Notes on *Telchin evalthe viryi* (Boisduval, [1875]) (Castniidae: Castniinae) in Mexico

José de Jesús García Díaz

Sociedad Mexicana de Lepidopterología A.C. E-mail: chuchogd@live.com.mx

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Abstract: *Telchin evalthe viryi* (Boisduval, [1875]) is one of the rarest castniids of the Gulf of Mexico slope that is not endemic to the country. Based on examination of various collections, field studies and greater knowledge about its distribution, relevant information about this subspecies is provided as well as data on its ecology, behavior, variability (in both sexes), and geographical distribution in Mexico.

Key words: biogeography, bionomics, castniid, geographic distribution, Lepidoptera, Neotropical, variability.

Resumen: *Telchin evalthe viryi* (Boisduval, [1875]) es uno de los cástnidos más raros de la vertiente del Golfo de México que no es endémico para el país. Con base en la revisión de distintas colecciones entomológicas, estudios de campo realizados y mayor conocimiento sobre su distribución, se proporciona información relevante sobre esta subespecie, así como breves datos ecológicos y de comportamiento, variabilidad del taxón (para ambos sexos) y su distribución geográfica en México.

Palabras clave: aspectos bionómicos, biogeografía, cástnido, distribución geográfica, Lepidoptera, Neotropical, variabilidad.

INTRODUCTION

Castniinae (Castniidae) is a Neotropical subfamily of giant-butterfly moths that includes species with diurnal or crepuscular habits (González & Stüning, 2007; Vinciguerra, 2008; González & Worthy, 2017; González *et al.*, 2017; van den Berghe *et al.*, 2020; García-Díaz & Turrent-Carriles, 2022), and it is in turn divided into two tribes, Castniini and Synemonini. Castniini occurs in the Americas, while the Synemonini presents a restricted distribution in Australia (Miller, 1986, 2000; González & Hernández-Baz, 2012; Moraes & Duarte, 2014; González & Domagała, 2019). According to López-Godínez & Porion (2012), Moraes & Duarte (2014), González *et al.* (2019), González *et al.* (2021), and García-Díaz & Turrrent-Carriles (2022), this subfamily is currently thought to contain 90 species in 18 genera. *Telchin* Hübner, [1825] is one of these genera, and it possibly has the broadest distribution in the Americas, with its species found from Mexico to South America. Some of these species are very common and of great economic and commercial importance (*e.g.*, *T. atymnius* (Dalman,1824), *T. licus* (Drury, 1773)), since they are pests of crops such as bananas (*Musa* spp., Musaceae) and sugar cane (*Saccharum officinarum*, Poaceae) in several Latin American countries (Gallego, 1946, 1963; Lara, 1964; Miller, 1986; González & Cock, 2004; González *et al.*, 2010; González *et al.*, 2017; LAICA, 2017; Salazar-Blanco *et al.*, 2018; Cadet-Piedra *et al.*, 2019; González & Domagała, 2019; Aya *et al.*, 2021; García-Díaz, 2022). Conversely, other *Telchin* species tend to be less common and are sparsely represented in collections. Among them is *Telchin evalthe* (Fabricius, 1775), a species broadly distributed from Mexico to southeastern Brazil (González & Cock, 2004; Parrales-R. & Vargas-Fonseca, 2017; Rodríguez-Ramírez *et al.*, 2020). Currently, *T. evalthe* is thought to include ten subspecies, with *Telchin evalthe viryi* (Boisduval, [1875]) having the northernmost distribution and possibly being one of the rarest in the group (van den Berghe *et al.*, 2020).

Telchin evalthe viryi can be easily distinguished from the nominal subspecies by the absence of the yellowish subapical band on the forewings in males (Miller, 1986; González *et al.*, 2010). The taxon was described as *Castnia viryi* based on material from Mexico (Boisduval, [1875]). Houlbert (1918) later transferred *C. evalthe*, *C. viryi*, *C. euphrosyne* (Perty, 1833) and other taxa into the genus *Xanthocastnia* Houlbert, 1918. This situation remained unchanged for almost a century until Moraes & Duarte (2014) synonymized *Xanthocastnia* with *Telchin*, a position that is currently accepted. Since its description until the checklist of Miller (1995), *viryi* was considered a distinct species; furthermore, Miller (1995) assigned four subspecies (including the nominal) to *viryi* (*intermedia*, *vicina*, *vicinoides*, *viryi*). However, Lamas (1995) reclassified it as subspecies of *evalthe*, a position that remains accepted to this date.

