Fig. 12); anal shield slightly lighter green than the body,

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FIGS. 1–8. *Dismorphia melia* (Godart, [1824]). **1–4.** Specimens from Santa Catarina, Brazil. **1–2.** Male, dorsal and ventral. **3–4.** Female, dorsal and ventral. **5–8.** Specimens from Rio de Janeiro state, Brazil. **5–6.** Male, dorsal and ventral. **7–8.** Female, dorsal and ventral. Scale bar = 1cm.

with tapered translucent light brown setae over light brown chalazae, somewhat trapezoidal in dorsal view; posterior edges of the anal shield with a pair of long, tapered terminal setae in each side of the projection and brown hook-shaped setae along the posterior edge (Fig. 13) ("anal comb"); crochets on the abdominal prolegs on A3–A6 as uniserial, triordinal, homoideous mesoseries, A9+10 crochets as a uniserial, triordinal, homoideous mesal pennelipse. Head capsule width: 4.1–4.3mm (n=2); length one day before prepupae: 4.15–4.25cm (n=2).

Pupa. (Figs 14–16, 19–21) mostly green, duller green dorsally, with a continuous yellowish green longitudinal stripe from the basilar tubercle, along the longitudinal ridge of the mesothorax and the abdomen, from A4 to the cremaster, fading posteriad; three pairs of small and irregular dark brown dorsal markings on the prothorax, A2 and A3 (Figs 14, 16); pupae slender and tapered at the ends, strongly keeled ventrally; silk girdle attached to the second abdominal segment. Head with a conical vertical projection about one fifth the length of the pupa; scape and pedicel dorsal, the former larger than

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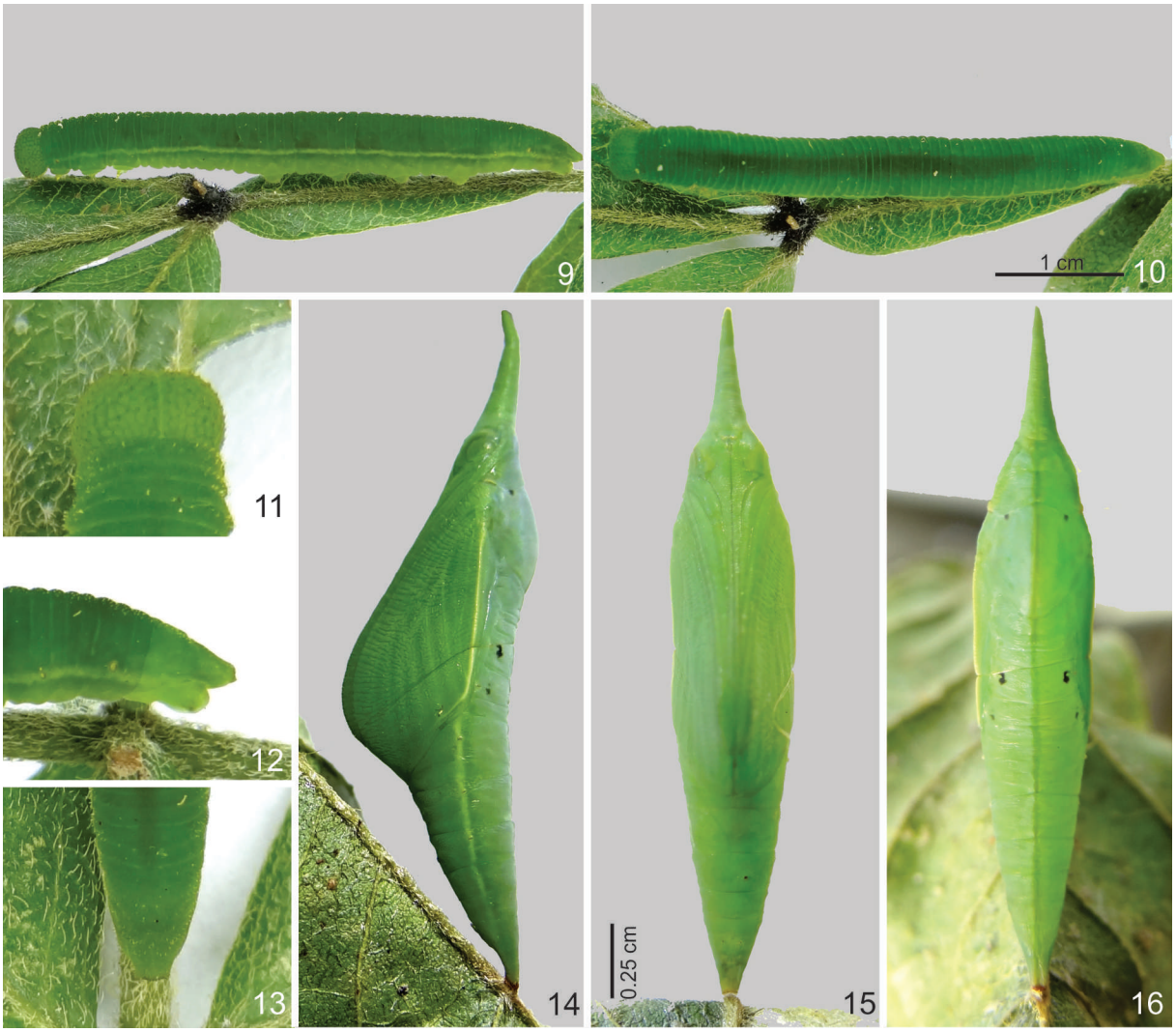

