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Macrocydia divergens, a new genus and species of Grapholitini (Lepidoptera: Tortricidae: Olethreutinae) from Central America

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ABSTRACT

Macrocydia divergens Brown and Baixeras, ***new genus*** and ***new species***, from Costa Rica and Panama, is described and illustrated. The new genus can be distinguished from other Grapholitini by its remarkably large size, distinctive pale forewing pattern, and elongate, porrect labial palpi. Other interesting morphological features of diagnostic value include female frenulum with two bristles (three in most Tortricidae), female genitalia with a single large signum (paired in most Grapholitini), and a well-defined chorda and M-stem in the forewing venation. Owing to its highly divergent appearance and the relatively unremarkable male and female genitalia of the single included species, which are similar to many species of *Cydia* and *Grapholita*, it is not possible to identify the closest relative of *Macrocydia*.

Key words: Costa Rica, faunal inventory, Neotropical, Panama, Systematics

INTRODUCTION

Over the past two decades significant progress has been made towards inventorying and describing the Neotropical tortricid fauna, with the vast majority of descriptive work contributed by Józef Razowski (e.g., 1984, 1987, 1994, 1997a, b, 1999a, b, c) and Razowski and Becker (e.g., 1993, 1994, 1999, 2000, 2004). These efforts have focused almost exclusively on the subfamilies Tortricinae and Chlidanotinae, with exceedingly few descriptions of Olethreutinae, suggesting that this subfamily may be less species-rich in the region. However, the low number of new Olethreutinae is almost certainly the result of taxonomic bias of current researchers rather than an indication of lower diversity of this group in the Neotropics. Parallel descriptive efforts on the African and Asian faunas show a similar pattern (e.g., Aarvik, 2004a, b, Pinkaew et al., 2005).

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The tribe Grapholitini (Olethreutinae) includes 50 described genera worldwide, 10 of which are recorded from the Neotropics (Powell et al., 1995): *Dichrorampha* Guenée, *Riculoides* Pastrana, *Talponia* Heinrich, *Pammene* Hübner, *Ethelgoda* Heinrich, *Grapholita* Treitschke, *Ofatulena* Heinrich, *Ecdytolopha* Zeller, *Gymnandrosoma* Dyar, and *Cydia* Hübner. Of these 10, only the monotypic *Riculoides* is restricted to the New World tropics. We take this opportunity to add a new genus to the fauna that apparently is restricted to Central America. The new genus is one of many new taxa that has accumulated during survey work in Costa Rica conducted by parataxonomists associated with Instituto Nacional de Biodiversidad (INBio), Santo Domingo de Heredia, Costa Rica, and the NSF-funded ALAS Project (Arthropods of La Selva).

MATERIALS AND METHODS

Specimens were borrowed from or examined at the following institutions: INBio and National Museum of Natural History, Washington, D.C., U.S.A. (USNM). Dissection methodology follows that presented in J. Brown and Powell (1991). Images of adults and genitalia were obtained using a Microptics digital camera system and enhanced using Adobe Photoshop© and Illustrator© software. Terminology for genitalia structures and wing venation follows Horak (1984). Terminology for the forewing pattern follows R. Brown and Powell (1991), with modifications by Baixeras (2002).