The aim of this work is: (1) to present novel ecological and behavioral information about *T. evalthe viryi* found in Mexico; (2) to illustrate and provide a detailed diagnosis for males and females of this taxon; and (3) to present an updated distribution map of the taxon in Mexico, based on data gathered from specimens in institutional and private collections worldwide.

MATERIALS AND METHODS

Telchin evalthe viryi distribution records were located while searching the following institutional and private collections: Private collection of Bernardo López-Godínez, Guadalajara, Mexico (BLG); Private collection of the De la Maza Family, Mexico City, Mexico (CDM); Private collection of the Haghenbeck Family, Tehuacán, Puebla, Mexico (CFH); Private collection of the Turrent Family, Mexico City, Mexico (CFT); Private collection of the Villarreal Family, Oaxaca, Oaxaca, Mexico (CFV); Private collection of Julián A. Salazar-Escobar, Caldas, Colombia (CJASE); Private collection of Dirk Casteleyn, Brugge, West Flanders, Belgium (DC); Private collection of Daniel J. Curoe, Mexico City, Mexico (DJCC); Private collection of José de Jesús García-Díaz, Tehuacán, Puebla, Mexico (JJGD); Private collection of Robert Worthy, Caterham, Surrey, U.K. (RW); American Museum of Natural History, New York, USA (AMNH); Colección Entomológica del Instituto de Ciencias Naturales de la Universidad Nacional de Colombia, Bogotá, Colombia (C-ICNMHN); Cornell University Insect Collection, Ithaca, New York, USA (CUIC); Colección Lepidopterológica de El Colegio de la Frontera Sur, Chetumal, Quinta Roo, Mexico (ECO-CH-LN); Colección Nacional de Insectos del Instituto de Biología de la Universidad Nacional Autónoma de México, Mexico City, Mexico (CNIN-IBUNAM); Essig Museum of Entomology Collection, University of California, Berkeley, USA (EMEC); Museum für Naturkunde, Berlin, Germany (ex-ZMHB: Zoologisches Museum der Humboldt Universität zu Berlin, Germany) (MfN); Colección Entomológica Alfredo Barrera del Museo de Historia Natural de la Ciudad de México, Mexico City, Mexico (MHNCM); Museo Nacional de Costa Rica, San José, Costa Rica (MNCR); Museo de Historia Natural de la Universidad de San Marcos, Lima, Perú (MUSM); Natural History Museum, London, U.K. (NHMUK); Oxford University Museum of Natural History, Oxford, U.K. (OUMNH); Entomological Collection, Texas A & M University, College Station, Texas, USA. (TAMU); Georgia Museum of Natural History - University of Georgia Collection of Arthropods, Athens, Georgia, USA (UGCA); Colección Entomológica de la Facultad de Ciencias Agronómicas de la Universidad Autónoma de Chiapas, Villaflores, Chiapas, Mexico (UNACH); Yale Peabody Museum of Natural History, New Haven, USA (YPM).

Bionomic information was obtained based on the personal observations of Roberto G. de la Maza and Daniel J. Curoe in Dos Amates, Veracruz and Santa Cruz Tepetotutla, Oaxaca, respectively. The distribution map was prepared using SimpleMappr (Shorthouse, 2010). Georeferencing of localities was done by means of Google Earth. The photos of the specimens illustrated in Figure 2 were taken with a Fujifilm FinePix HS20EXR camera. Adobe Photoshop 2020 was used for figure editing.

RESULTS

Biogeographical and distributional comments. Several authors have cited records for the subspecies from Mexico to Colombia and Venezuela (Westwood, 1877; Druce, 1883; Miller, 1986; González *et al.*, 2010; van den Berghe *et al.*, 2020). This taxon is strongly associated with very humid ecosystems. In Mexico, *Telchin evalthe viryi* is distributed in rainforests, semideciduous forests and cloud forests of the central and southern Gulf of Mexico slope. To the north, its distribution appears to be limited by the Trans-Mexican Volcanic Belt, while the arid region of the Isthmus of Tehuantepec seems to be a natural barrier that has prevented its distribution on the Pacific slope of Mexico. According to the biogeographic provinces of the Neotropical region proposed by Morrone *et al.* (2022), in Mexico *T. e. viryi* flies in localities that belong to the Veracruzan province of the Mesoamerican dominion in the

Figure 1. Geographic distribution of *Telchin evalthe viryi* in Mexico.