FIGS . 9–16. Last instar and pupa of *Dismorphia melia* (Godart, [1824]). **9–10.** Last instar, lateral and dorsal. **11.** Head capsule, dorsal. **12–10**. A9+10, lateral and dorsal. **14–16.** Pupae, lateral, ventral and dorsal. Scale bar: figs 9–10 = 1cm; figs 14–16 = 0.25mm.

the latter; antennae flagellum dorsal at first, extending ventrally and posteriorly between the mesothoracic wing cases; eye cases lateral; frons and clypeus indistinguishable from the genae; anterior tentorial fovea faint; mandibles pentagonal; labium narrow and long, somewhat lozenge-shaped, ventral to the mandibles and dorsal to the galeae; galeae extending between the mesothoracic legs not reaching the posterior end of the mesothoracic wing cases, but slightly longer then the antennae. Prothorax wide; mesothoracic spiracle slit-shaped, in a bulge between the prothorax and the mesothorax; mesothorax dorsally slightly bulged at the mesonotum; basilar tubercle and longitudinal ridge lateral, extending posteriorly in a more or less straight line and then bending ventrally to the posterior end of the mesothoracic wing cases; longitudinal ridge indented at the silk girdle; mesothoracic wing cases greatly enlarged ventrally, forming a keel, forewing shape and venation visible; prothoracic and mesothoracic legs between the galeae and the antennae, the former wider and slightly shorter than the latter; metathoracic legs not externally visible; metathorax, narrow, not bulged, 'M' shaped; metathoracic wing cases mostly covered by the mesothorax, not visible ventrally. First three abdominal segments subretangular, the remaining segments as conical sections, tapering posteriad; A1–A3 totally and A4 partially covered by the thorax ventrally; abdominal spiracles yellowish-brown and slit-shaped; A1 spiracle not visible; spiracles A2 and A3 dorsal, partially covered

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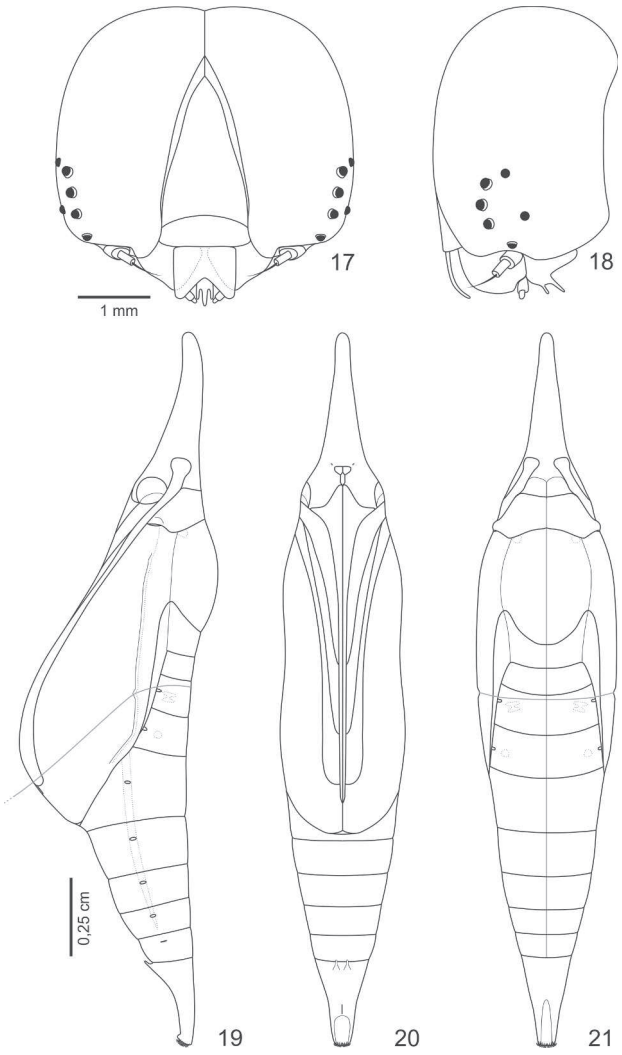
by the metathorax, spiracles A4–A8 lateral, on the anterior area of the segment; A8 spiracle reduced and apparently not functional; cremaster (i.e. A9+10) with a pair of anterior and ventral pointed projections, posteriorly dorsally and ventrally excavated, posterior end curved ventrally and flattened, with several tiny reddish brown hooks. Length: 2.02–2.25cm; greatest width in dorsal view: 0.45–0.47; greatest width in lateral view: 0.51–0.53cm; duration: 8 days (n=2).