SYSTEMATICS

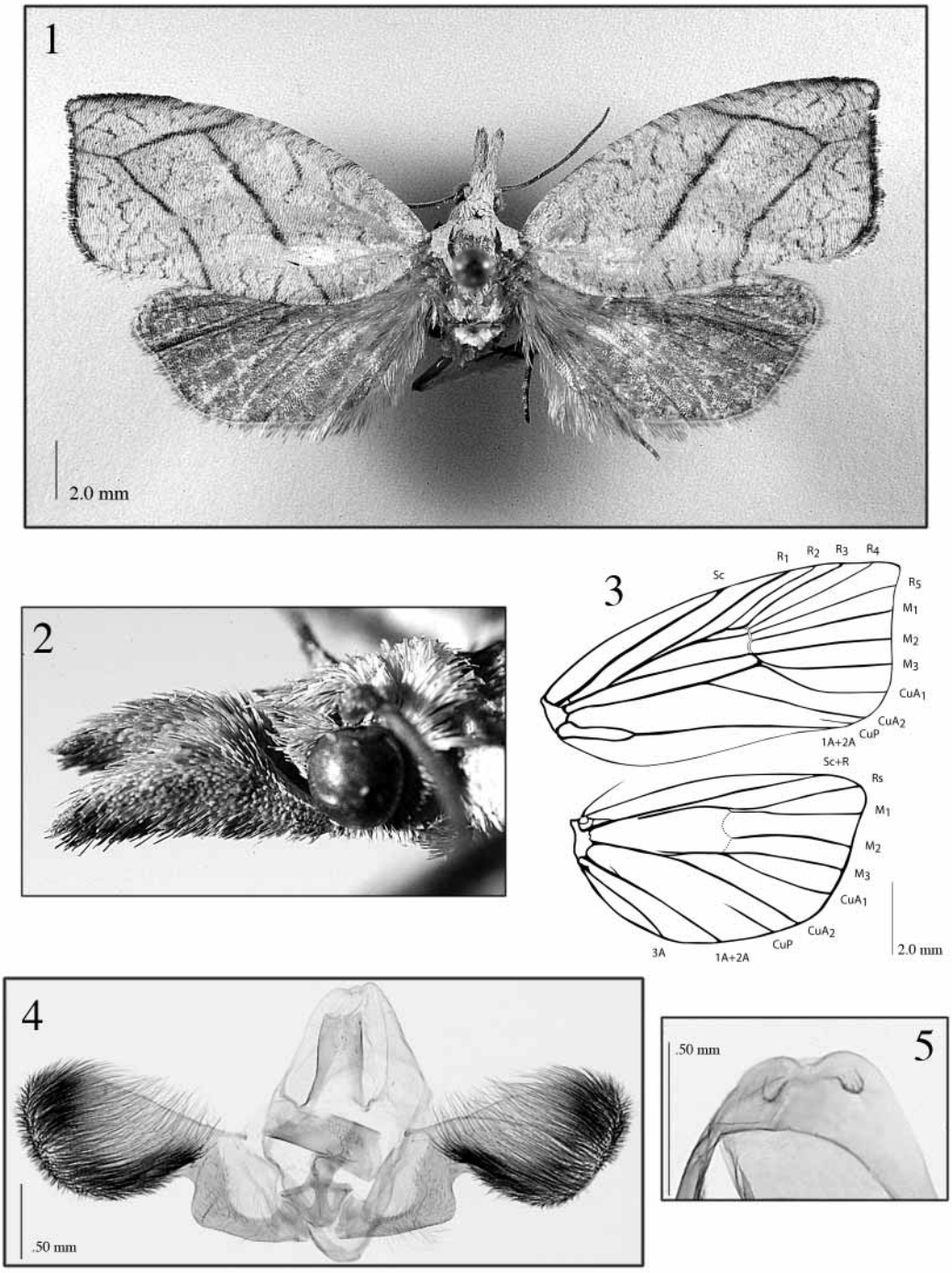
Macrocydia Brown and Baixeras, *new genus*

Figs. 1–6

Type species.—*Macrocydia divergens* Brown and Baixeras, new species.

Diagnosis. *Macrocydia* can be distinguished easily from all other Grapholitini by its conspicuously large size, distinctive pale forewing pattern (Fig. 1), and elongate, porrect labial palpi (Fig. 2), all of which combine to give it an appearance superficially similar to some Sparganothini (Tortricinae) (e.g., *Amorbia rectilineana* (Zeller)). Other interesting morphological features of diagnostic value include a female frenulum with two bristles (usually three in Tortricidae), female genitalia with a single large signum (usually paired in Grapholitini) (Fig. 6), and a well-defined chorda and M-stem in the forewing venation (reduced or absent in most Grapholitini) (Fig. 3). The male genitalia (Figs. 4, 5) are similar to many species of *Cydia* and *Grapholita*, with a weakly sclerotized tegumen, no uncus, a valva with a rounded cucullus, and a short, stout aedeagus with a dense cluster of slender deciduous cornuti. Owing to its highly divergent external appearance and the relatively

unremarkable male and female genitalia of the single included species, it is not possible to identify the closest relative of *Macrocydia*.