Brazilian subregion. The northernmost known locality for this taxon appears to be Motzorongo, Veracruz. The following is a list of localities where the taxon has been sighted or collected in Mexico: **Chiapas:** Cañón del Sumidero, Chajul; **Oaxaca:** Chalchijapa, Chiltepec, Matías Romero Avendaño, Metates, Puerto Eligio, San Juan Guichicovi, Santa Cruz Tepetotutla, Santa María Chimalapa, Vista Hermosa; **Veracruz:** Cerro El Vigía, Dos Amates, Motzorongo, Popoctépetl, Comoapan (see below), Volcán San Martín, Volcán Santa Martha (Fig. 1).

A male specimen of *T. evalthe viryi* deposited at the EMEC was, according to information on its label, collected on May 23, 1979, seven miles north of "Santa Comapan", Veracruz; however, there does not appear to be a town with this name in the state, which could suggest that the location indicated on the label might be wrong. Considering the known distribution of the taxon, the town of Comoapan within the municipality of San Andrés Tuxtla, Veracruz, could correspond to the locality mentioned on the label (Roberto de la Maza, pers. comm.).

Ecology and behavior. In Mexico, depending on the locality, *T. e. viryi* coexists with different castniid species. In most localities it is sympatric with *Athis inca orizabensis* (Strand, 1913), while in a few others it flies together with *A. delecta* (Schaus, 1911), *A. inca inca* (Walker, 1854), *Telchin atymnius futilis* (Walker, 1865) and/or *Divana diva diva* (Butler, 1870). According to current knowledge of its distribution in the country, the localities where it occurs vary from 0-1700 m, but it has been more frequently observed or collected from 400-1200 m. As with most Mexican castniids, its flight period varies depending on locality and the onset and duration of the rainy season. Temporal distribution records range between March and November, but most come from May to September.

According to published records, bromeliads (*Bromelia* spp., Bromeliaceae) and heliconias (*Heliconia* spp., Heliconiaceae) might be the host plants of some subspecies of *T. evalthe* (Moss, 1945; Miller, 1986; González & Cock, 2004; González *et al.*, 2010; González *et al.*, 2013; González *et al.*, 2017; González & Domagała, 2019; Rodríguez-Ramírez *et al.*, 2020; Aya *et al.*, 2021), but we have not been able to determine the host plant of this subspecies in Mexico.

This is a diurnal species that, like most known castniids, is highly territorial. On sunny and hot days (between 28 and 33°C), adults often fly up to 2 m high between 12:00 hr and 16:00 hr; their preferred sites are along the edges of bodies of water such as streams or springs and along wide and sunny trails or dirt roads. They do not fly in the shade nor within forests and they usually perch on dry twigs, tree branches or leaves of medium-sized plants (Roberto de la Maza, pers. comm.). Their particular coloration (black, dark orange-red and yellow) makes them unmistakable in the field. Males fly rapidly, like *T. atymnius futilis*; females, on the other hand, have a slower and heavier flight. Males and females do not fly on cloudy days nor during rain. In Santa Cruz Tepetotutla, Oaxaca, a male was sighted sunning itself in the morning on a leaf, in a stegopterous position (Daniel J. Curoe, pers. comm.). This suggests that males and females of this species might sun themselves in the morning to raise their temperature before flight activity around midday. Adults have not been recorded feeding on flowers, decomposing fruits or mud. Courtship behavior and copulation has not been observed, and the life cycle is unknown.