DISCUSSION

All obtainable sources report species of Fabaceae, Mimosoideae, as host plants of species of *Dismorphia*, with only one exception in Caesalpinoideae (an unidentified species of *Cassia*) by Lamas (1985) (Beccaloni et al. 2008). The vast majority of records belong to species of *Inga*, but there are records of species of *Acacia, Cojoba, Mimosa* and *Zygia* (Becalloni et al. 2008, Janzen & Hallwachs 2015). As noted by Young (1973) and Aiello (1981), the cryptic behavior and the color of the larvae, which matches almost exactly the color of the leaves of the host plant, may confer protection against visually orientated predators; to a similar effect, the shape and color of the pupae resemble leaves and flower buds.

There are very few species of Dismorphiinae with descriptions of the immature stages; most accounts, as those provided for *D. amphione astynome* (Dalman, 1823), by D'Almeida (1944), and *D. zaela oreas* (Salvin, 1871), *D. crisia lubina* Butler, 1872; *D. zathoe pallidula* Butler & Druce, 1874; *D. amphione praxinoe* (Doubleday, 1844), by DeVries (1987) are very brief and scarce in illustrations. *Dismophia zaela oreas* was also described by Young (1973), but focusing in the biology and natural history rather than in morphology, nevertheless, brief descriptions and black and white illustrations were provided. *Dismophia amphione beroe* (Lucas, 1852) and *Dismorphia spio* (Godart, 1819), were decribed by Aiello (1981) and Torres (1991), respectively; those authors, in addition to the biological information, provide descriptions of the external morphology, with black and white illustrations. Later instars and pupae of *D. theucharila fortunata* (Lucas, 1854), *D. amphione praxinoe, D. crisia lubina* and *D. eunoe desine* (Hewitson, 1869) were illustrated in color by Janzen and Hallwachs (2015) (Figs 22–27), and some information on parasitoid biology are provided; last instars and pupae of *D. amphione* (Cramer, 1779) and *D. crisia* (Drury, 1782) were also illustrated by Le Crom et al. (2004).

Based on the information about the number of instars of other species of *Dismorphia*, the larvae of species of the genus usually undergo five stages. The fifth or last



FIGS . 17–21. Head capsule of last instar and pupa of *Dismorphia melia* (Godart, [1824]). **17–18.** Head capsule, anterior and lateral. **19–21.** Pupa, lateral ventral and dorsal. Scale bar: figs 17–18 = 1mm; figs 19–21 = 0.25cm.

instars of species of Dismorphiinae are apparently very similar, with limited species specific characters. DeVries (1987) noted that the immature stages of the Dismorphiinae are similar to each other and to generalized pierids, without any exceptional characteristics; the illustrations of *Enantia lina* (Herbst, 1792) and *Lieinix nemesis* (Latreille, [1813]) provided by Le Crom et al. (2004) support that assumption. Nevertheless, detailed examination reveals potential specific or supraspecific informative characters, as the color of the head capsule and chalazae, length, shape and color of the setae, number and development of annulets per segment, presence and development of a spiracular stripe and color and position of the spiracles. The color of the head capsules of *D. zaela oreas* and *D.*

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FIGS . 22–27. Last instar and pupae of species of *Dismorphia* Hübner, 1816 from Costa Rica illustrated by Janzen & Hallwachs (2015), with respective voucher numbers. **22–25.** Last instar, lateral. **22.** *D. theucharila fortunata* (Lucas, 1854), in prepupa, 05-SRNP-35409. **23.** *D. eunoe desine* (Hewitson, 1869), 09-SRNP-35899. **24.** *D. amphione praxinoe*, 05-SRNP-35409. **25.** *D. crisia lubina* Butler, 1872, 08-SRNP-36448. **26–27.** Pupae, lateral. **25.** *D. amphione praxinoe*, 07-SRNP-5106. **26.** *D. crisia lubina* 07-SRNP-35720.