FIGURES 1–5. Morphological features of *Macrocydia divergens*. 1. Adult female paratype; 2. Head; 3. Wing venation (USNM slide 84,930); 4. Male genitalia with valvae spread, aedeagus in situ (USNM slide 82,501); 5. Dorsum of tegumen of male genitalia (USNM slide 94,195).

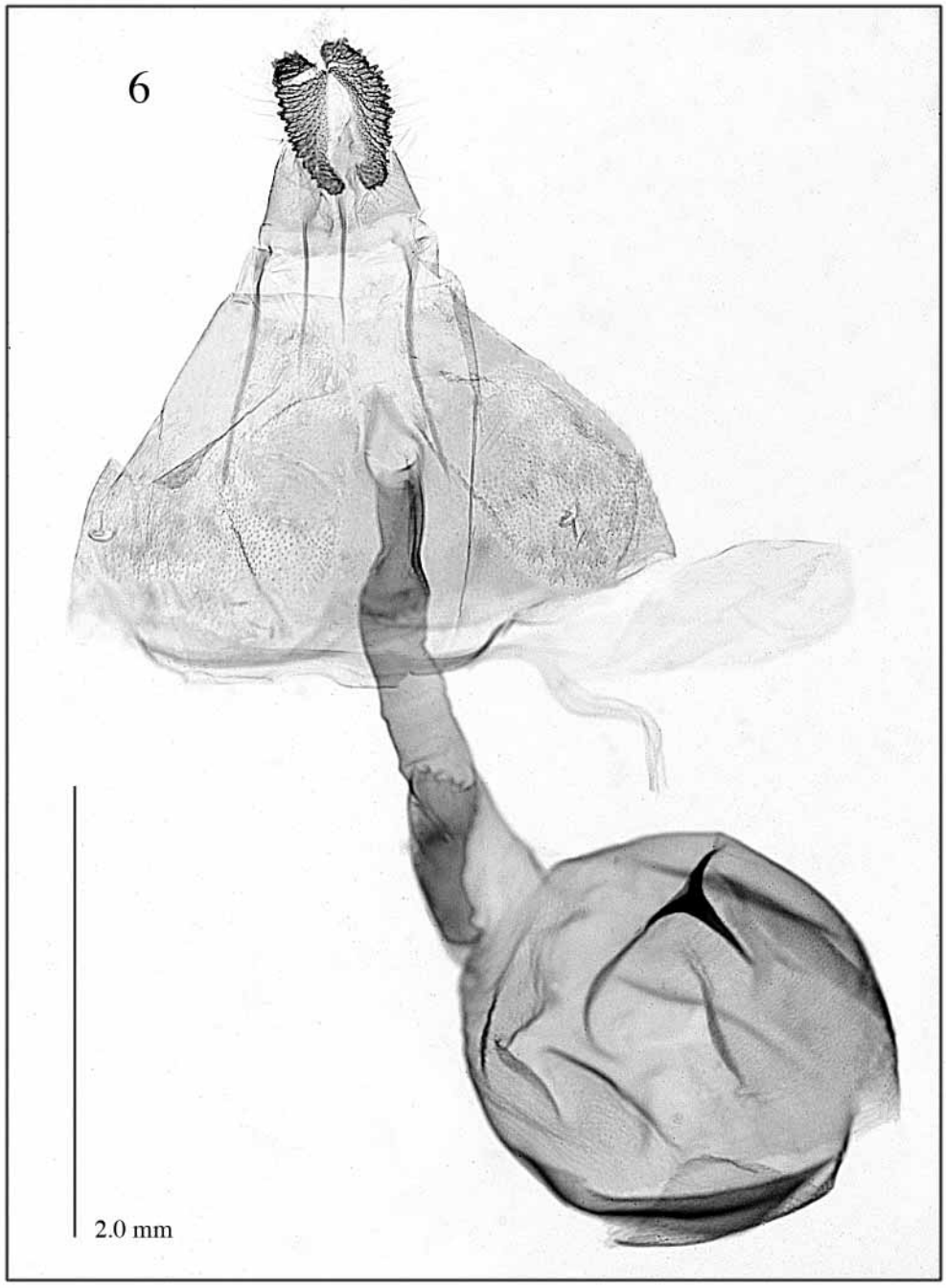


FIGURE 6. Female genitalia of *Macrocydia divergens* (USNM slide 94,196).