Material examined. Data from 49 specimens (39♂♂, 10♀♀) were recorded from several collections:
1♂, Holotype, *viryi* B. d. v., Mexico, Type, ex Musaeo Dris Boisduval (NHMUK); 1♂, Mexico (NHMUK); 1♂, mssn. G. / *Castnia viryi* B.d., Mexico (MfN); **Chiapas:** 1♀, Marqués de Comillas, Boca de Chajul, 26-VI-1980, *leg.* J. de la Maza E. (CDM); 1♂, Chiapa de Corzo, Cañón del Sumidero, XI-2012 (DC); **Oaxaca:** 1♂, Santiago Comaltepec, Puerto Eligio, 25-V-1980, *leg.* C. Velázquez M. (JJGD); 1♀, Santiago Comaltepec, Metates, 30-VI-1977, *leg.* R. F. de la Maza. R. (CDM); 1♂, Santiago Comaltepec, Metates, 06-V-1977, *leg.* R. F. de la Maza. R. (CDM); 1♂, San Felipe Usila, Santa Cruz Tepetotutla, 16-VI-2018, *leg.* D. J. Curoe (DJCC); 1♂, Santiago Comaltepec, Metates, III-1996, *leg.* F. G. Haghenbeck F. (CFH); 1♂, Santiago Comaltepec, Metates, III-1997, *leg.* F. G. Haghenbeck F. (CFH); 3♂♂, Santiago Comaltepec, Metates, 28-III-1999, *leg.* F. G. Haghenbeck F. (CFH); 1♂, Santiago Comaltepec, Metates, VI-1980, *leg.* C. Velázquez M. (CFH); 1♂, Santiago Comaltepec, Metates, VII-1980, *leg.* C. Velázquez M. (CFH); 4♂♂, Santiago Comaltepec, Puerto Eligio, 20-V-1980, *leg.* C. Velázquez M. (CFH); 1♀, Santiago Comaltepec, Vista Hermosa, V-1964 (CNIN-IBUNAM); 1♂, Matías Romero Avendaño, Matías Romero (Istmo), VIII-1967, *leg.* A. Díaz F. (CNIN-IBUNAM); 1♂, Santa María Chimalapa, Chalchijapa, 31-V-1995, *leg.* J. L. Salina G. (CNIN-IBUNAM); 2♂♂, Santiago Comaltepec, Puerto Eligio, 20-V-1980, *leg.* C. Velázquez M. (CNIN-IBUNAM); 1♂, San Juan Guichicovi, San Juan Guichicovi (Istmo), VIII-1973, *leg.* A. Díaz F. (CNIN-IBUNAM); 1♂, San José Chiltepec, Chiltepec, V-1967, *leg.* A. Díaz F. (CFT); **Veracruz:** 1♀, Santiago Tuxtla, El Vigía, 02-IX-1963, *leg.* R. F. de la Maza R. (JJGD); 1♀, 1♂, Santiago Tuxtla, El Vigía, 10-VII-2017 (JJGD); 2♂♂, Santiago Tuxtla, El Vigía, 12-VI-2018 (JJGD); 3♂♂, Santiago Tuxtla, El Vigía, 20-VI-2019 (JJGD); 1♂, Santiago Tuxtla, El Vigía, 21-VII-2021 (JJGD); 1♀, Santiago Tuxtla, El Vigía, 22-VIII-1963, *leg.* R. F. de la Maza R. (CDM); 1♂, Catemaco, Dos Amates, 20-VI-1963, *leg.* R. F. de la Maza R. (CDM); 1♂, Santiago Tuxtla, El Vigía, VII-2012 (CFH); 1♀, Santiago Tuxtla, El Vigía, 20-VIII-2009 (BLG); 1♂, Santiago Tuxtla, El Vigía, 20-VII-2010 (BLG); 1♀, Santiago Tuxtla, Popoctépetl, VIII-1972, *leg.* A. Díaz F. (CNIN-IBUNAM); 1♂, Santiago Tuxtla, Popoctépetl, IX-1973, *leg.* A. Díaz F. (CNIN-IBUNAM); 1♂, Santiago Tuxtla, El Vigía, VII-1978, *leg.* A. Díaz F. (CNIN-IBUNAM); 1♀, San Andrés Tuxtla, Estación Biológica "Los Tuxtlas" (180 m), 15-V-1985, *leg.* P. Sinaca (CNIN-IBUNAM); 1♂, Santiago Tuxtla, El Vigía, 20-III-2017 (CFT); 1♂, No. 2702, Motzorongo, V, *leg.* R. Müller (MHNCM); 1♀, No. 2703, Motzorongo, V, *leg.* R. Müller (MHNCM); 1♂, 7 mi N Santa Comapan [*sic*], Ver., Mex. V-23-1979, *leg.* J. R. Powers (EMEC).

Diagnosis and variability. *Telchin evalthe viryi* exhibits strong sexual dimorphism (Fig. 2). Dorsally, males present a blackish ground coloration on both fore- and hindwings. On the forewings they have a pale yellowish diagonal band that extends from the costa to the anal angle. On the hindwings there is a blurry spot on the costa; 5-6 dark orange-red submarginal spots between M_1 and 3A (the two middle ones being the largest); and on the anal angle, between 2A and 3A, a large dark orange-red patch that extends toward the discal area and merges with four yellow discal spots (the two middle ones being the largest). Ventrally, the ground coloration of the forewings is blackish brown and the same diagonal band as on the dorsal side is present, although wider. The costal margin as well as the apical and subapical regions are dark orange-red; the veins are black. On the hindwings, the base coloration is dark orange-red. The yellow costal spot and the four yellow discal spots are also present; between the spots and the margin the veins are black.