zathoe pallidula are described as grey-green by Young (1973) and DeVries (1987), while green in other species; but with brown reticulated markings in *D. melia* (this study). The number of annulets per segment and the position of the spiracles on the annulets are identical in *D. melia* and in all species in which these characters could be directly observed from the illustrations, namely, *D. amphione praxinoe*, *D. crisia lubina* and *D. eunoe desine* (Janzen & Hallwachs 2015), but this character is usually neglected in descriptions. The spiracular stripe of *D. melia* are wider and lighter in color than other described species, in which the spiracular stripe is absent, faint or not continuous along the segments; the prepupa of *D. theucharila fortunata* illustrated by Janzen and Hallwachs (2015) (Fig. 22), the spiracular stripe appears to be well developed, but this may be due to its closeness to pupation. In all last instars of Dismorphiinae the spiracles are elliptical, as in species of Coliadinae (Toliver 1987).

The characters of the pupa of species of *Enantia* Hübner, [1819], *Lieinix* Gray, 1832 and *Dismorphia* (Figs 26–27) are almost identical (Young 1973, Aiello 1981, Torres 1991, Le Crom et al. 2014, Janzen & Hallwachs 2015) and generally similar to those of the Pseudopontiinae, Coliadinae, and the Pierinae tribes Teracolini and Anthocharidini (Braby et al. 2006). Braby et al. (2006) named these type of pupae as "type I" (Fig. 28), and described them as with the vertex tapered apically often forming a prominent point or spine; keeled ventrally at the mesothoracic wing cases; and smooth abdomen, in contrast to the apomorphic form of the Pierini, named "type II", and described as with the vertex with an anterior horn or spine-like process; thorax flat ventrally, but ridged dorsally; and bearing dorsal and/or dorsolateral spines on some segments of the abdomen. Both types of pupae are suspended by a silk girdle, but in "type I" the pupae are usually horizontally loosely suspended by the girdle, ventral side facing upmost, while in "type II" pupae are suspended vertically tight to the substrate, dorsal side facing upmost (Braby et al. 2006). Although similar, the pupae of Dismorphiinae are conspicuously slender than most "type I" pupae, such as species of Elodinini (Fisher 1984), Nepheroniini, species of the

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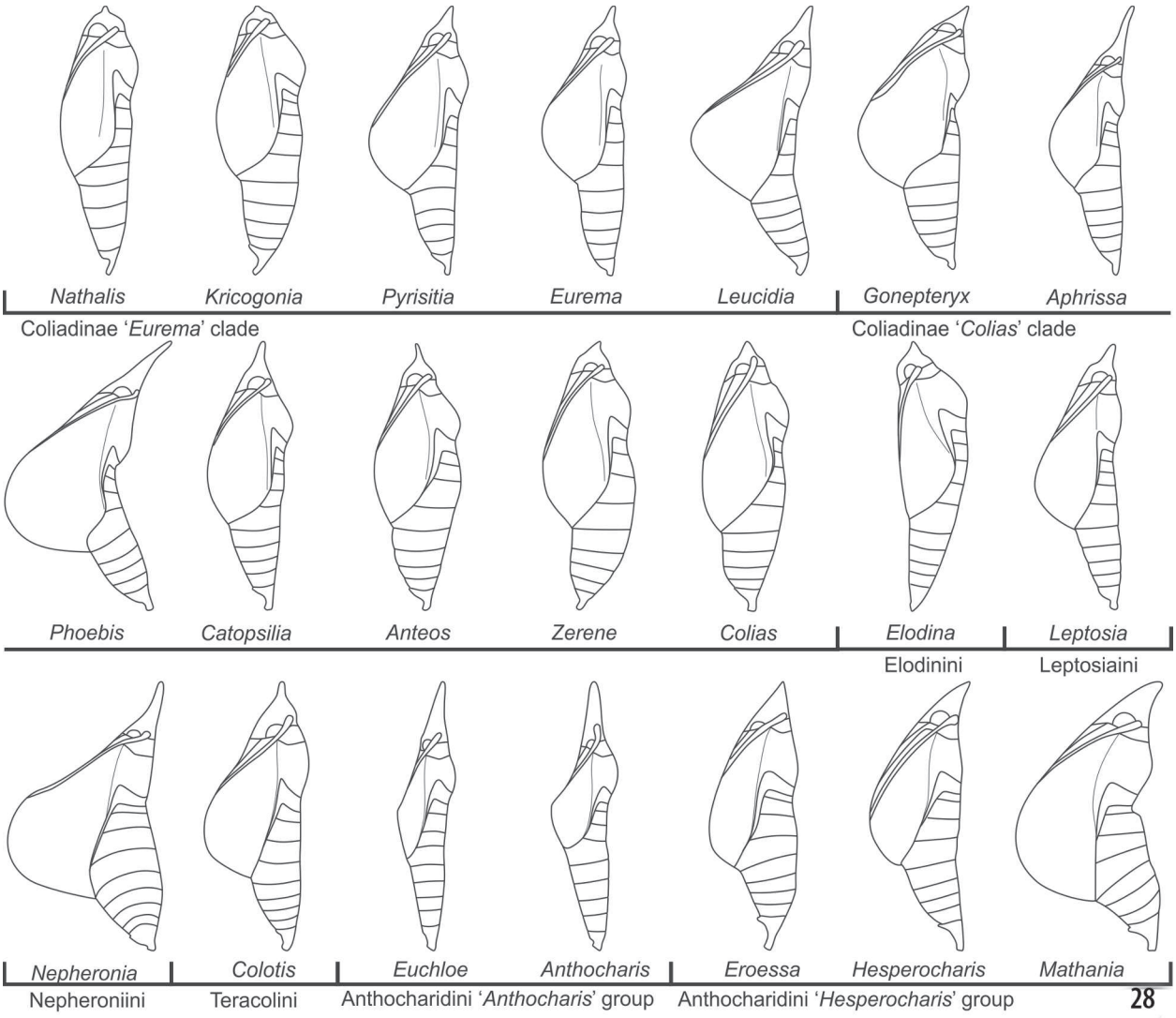