The tribe Grapholitini is defined by a feature of the hindwing venation (i.e., M_2 and M_3 parallel and widely separated at the base) and characteristic reductions in the male and female genitalia (Horak and Brown 1991). However, according to Horak and Brown

(1991) the group may represent a polyphyletic assemblage of genera based on the supposition that these features may reflect parallel reductions rather than synapomorphies. Although this hypothesis has merit, no genera outside Grapholitini have been implicated as sister-groups to taxa within the tribe. Komai (1999) defended the monophyly of the tribe based on a putative synapomorphy: the shortened sternum 8 in the male with a straight posterior margin. All of these characters, i.e., hindwing venation, reduced genitalia, and shortened sternum, are present in *Macrocydia*. Nonetheless, *M. divergens* will not key to any described genus using either Heinrich's (1926) revision of North American Laspeyresiinae, which includes all but one of the genera recorded from the Neotropics (Powell et al., 1995), or Komai's (1999) review of the Palaearctic *Grapholita* group of genera. Although the two-bristled frenulum in the female is unusual, this character state is found in several other Grapholitini (e.g., a few species in each of the genera *Pammene*, *Cydia*, and *Grapholita*); Komai (1999) proposed that it represented a synapomorphy for *Strophedra* Herrich-Schäffer and *Andrioplecta* Obraztsov, neither of which occurs in the New World. The position of the chorda at the distal end of the discal cell (i.e., intersecting R_5) also is somewhat unusual, but this condition can be found in a few species of *Pammene* and *Dierlia Diakonoff* (Komai, 1999). While most Grapholitini have paired signa in the female genitalia, *Macrocydia* has a single signum. Again, this character state is shared with *Dichrorampha* and *Ricula Heinrich* (Heinrich, 1926). Given the mosaic distribution of these character states, it is difficult to separate the taxa in which they represent homoplasies from those in which they represent synapomorphies.

Komai (1999) recognized three genus groups within the tribe Grapholitini: *Dichrorampha* group, *Cydia* group, and *Grapholita* group. The latter two together form a monophyletic lineage with the first as the sister group to that pair. *Macrocydia* lacks coremata at end of the abdomen (*Grapholita* group condition); the sterigma, seventh sternite, and ductus bursae are not fused (*Dichrorampha* group condition); and the hindwing venation shows the plesiomorphic state with Rs and M_1 approximate (*Cydia* group condition). The ventral margin of the sacculus is only slightly concave, and there is no anal roll; a conspicuously concave sacculus (subbasally) and hindwing anal fold are apomorphies for the *Cydia* group (Komai, 1999). *Macrocydia divergens* lacks secondary sexual characters, but these are variable throughout Olethreutinae (Baixeras, 2002) including the *Cydia* group. Finally, vein 3A is close to the anal edge, a condition found in the *Cydia* group. In summary, key characters of *Macrocydia* represent a collection of plesiomorphic conditions closer to the *Cydia* group than to any other group.

Assignment of *Macrocydia* to Olethreutinae (Tortricidae) is unquestionable on the basis of the antenna with one ring of scales per flagellomere; the hindwing with cubital pecten; the male genitalia with the transtilla and gnathos absent, the valva with a conspicuous basal excavation, and the aedeagus fused with the anellus and juxta; and the female genitalia with one or two large hornlike signa (Horak, 1999).