Unlike males, the females present on the forewings (both dorsally and ventrally) a pale yellow diagonal subapical band; the diagonal band that extends from the costa to the anal angle is also present, though wider than in males. Dorsally, on the hindwings the submarginal spots are larger than in males and

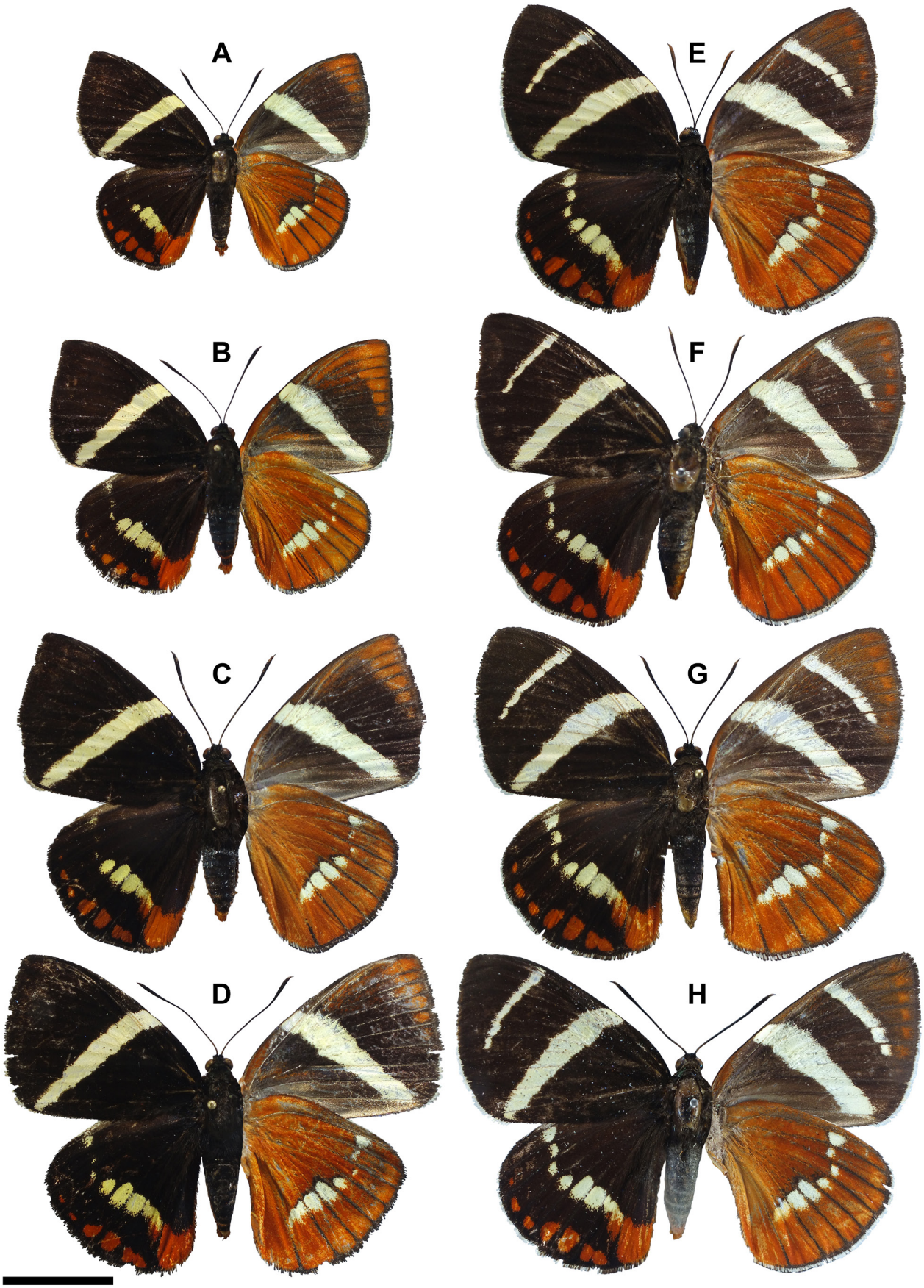

Figure 2. Dorsal and ventral variation of *Telchin evalthe viryi* males (A-C) and females (D-F) collected in Santiago Tuxtla, Veracruz. A-C) Males, 20-VI-2019 (JJGD); D) male, 21-VII-2021 (JJGD); E) female, 10-VII-2017 (JJGD); F) female, 02-IX-1963, *leg.* R. F. de la Maza R. (JJGD); G) female, 20-VIII-2009 (BLG); H) female, VIII-1972, *leg.* A. Díaz F. (CNIN-IBUNAM). Scale bar = 2 cm.

there is an extra spot between Rs and M_1. The yellow discal spots are larger and there are also two extra spots, thereby linking the costa and the anal angle. Ventrally, on the forewings the subapical and diagonal bands that appear on the dorsal side are also present; the submarginal region between R_4 and Cu_1 is dark orange-red. As in males, the female hindwings present the same yellowish discal spots as on the dorsal side, and the same black veins between these and the margin.