FIG. 28. Schematic representation of pupae of 21 species of Pieridae of the subfamily Coliadinae and the Pierinae tribes Anthocharidini, Elodinini, Leptosiaini, Nepheroniini and Teracolini with "type I" pupae (Braby et al. 2006), lateral. Illustrations not to scale and based on the references cited in the text; species groups by Braby et al. (2006), Braby (2007) and Wahlberg et al. (2014).

"*Hesperocharis*" group of Anthocharidini (Braby et al. 2007), most species of the "*Colias*" clade (Le Crom et al. 2004, van der Poorten & van de Poorten 2013, Wahlberg et al. 2014, Warren et al. 2015) and the divergent *Kricogonia* Reakirt, 1863 and *Nathalis* Boisduval, 1836 of the "*Eurema*" clade. In contrast, species of Teracolini, Leptosiaini (Clarck & Dickson 1967), species belonging to the "*Anthocharis*" group of Anthocharidini (Warren et al. 2015), species of *Aphrissa* Butler, 1873, and most coliadines of the "*Eurema*" clade (Le Crom et al. 2004, Freitas 2008, van der Poorten & van de Poorten 2013, Warren et al. 2015) are morphologically more akin to Dismorphiinae. In comparison, the development of vertical prominence is variable; generally much smaller, but similarly long to the plesiomorphic Dismorphiinae in species of *Aphrissa* and Anthocharidini of the "*Anthocharis*" group. The development of the ventral keel can be considerably variable in coliadines, being characteristically smaller and angled in species of Anthocharidini of the "*Anthocharis*" group. The morphology of the pupa is certainly phylogenetically informative in Pieridae (Le Crom et al. 2004), given its morphological diversity and the association of certain types of pupa to a genus or group of genera (Fig. 28). The morphologic types of pupa recognized here by Braby et al. (2006) and Braby