Description. *Head* (Fig. 2): Frons convex, with small appressed scales. Vertex with long scales protruding anteriorly and dorsally between the antennae forming a broad hood over the basal portion of palpi. Antenna ca. 0.5 as long as forewing costa; cilia less than 0.5 times width of flagellomere, similar in both sexes; one row of scales per flagellomere. Labial palpus elongate, length (all three segments combined) ca. 2.2 times diameter of compound eye, dorsally exceeding level of head; first segment short, upcurved; second segment long, densely scaled dorsally, ca. 8 times as long as third segment, basal 0.5 slightly upcurved; third segment short, extending slightly beyond scaling of second; opening of organ of vom Rath in apical position. Maxillary palpus inconspicuous. Proboscis developed, naked. Ocelli and chaetosemata well developed. A tuft of long erect scales from lateroposterior part of vertex to occiput and surrounding the eyes. *Thorax*: Smooth scaled including tegula; posterior tuft absent. Legs unmodified except for meso- and metathoracic tibiae densely covered by distinctive scales. Forewing (Fig. 3) with all veins present and separate beyond discal cell; M-stem and chorda well defined; discal cell ca. 0.6 times length of wing; chorda from distal half of cell extending from ca. midway between R_1 and R_2 to origin of R_5; M-stem from basal 0.25 of R to base of M_2; M_1 closer to R_5 than to M_2 at base; M_3 and CuA_1 approximate at bases, divergent in basal 0.5, parallel in distal 0.5; CuP weak, present only at wing margin; anal loop ca. 0.33 times length of 1A+2A; male without costal fold. Hindwing (Fig. 3) with veins Sc+R straight, closely parallel to Rs in basal 0.5; M_1 parallel to Rs in basal 0.25; M_2 closer to M_3 than to M_1 at base; M_3 and CuA_1 coincident at base; CuP atrophied except in distal portion; basal stem of CuP and 1A+2A usually hairy; cubital pecten poorly developed. Frenulum in female with two bristles, male with one. *Abdomen*: Sternum 8 in male short with straight posterior margin; coremata absent. Male genitalia (Figs. 4, 5) (based on two preparations) with tegumen simple, with weak dorsal depression at middle; socius weakly developed (Fig. 5), pendant, with few setae; anal tube large, broad, rectangular, partially sclerotized, connected to tegumen basally by two slightly sclerotized, short arms, presumably representing the gnathos; valva with costa straight, apex rounded, ventral edge with deep excavation in basal 0.33 dividing sacculus from cucullus; sacculus straight ventrally, rounded right-angled distally, with a few long setae; cucullus broad, rounded, densely hairy. Aedeagus simple, short, straight, with cluster of slender, deciduous cornuti. Female genitalia (Fig. 6) (based on two preparations) with ovipositor short; papillae anales simple with relatively short setae; ostium ringlike, sterigma teardrop-shaped with a short, posteriorly pointed lamella postvaginalis, lamella antevaginalis undeveloped; no special structure in posteror portion of ductus bursae; sternite of seventh segment with a pair of irregularly rounded, lightly sclerotized lateral areas; ductus bursae relatively straight, slightly longer than diameter of corpus bursae, gradually broadened toward junction with corpus bursae, membranous except for a large, well-sclerotized plate in anterior left 0.33; ductus seminalis from lateral right portion of membranous area; corpus bursae rounded, without spicules; a single signum consisting of a long, straight, attenuate thorn from a curved, narrow base.

Etymology. The genus name refers to the extraordinarily large (= macro) forewing size and the putative relationship to the *Cydia* genus group.

Macrocydia divergens* Brown and Baixeras, *new species
Figs. 1–6

Diagnosis. *Macrocydia divergens* is the only species in the genus. It can be distinguished from other Grapholitini by the characters discussed above in the diagnosis of the genus.

Description. *Head*: Frons, vertex, and labial palpus pale yellowish ochreous, the last with a few brown scales distally. *Thorax*: Dorsum concolorous with head; forewing length 10.2–10.5 mm ($\bar{x}$ = 10.3; n = 5) in males, 12.5–14.8 mm ($\bar{x}$ = 13.5; n = 4) in females; forewing upperside ground color pale yellowish gray with scales uniformly distributed in rows; strigulae basal to R_1 formed by dense groups of 4–5 rows of pale scales concolorous with ground; spaces between strigulae narrow, often 1–2 scales wide, dark brown, confined in length to 4–5 scales; some dark brown scales scattered over wing surface; a pair of strigulae between R_1 and R_2 fused; no distinctive strigulae distal to R_2; no basal fascia; fragments of fasciae represented by brown lines 3–6 scales wide; postbasal (= subbasal) fascia from costa represented by short fragment broken at R level; dorsal fragment of postbasal fascia meeting median fascia at space between R_2 and R_3; median fascia arising just basal to point where Sc meets costa, slightly sinuous and oblique, intersecting M_1 at junction of R_3 and costa; at latter point median fascia meeting a dorsal fragment, parallel to the dorsal postbasal fragment, at ca. 60° angle; dorsal fragment of uncertain morphological origin, but may represent dorsal fragment of median fascia; position of veins R_1 to M_1 finely marked with brown scaling; costa from intersection of R_2 to apex, termen, and tornal area to Cu_2 brown. Forewing underside similar to upperside, but with deep suffusion of brown scales. Hindwing upperside ground color pale brown; area of overlap with forewing pale silvery with a small group of brown scales at position of dorsal median fragment of forewing, suggesting a particular resting position of the wings; underside ground color pale with diffuse, short, transverse rows of brown scales. *Abdomen*: Concolorous with dorsum of thorax. Male genitalia (Figs. 4, 5) as described above for genus. Female genitalia (Fig. 6) as described above for genus.