The subspecies seems to exhibit little variability within both sexes. In males and females the size and width of the forewing diagonal band and the hindwing discal and submarginal spots is variable in both dorsal and ventral view. In some males there are two extra discal spots on the hindwings, as in females, but these are much reduced in size and barely perceptible (Fig. 2).

DISCUSSION

As with *T. atymnius futilis* and *Divana diva diva*, the presence of this taxon in Mexico seems to be relatively recent, since it is not endemic to the country. It is not distributed in arid regions of the country and does not have a sister species on the Pacific slope, unlike other castniids (*e.g.*, *Athis hechtiae* (Dyar, 1910), *A. inca* (Walker, 1954), *A. delecta* (Schaus, 1911), *Escalantiana chelone* (Hopffer, 1856)).

The rarity of this subspecies could be linked to its host plant. It is well established that many castniids are closely associated with their host plants, which are sometimes endemic and/or present in very local or ecologically restricted distributions (García-Díaz *et al.*, 2019; García-Díaz *et al.*, 2020; González *et al.*, 2021; García-Díaz & Turrent-Carriles, 2022). Thus, it appears that Heliconiaceae, whose species are broadly distributed, might not be its host plants in Mexico, because unlike *T. atymnius futilis* (a taxon that feeds on heliconias and is frequently observed in Mexico), *T. evalthe viryi* has been reported only from a few localities on the Gulf of Mexico slope. If *T. evalthe viryi* is indeed associated with the genus *Bromelia*, the species *B. karatas* L., 1753, and *B. pinguin* L., 1753, being distributed in Mexico, Central America and northern South America (Espejo-Serna *et al.*, 2005), could be its potential host plants. However, more field work is required to know in detail this taxon's ecology and its host plants.

Of the ten currently recognized subspecies of *T. evalthe* (*cuyabensis* (Lathy, 1922), *euphrosyne* (Perty, 1833), *evalthe* (Fabricius, 1775), *evalthoides* (Strand, 1913), *quadrata* (Rothschild, 1919), *tica* (Lamas, 1995), *vicina* (Houlbert, 1917), *vicinoides* (Hopp, 1925), *viryi* (Boisduval, [1875]), *wagneri* (Buchecker, [1899])), the closest relative of *T. e. viryi* seems to be *T. e. tica*, which is distributed in southern Central America and whose phenotype is very similar in both dorsal and ventral view. However, a study involving a broad revision of specimens from different known populations from throughout the continent is necessary to confirm the limits of and relationships among species and subspecies (González *et al.*, 2010; González & Domagała, 2019; González & Domagała, 2021).

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LITERATURE CITED

Aya, V. M., Pabón, A., González, J. M., Vargas, G. 2021. Morphological and molecular characterization of Castniidae (Lepidoptera) associated to sugarcane in Colombia. *Bulletin of Entomological Research* 1-12.

Boisduval, J. B. A. D. [1875]. *Species général des Lépidoptères Hétérocères. Tome premier: Sphingides, Sesiides, Castnides*. Librairie Encyclopédique de Roret, Paris, IV + 568 + 4 pp., 11 pls.

Cadet-Piedra, E., Salazar-Blanco, J. D., Oviedo-Alfaro, R. 2019. Monitoreo y manejo del barrenador gigante del tallo de la caña de azúcar (*Telchin atymnius* Lepidóptera: Castniidae) en Costa Rica. *Boletín Agroclimático* 1(12): 5-8.

Druce, H. 1881-1900. *Insecta. Lepidoptera-Heterocera*, 1 & 3, pp. 1-490 & pls. 1-101. *In:* Godman, F. D., Salvin, O. (1881-1900), Godman, F. D., Salvin. O. 1889, *Biologia Centrali-Americana; or Contributions to the Knowledge of the Fauna of Mexico and Central America*. London, Dulau & Co., Bernard Quaritch.

Espejo-Serna, A., López-Ferrari, A. R., Ramírez-Morillo, I. 2005. Bromeliaceae. *Flora de Veracruz* 136: 1-307.

Gallego, F. L. 1946. Catálogo de insectos correspondientes a la Orden Lepidoptera existentes en la sección de Entomología de la Facultad Nacional de Agronomía, Medellín. Parte II. Nocturnas, Heterocera o Chalinoptera. *Revista de la Facultad Nacional de Agronomía* 6(24): 415-471.