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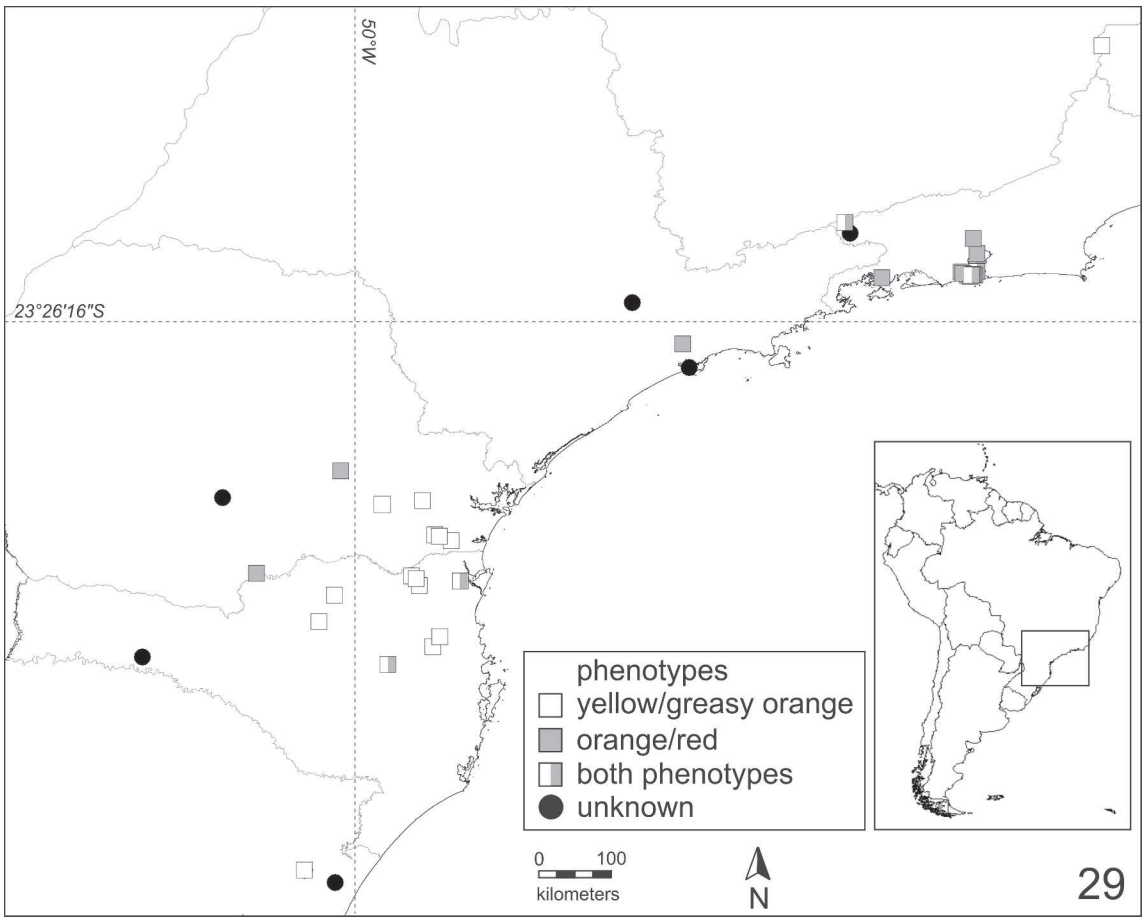

FIG. 29. Distributional map of *Dismorphia melia* (Godart, [1824]). White squares: records of "yellow and dark brown" males or "greasy-orange" females phenotypes; gray squares: records of "orange and dark brown" males or "red" females phenotypes; half gray and white squares: occurrence of both types of phenotypes (see text for detailed description of phenotypes); black circles: data of unknown phenotype from literature.

(2007) match closely the phylogeny of Wahlberg et al. (2014) based on molecular data, indicating that further detailed studies of immature stages may provide morphologic support for the groups recognized by those authors.

Taxonomy, distribution and variation. *Dismorphia melia* occurs in both coastal and interior Atlantic Forest from Minas Gerais to Rio Grande do Sul (Fig. 28), probably occurring in the state of Espirito Santo (Brown & Freitas 2000). Examination of specimens deposited at the DZUP reveals that both sexes are intraspecifically variable in that range, with extremes of variation intercalated by intermediary specimens along a somewhat latitudinal gradient. Male specimens from Southern Brazil are bright yellow and dark brown on the upper side (Figs 1–2), while female specimens are almost perfect mimics of species of *Actinote* of the "greasy-orange" mimicry group (Francini & Penz 2006), with the forewing upper side dull-colored, and somewhat translucent spots, glossy at the base of the wings, producing a visual effect similar to the greasiness observed in species of the above-mentioned mimicry group (Figs 3–4). In contrast, most male specimens from further North, from Southeastern and Eastern Brazil, are dull to bright orange and dark brown on the upper side (Figs 5–6), while the pattern of the females is variable, with some specimens similar to the described above, but never glossy at the base of the forewing upper side, and some with spots brightly colored, yellow or orange, falling in-between the *Actinote* "red" mimicry groups (Francini & Penz 2006) and the more widespread "tiger" pattern, common to some other species of *Dismorphia*, and species of Heliconiini and Ithomiini (Nymphalidae) (Figs 7–8). These differences in color pattern do not reflect in morphological differences between the genitalia of both sexes (Figs 30–32). It is interesting to note that *D. melia* is the only species of *Dismorphia* that mimics species of

