

Panoquina luctuosa luctuosa (Herrich-Schäffer, 1869): a new record for Mexico (Lepidoptera: HesperIIDae: HesperIIDae)

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Abstract: A new country record for Mexico is reported for *Panoquina luctuosa luctuosa* (Herrich-Schäffer, 1869), based on a specimen collected in the north part of the Tehuacán-Cuicatlán Valley in the state of Puebla, Mexico. In addition, a lectotype is designated for *Goniloba luctuosa* Herrich-Schäffer, 1869.

Key words: Distribution, Neotropical, Puebla, Tehuacán-Cuicatlán Valley, xeric shrubland.

Resumen: Se presenta un nuevo reporte para *Panoquina luctuosa luctuosa* (Herrich-Schäffer, 1869) en México con base en un espécimen colectado en la parte norte del Valle de Tehuacán-Cuicatlán en el estado de Puebla, México. También, se designa un lectotipo de *Goniloba luctuosa* Herrich-Schäffer, 1869.

Palabras clave: Distribución, matorral xerófilo, Neotropical, Puebla, Valle de Tehuacán-Cuicatlán.

INTRODUCTION

Just under half of the butterfly species reported from Mexico are in the family HesperIIDae. Since Hoffmann's (1941) initial listing of HesperIIDae from the country, a large number of new species have been described and documented from Mexico. The number of skippers known from Mexico as of 1991 had increased by 30% over Hoffmann's (1941) tally (R. De la Maza-Elvira *et al.*, 2017), and new species and national records are reported from the country almost every year (*e.g.*, García-Díaz & Turrent-Carriles, 2019b, 2020; Warren *et al.*, 2020).

The genus *Panoquina* Hemming, 1934 is American in distribution, ranging from the United States to Argentina, including most Caribbean islands. According to Warren *et al.* (2017), *Panoquina* currently comprises 19 species and an additional 11 subspecies, of which 8 taxa are listed from Mexico: *P. panoquinoides panoquinoides* (Skinner, 1891), *P. errans* (Skinner, 1892), *P. ocola ocola* (W. H. Edwards, 1863), *P. hecebolus* (Scudder, 1872), *P. lucas* (Fabricius, 1793), *P. evansi* (H. Freeman, 1946), *P. pauper pauper* (Mabille, 1878), and *P. evadnes* (Stoll, 1781).

One of the most enigmatic species in the genus is *P. luctuosa* (Herrich-Schäffer, 1869). Since its original description, which provided no locality information, very little has been learned about this taxon. Two syntype specimens of *Goniloba luctuosa* are known, one housed in the Museum für Naturkunde, Berlin, Germany (MNHU) (Fig. 1A), and another in the The Natural History Museum, London (NHMUK) (Fig. 1B), which Evans

(1955) considered the "Type". This syntype is labeled from "Venezuela", as are four additional males indicated by Evans (1955) in the NHMUK, yet Herrich-Schäffer (1869) made no mention of Venezuela in the original description, so the validity of this syntype is questionable. The syntype in the MNHU lacks locality data, but is undoubtedly a syntype (*pers. comm.* B. Hermier, 2020). In order to ensure correct identification of *Goniloba luctuosa*, the syntype in the MNHU (Fig. 1A) is here designated as the lectotype, and a corresponding label will be added to the specimen. Evans (1955) described two additional taxa as subspecies of *P. luctuosa* that share the same overall spotting pattern and coloration, but vary in details of the ventral hindwing pale band: *P. l. cineas* Evans, 1955, from Huancabamba, Peru, and *P. l. fonda* Evans, 1955, from Zamora, Ecuador. The taxonomic status of these two subspecies remains to be elucidated in detail; taxa considered subspecies by Evans (1951, 1952, 1953, 1955) have frequently been elevated to the species-level upon further study (*e.g.*, Medeiros *et al.*, 2019; Siewert *et al.*, 2020).

Other than the lectotype, paralectotype, and specimens in the NHMUK mentioned by Evans (1955) from Venezuela, there are few mentions of *P. l. luctuosa* in the literature. Draudt (1923) figured it (as *Prenes luctuosa*) from "Brazil", without further details. Hayward (1938) reported it from Argentina (as *Prenes luctuosa*), based on a female from Misiones Province, but later (Hayward 1948) corrected this to "*Panoquina nero* fa. *fusina*"; subsequent records of *P. luctuosa* from Argentina (*e.g.*, Hayward, 1940; Canals, 2003) are apparently based on Hayward's original (1938) erroneous record. Records

of *luctuosa* (as *Calpododes luctuosa*) from Ecuador reported by Williams & Hayward (1944) presumably refer to the subsequently described *P. l. fonda*; the report of *P. luctuosa* from Ecuador by Johnson & Matusik (1998) possibly does as well. Kochalka *et al.* (1996) reported *P. luctuosa* from Guairá, Paraguay, without additional details. A specimen recently reported as *P. luctuosa* from Colombia (Vargas & Salazar, 2006; González-Montana & Andrade-C., 2008) was subsequently described as *P. neblina* Vargas & Salazar, 2013 (Constantino *et al.*, 2013; but see below).