Gallego, F. L. 1963. Superfamilia Castnioidea (Castnioidea Handlirsch. 1925). *Revista de la Facultad Nacional de Agronomía* 23(58): 22-44.

García-Díaz, J. J. 2022. Distribution and observations on the biology of *Telchin atymnius futilis* (Walker, 1856) (Castniidae: Castniinae) in Mexico. *Tropical Lepidoptera Research* 32(1): 63-72.

García-Díaz, J. J., Turrent-Carriles, A. 2022. Descripción de una nueva

subespecie de *Escalantiana chelone* (Hopffer, 1856) y un nuevo género de Castniinae (Lepidoptera: Castniidae). *Revista de la Sociedad Mexicana de Lepidopterología (Nueva serie)* 9(2): 113-142.

García-Díaz, J. J., López-Godínez, B., Turrent-Carriles, A. 2019. Descripción de la hembra de *Athis jaliscana* López y Porion, 2012 (Castniidae) con algunos comentarios bionómicos. *Revista de la Sociedad Mexicana de Lepidopterología (Nueva serie)* 7(1): 35-41.

García-Díaz, J. J., Miller, J. Y., González, J. M. 2020. Observations on the courtship and other biological aspects of *Athis hechtiae* (Dyar, 1910) (Castniidae) in Tehuacán, Puebla, Mexico. *Tropical Lepidoptera Research* 30(2): 86-89.

González, J. M., Cock, M. J. W. 2004. A synopsis of the Castniidae (Lepidoptera) of Trinidad and Tobago. *Zootaxa* 762: 1-19.

González, J. M., Domagała, P. 2019. A catalog of the Castniidae (Lepidoptera) in the California Academy of sciences with general and historical comments. *Annals of the Upper Silesian Museum in Bytom, Entomology* 28: 1-24.

González, J. M., Domagała, P. 2021. Castniidae of the Museum of Natural History of the University of Wrocław: new findings from Friedrich Wilhelm Niepelt's collection with comments on Karl Adolf Georg Lauterbach and August Weberbauer. *Nota Lepidopterologica* 44: 123-132.

González, J. M., Hernández-Baz, F. 2012. *Polillas y taladradores gigantes de la familia Castniidae (Lepidoptera) de Guatemala*, pp. 145-153. *In:* Cano, E. B., Schuster, J. C. (Eds.), *Biodiversidad de Guatemala*. Vol. 2. Guatemala, Universidad del Valle de Guatemala.

González, J. M., Stüning, D. 2007. The Castniidae at the Zoologisches Forschungmuseum Alexander Koenig, Bonn (Lepidoptera: Castniidae). *Entomologische Zeitschrift* 117(2): 89-93.

González, J. M., Worthy, R. 2017. First records of *Synpalamides phalaris* (Fabricius, 1793) (Lepidoptera: Castniidae) in Venezuela, with comments on its natural history. *Check List* 13(4): 177-183.

González, J. M., Domagała, P., Larysz, A. 2013. The giant butterfly-moths (Lepidoptera Castniidae) of the Upper Silesian Museum (Muzeum Górnośląskie) in Bytom, Poland, with notes on the history of the museum. *Biodiversity Journal* 4(1): 219-228.

González, J. M., Boone, J. H., Brilmyer, G. M., Le, D. 2010. The Giant Butterfly-moths of the Field Museum of Natural History, Chicago, with notes on the Herman Strecker collection (Lepidoptera: Castniidae). *SHILAP Revista de Lepidopterología* 38(152): 385-409.

González, J. M., Gonzalo-Andrade, C. M., Worthy, R., Hernández-Baz, F. 2017. Giant butterfly moths of the Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá, Colombia (Lepidoptera: Castniidae). *SHILAP Revista de Lepidopterología* 45(179): 447-456.

González, J. M., López-Godínez, B., Huerta, J. P., Miller, J. Y. 2019. A new genus of Castniinae (Lepidoptera Castniidae) with comments on comparative morphology and bionomics of its assigned species. *Zootaxa* 4668(1): 89-104.

González, J. M., López-Godínez, B., García-Díaz, J. J., Simon, S., Sarto i Monteys, V., Worthy, R. 2021. Reinstatement of *Athis miastagma* (Dyar, 1925) (Lepidoptera: Castniidae) as a valid species inhabiting the Pacific slope of Central Mexico. *Zootaxa* 5061(2): 300-322.

Houlbert, C. 1918. *II. Révision monographique de la Sous-Famille des Castniinae*, pp. 5-713, 437-462 pls. *In:* Oberthür, C. (Ed.), *Études de Lépidoptérologie comparée, Fascicle XV. Imprimerie Oberthür*. Rennes.