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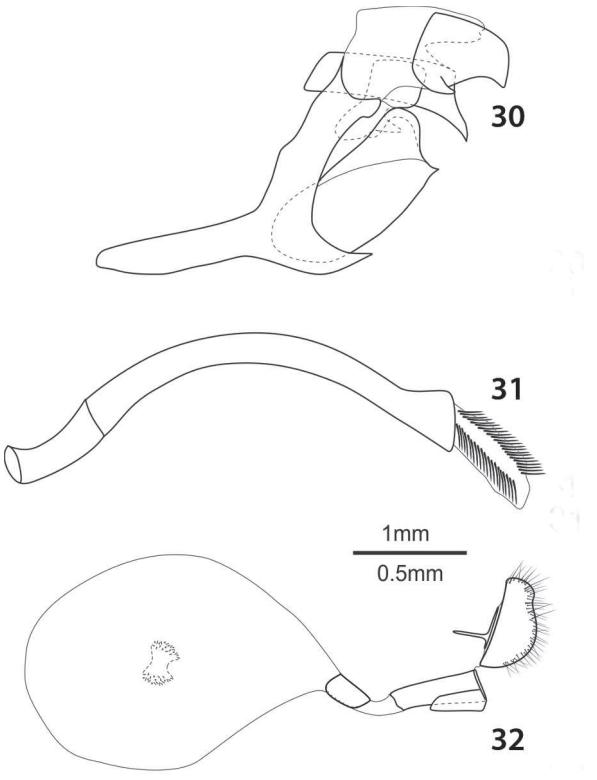
Actinote, an abundant and conspicuous element of the Atlantic Forest, considered impalatable by the presence of cyanogenic glycosides and pyrrholizidine alkaloids and subject to great intraspecific variability (Francini & Penz 2006). In addition to the similarity between the color pattern of those taxa, the mimetic association of *D. melia* as a Batesian mimic of species of *Actinote* is supported by the fact that species of *Dismorphia* are most likely palatable (Young 1973), as species of *Inga* are not known to contain toxic compounds (Ehrlich & Raven 1965), the cryptic color and behavior of the immature stages, and the apparent low abundance of the species. However, Brown (1992) reports that some species of Dismorphiinae are rejected by predators, therefore acting as Müllerian co-models. The intraspecific variation of the female follows closely the high level of intraspecific variation acknowledged in species of *Actinote* (Francini & Penz 2006). This variation, especially because of the dimorphic female, yielded a number of names, all of them currently recognized as synonyms of *D. melia* (Lamas 2004). *Pieris melia* Godart, [1824] was described on the basis of an orange male specimen from "Brazil", which was probably collected in the state of Rio de Janeiro; type specimens of taxonomic names currently recognized as junior subjective synonyms are all females with either the "red" mimicry group wing pattern, (i.e. *Leptalis eumara* Doubleday, 1848, type location unclear "America Meridionali"; *L. acraeoides* Hewitson, 1851, type location Minas Gerais, Brazil; and *D. mimetica* Staudinger, 1884, type location doubtful "French Guiana"); or of the "greasy-orange" mimicry group (i.e. *L. thalia* Müller, 1876, type location Santa Catarina, Brazil and *D. melia f. metallescens* Hoffmann, 1935, type location Santa Catarina, Brazil). Furthermore, two nomina nuda, *D. actinote* Kaye, 1911, **nomen nudum**, and *D. melia moena* Martin, [1923], **nomem nudum**, were supposed to be based on female specimens. Nevertheless, the homogeneity of the genitalia and the presence of both phenotypes sympatrically in some localities prevent the recognition of any of those names as valid taxa.



FIGS . 30–32. Genitalia of *Dismorphia melia* (Godart, [1824]). **30–31**. Male genitalia, lateral. **30.** Genital capsule. **31.** Aedeagus. **32**. Female genitalia, lateral. Scale bar: figs 30–31 = 1mm, fig. 32 = 0.5mm.