Holotype, ♂, Costa Rica, Cachi, W. Schaus (USNM).

Paratypes (24♂, 4♀). **Costa Rica**: *Alajuela Province*: Puesto Quebradon, 300 m, Jun 1997 (1♂), G. Rodríguez; Bijangua, Albergue Heliconias, 700 m, Feb 2000 (1♂), G. Rodríguez; Finca San Gabriel, 16 km E Quebrada Grande, 680 m, 12 Mar 1983 (1♂), D. Jansen & W. Hallwachs; Finca Campaña, 5 km NW Dos Rios, 750 m, 21 Mar 1985 (1♀), D. Jansen & W. Hallwachs. *Cartago Province*: Monumento Nacional Guayabo, A. C. Amistad, 1100 m, Jul 1994 (1♂), G. Fonseca; Río Grande de Orosi, desde Administración hasta Sect. La Pava, 1150–1600 m, Feb 1997 (1♀), R. Guzmán. *Guanacaste Province*: Est-

ación Cacao, lado suroeste Vólcan Cacao, 1100, 8–30 Jun 1991 (2♂), C. Chaves; Estación Cacao, lado suroeste Vólcan Cacao, P.N. Guanacaste, 1000–1400 m, 21–29 May 1992 (1♂), M. A. Zumbado, 21–29 May 1992 (1♂), A. Marin, Jun 1990 (1♂), II curso parataxon.; Estación Pitilla, 9 km S Santa Cecelia, P.N. Guanacaste, 700 m, Mar 1991 (1♀), C. Moraga, 6–18 Aug 1993 (1♂), P. Rios, Oct 1994 (1♂), P. Rios, Oct 1994 (1♂), C. Moraga, Mar 1994 (1♂, 1♀), P. Rios, Jul 1991 (1♂), P. Rios, Mar 1991 (2♂), C. Moraga, Mar 1995 (1♂), P. Rios, Mar 1989 (1♂), GNP Biodiversity Survey, 1–15 Jul 1992 (1♂), C. Moraga. *Heredia Province*: 10 km SE La Virgen, 450–550 m, 19 Feb 2003 (1♂), 22 Feb 2003 (1♂), 23 Mar 2003 (1♂), INBio-OET-ALAS transect. *Puntarenas Province*: Estación Sirena, P.N. Corcovado, May 1991 (1♂), G. Fonseca; San Luis, Monteverde, 1000–1350 m, Mar 1994 (1♂), Z. Fuentes. **Panama**: Cerro Campaña, nr. Chica, 2–5 Apr 1965 (1♂), S. S. & W. D. Duckworth. Paratypes deposited in INBio, USNM, and The Natural History Museum, London.

Biology and Distribution. Nothing is known of the early stages; adults have been collected in February (n = 4), March (n = 10), April (n = 1), May (n = 3), June (n = 4), July (n = 3), August (n = 1), and October (n = 2). The species occurs primarily at middle elevations from about 300 to 1600 m. During a multi-year survey along an elevational transect (0–2000 m) near Estación Biologia La Selva, Costa Rica, *M. divergens* was collected (n = 3 specimens) only at the 450–550 m site. It has been recorded primarily from central and western Costa Rica (i.e., Alajuela, Cartago, Guanacaste, Heredia, and Puntarenas provinces), with a single specimen from Panama.

Etymology. The specific epithet refers to the highly divergent superficial appearance of the adult, which resembles no other member of Grapholitini, the tribe to which it is assigned provisionally.

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