LAICA. 2017. *Identificación y reclasificación taxonómica del barrenador gigante de la caña de azúcar*, pp. 6-8. Costa Rica, Programa de Fitosanidad, Manejo de Plagas (Informe de resultados 2016).

Lamas, G. 1995. A critical review of J. Y. Miller´s checklist of the Neotropical Castniidae (Lepidoptera). *Revista Peruana de Entomología* 37: 73-87.

Lara, F. 1964. The banana stalk borer *Castniomera humboldti* (Boisduval) in La Estrella Valley, Costa Rica. I. Morphology. *Turrialba* 14(3): 128-134.

López-Godínez, B., Porion, T. 2012. Notes sur le genre *Athis* Hübner, [1819] et description d›une nouvelle espèce du Mexique (Lepidoptera, Castniidae). *Les cahiers du Musée des Confluences - Études scientifiques* 3: 75-81.

Miller, J. Y. 1986. *The Taxonomy, Phylogeny, and Zoogeography of the Neotropical Castniidae (Lepidoptera: Castnoidea: Castniidae)*. Ph.D. Thesis. Gainesville, University of Florida. 571 pp.

Miller, J. Y. 1995. *Castnioidea: Castniidae: Castniinae*, pp. 133-137. *In:* Heppner, J. B. (Ed.), *Checklist: part 2. Hyblaeoidea-Pyraloidea-Tortricoidea. Atlas of Neotropical Lepidoptera*. Gainesville, Association for Tropical Lepidoptera and Scientific Publishers.

Miller, J. Y. 2000. *Castniidae (Lepidoptera)*, pp. 527-531. *In:* Llorente B., J, González S., E., Papavero, N. (Eds.), *Biodiversidad, taxonomía y biogeografía de artrópodos de México: hacia una síntesis de su conocimiento*. Vol. II. México, CONABIO.

Moraes, S. S., Duarte, M. 2014. Phylogeny of Neotropical Castniinae (Lepidoptera: Cossoidea: Castniidae): testing the hypothesis of the mimics as a monophyletic group and implications for the arrangement of the genera. *Zoological Journal of the Linnean Society* 170(2): 362-399.

Morrone, J. J., Escalante, T., Rodríguez-Tapia, G., Carmona, A., Arana, M., Mercado-Gómez, J. D. 2022. Biogeographic regionalization of the Neotropical region: New map and shapefile. *Anais da Academia Brasileira de Ciencias* 94: e20211167.

Moss, A. M. 1945. The *Castnia* of Pará, with notes on others (Lep. Castniidae). *Proceedings of the Royal Entomological Society of London (B)* 14: 48-52.

Parrales-R., D. A., Vargas-Fonseca, S. A. 2017. Mariposas-polilla gigantes (Lepidoptera: Castniidae: Castniinae) en la Colección Entomológica del Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. *Biota Colombiana* 18(2): 180-189.

Rodríguez-Ramírez, J., Río, S. D., Moraes, S. S., Penco, F. C., González, J. M. 2020. Catálogo de los Castniidae (Lepidoptera) del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires: descripción de tipos y notas generales e históricas. *Revista del Museo Argentino de Ciencias Naturales*, n. s. 22(2): 173-190.

Salazar-Blanco, J. D., Cadet-Piedra, E., Oviedo-Alfaro, R., Berrocal-Kopper, R., Araya-Vindas, A. 2018. *Monitoreo y manejo del barrenador gigante del tallo de la caña de azúcar (*Telchin atymnius *Lepidóptera: Castniidae) en Costa Rica*, p. 87. *In*: *Resumen XI Congreso ATALAC - TECNICAÑA. 26 - 28 de Setiembre de 2018*. Cali.

Shorthouse, D. P. 2010. *SimpleMappr, an online tool to produce publication-quality point maps*. http://www.simplemappr.net. Accessed 5 March 2022.

van den Berghe, E., Maes, J. M., Hernández-Baz, F. y González, J. M. 2020. Synopsis of the Castniidae (Lepidoptera) from Honduras and Nicaragua, Central America. *Zootaxa* 4895(2): 272-284.

Vinciguerra, R. 2008. Osservazioni su *Ircila hecate* (Herrich-Schäffer, [1854]) (Lepidoptera: Castniidae). *SHILAP Revista de Lepidopterología* 36(142): 205-208.

Westwood, J. O. 1877. A Monograph of the Lepidopterous genus *Castnia* and some allied groups. *Transactions of the Linnean Society of London, Zoology* 2(1): 155-207, pls. 28-33.