Examined material. Brazil – no data, 2 ♀, DZ 33.678, 33.679. Minas Gerais: 1 ♂, V-2013, 1200m. Rio de Janeiro: 1 ♂, 8-X-1961, DZ 33.661. Angra dos Reis – Jussaral, 1 ♂, 13-IV-1934, DZ 33.659. Resende – Mauá, 1150m, 1 ♂, IX-1956, H. Ebert leg., DZ 33.656; Serra de Itatiaia, 1500 m, 1 ♂, 14-IV-1951, Ebert leg., DZ 33.660, 800m, 2 ♀, 14-IV-1951, 15-IV-1951, Ebert leg., DZ 33.675, DZ 33.674. Petrópolis – Independência, 900m, 1 ♀, 15-IX-1939, Gagarin leg., DZ 33.676. Rio de Janeiro – 2 ♀, 11-VII-1934, 26-VII-1934, Gagarin leg., DZ 33.666, DZ 33.665, 2 ♀, Ferreira D'Almeida leg., DZ 33.667, DZ 33.668; Floresta da Tijuca, 1 ♂, 7-I-1969, Pe. Moure leg., DZ 33.647, 600m, 1 ♂, 22-III-1953, H. Ebert leg., DZ 33.657; Floresta do Macaco, 1 ♂, XII-1959, Altamiro leg., DZ 33.662; Icatú, 1 ♀, 15-V-1955, Gagarin leg., DZ 33.677; Jacarepaguá, Covanca, 2 ♂, 1-VI-1945, Silva leg., DZ 33.652, 9-IV-1945, DZ 33.651; Jacarepaguá, Três Rios, 2 ♂, 2-VIII-1922, DZ 33.650, 18-IX-1960, [illegible] leg., DZ 33.649; Morro de Santa Marta, 1 ♂, 23-VIII-1938, Gagarin leg., DZ 33.658; Paineiras, 1 ♀, 26-VIII-1982, Gagarin leg., DZ 33.669; Sumaré, 500m, 3 ♂ and 3 ♀, 31-VII-1967, Ebert leg., DZ 33.653, DZ 33.654, DZ 33.655, DZ 33.670, DZ 33.671, DZ 33.672; Sumaré, Serra de Santa Tereza, 1 ♀, 9-IX-1917, Ferreira D'Almeida leg., DZ 33.673. São Paulo: Ribeirão Pires – 800m, 1 ♂, 27-IV-1963, Ebert leg., DZ 33.633. Paraná: Curitiba – 900m, 1 ♀, 14-IV-1977, O. Mielke leg., DZ 33.640. Guaratuba – Pontal do Itararé, 950m, 2 ♂ and 1 ♀, 19-II-2005, O.-C. Mielke leg., DZ 33.619, DZ 33.620, DZ 33.639. Ponta Grossa – 1 ♂, 21-IV-1967, Mielke leg., DZ 33.617; Quintal, 1 ♂, XII-1940, DZ 33.616. Balsa Nova – São Luiz do Purunã, 1 ♂, 30-IV-1-V-2006, Beltrami & Selusniaki, DZ 33.618. Tijucas do Sul – Rincão, 900m, 1 ♀, 25-II-1969, Mielke &

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Sakakibara leg., DZ 33.635; Vossoroca, 850m, 1 ♀, 23-I-1977, Mielke leg., DZ 33.634. União da Vitória – 4 ♂ and 3 ♀, III-1950, C. Bruhm leg., DZ 33.612, DZ 33.613, DZ 33.614, DZ 33.615, DZ 33.637, DZ 33.638, DZ 33.663, 1 ♀, III-1950, Justus leg., DZ 33.636. Santa Catarina: 1 ♂, III-1963, DZ 33.621; Alto Rio Itajaí, 400m, 1 ♂, H. Wuff leg., DZ 33.631. Dalbergia, 2 ♀, 11-II-1932, 30-III-1932, d'Almeidaex-coll., DZ 33.664, paralectotype metallescens Hoffman, 1935, DZ 31.900, lectotipo metallescens Hoffman, 1935. Ituporanga, 3 ♂, II-IV-1970, Sommer leg., DZ 33.625, DZ 33.626, DZ 33.648. Joinville – 10-200m, 1 ♂, X-1978, Miers leg., DZ 33.622, 1 ♂ and 1 ♀, 5-IV-1980, 20-IV-1969, Mielke & Miers leg., DZ 33.623, DZ 33.641, 0-200m, 1 ♂, 25-IV-1991, Miers leg., DZ 33.624. Monte Castelo – 800m, 1 ♀, 24-II-1973, Ebert leg., DZ 33.646. São Bento do Sul – 1 ♂, 8-V-1971, Weiss leg., DZ 33.632, 900m, 1 ♀, 12-III-1980, H. Ebert leg., DZ 33.644; Rio Natal, 1 ♀, 2-II-2012, Rank leg., DZ 33.642; Rio Vermelho, 850m, 2 ♂ and 1 ♀, 2-IV-1980, 21-XI-2004, 22-II-1974, Rank leg., DZ 33.630, DZ 33.629, DZ 33.645. Santa Cecília – Campo Alto, 2 ♂, 22-II-1973, O.H. Mielke leg., DZ 33.627, DZ 33.628.

ACKNOWLEDGEMENTS

We would like to thank Sr. Ivo Rank (São Bento do Sul, Santa Catarina, Brasil), Thamara Zacca (UFPR) for providing details of the ex-collection of Prof. Johann Becker, and Prof. Dr. André Victor Lucci Freitas and Dr. Lucas Augusto Kaminski for critically reviewing the manuscript and providing additional distributional data. We also thank the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for providing financial support to the authors (FMSD 150542/2013-5, GLL 134752/2013-9, MMC 308247/2013-2, OHHM 304639/2014-1).

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Submitted for publication 3 June 2015; revised and accepted 12 December 2015.

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