Given the few known records for *P. l. luctuosa* from South America, and the absence of records from Mesoamerica, it was completely unexpected when the senior author encountered a male *Panoquina* specimen in the Tehuacán Valley, Puebla, Mexico (Fig. 1C), which is an almost exact match to the lectotype and paralectotype specimens of *P. luctuosa luctuosa* (Figs. 1A, 1B).

MATERIALS AND METHODS

The senior author (JG) has conducted systematic studies of the Lepidoptera fauna of the Tehuacán Valley of Puebla since 2010, using a hand-held entomological net with a maximum reach of 4 meters. The Municipality of Santiago Miahuatlán, Puebla, has been surveyed on 30 occasions since 2011, in the months of June, July, and August, during sunny and cloudy conditions. On 19 July 2015, JG collected an unfamiliar *Panoquina* specimen in Santiago Miahuatlán (18°34'01"N, 97°26'09"O) at 1950 m (Fig. 2). The locality where the specimen was found is situated outside of the Reserva de la Biósfera Tehuacán-Cuicatlán (RBTC), situated 10 kilometers north of the city of Tehuacán. Study of literature and internet sources (*e.g.*, Warren *et al.*, 2017) suggested that the unusual specimen represents *Panoquina l. luctuosa*. We have not yet dissected the genitalia of this specimen, since materials to enable the simultaneous extraction of DNA have not been available, and direct comparison to the types is currently not feasible.

Over the past two decades we have reviewed collections of Lepidoptera containing Mexican HesperIIDae, as follows: Museo de Zoología, Departamento de Biología Evolutiva, Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico City (MZFC); Instituto de Biología, Universidad Nacional Autónoma de México, Mexico City (IBUNAM); Museo de Historia Natural de la Ciudad de México, Mexico City (MHNCM); McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, Gainesville (MGCL); Private Family collections of the De la Maza, Turrent, and Haghenbeck families (the first two in Mexico City and the last in Tehuacán). The MNHNCM collection includes material from Roberto Müller, who surveyed the Lepidoptera fauna of the Tehuacán Valley between 1908 and 1918 (Hoffmann, 1932), but he apparently never encountered *P. l. luctuosa* (Díaz-Batres, 2004). In summary, no additional museum specimens of *P. l. luctuosa* from Mexico were encountered during any of these collection searches.

We also reviewed literature related to the Mexican fauna of HesperIIDae, in a search for reports of *P. l. luctuosa* or

anything that could be interpreted as that taxon from Mexico, including national (Hoffmann, 1941; De la Maza-Ramírez, 1987; Llorente-Bousquets *et al.*, 1990; J. De la Maza-Elvira *et al.*, 1991; Warren, 2000) and regional studies, as follows: Campeche (Poza *et al.*, 2008); Colima (Warren *et al.*, 1998); Chiapas (Hoffmann, 1933; J. De la Maza-Elvira & R. De la Maza-Elvira, 1985; R. De la Maza-Elvira & J. De la Maza-Elvira, 1993; Luis-Martínez *et al.*, 2011b; R. De la Maza-Elvira & J. De la Maza-Elvira, 2017); Distrito Federal (Luis-Martínez & Llorente-Bousquets, 1990; Díaz-Batres & Llorente-Bousquets, 2011); Durango (Díaz-Batres, 1991); Estado de México (Hernández-Mejía *et al.*, 2008; Jiménez-Sánchez *et al.*, 2019); Guerrero (Vargas-Fernández *et al.*, 1992); Jalisco (Llorente-Bousquets *et al.*, 1995; Vargas-Fernández *et al.*, 1996); Michoacán (Salinas-Gutiérrez *et al.*, 2015); Morelos (R. De la Maza-Elvira, 1976; Luna-Reyes *et al.*, 2012; Legal *et al.*, 2017); Nayarit (Llorente-Bousquets *et al.*, 2004); Nuevo León (Sada *et al.*, 2011, 2019); Oaxaca (Luis-Martínez *et al.*, 2004; Luis-Martínez *et al.*, 2016; Llorente-Bousquets, 2017); Quintana Roo (R. De La Maza-Elvira & Gutiérrez-Carbonell, 1992); San Luis Potosí (R. De la Maza-Elvira & J. De la Maza-Elvira, 1988; R. De la Maza-Elvira & White-López, 1990); Tamaulipas (Meléndez-Jaramillo, 2017); Veracruz (Raguso & Llorente-Bousquets, 1990; Hernández-Baz, 1993; Luis-Martínez *et al.*, 2011a). No previous reports of *P. l. luctuosa* from Mexico were encountered in our literature search.

RESULTS AND DISCUSSION

This is the first report of *Panoquina l. luctuosa* from Mexico, and apparently, from anywhere in Mesoamerica. The male *P. l. luctuosa* specimen from Santiago Miahuatlán, Puebla, Mexico, closely matches the lectotype and paralectotype of *P. l. luctuosa* in all details of wing markings. The ground color of the Mexican male is dark brown as on the types, dorsally with orangish-brown scales concentrated at the central and basal areas of the wings. The Mexican male has the same forewing spot pattern as the lectotype and paralectotype of *P. l. luctuosa*, dorsally and ventrally, as follows: two small, oval, apical spots in cells R_4-R_5 and R_5-M_1 ; larger, semi-rectangular, near the base of cell M_3-CuA_1 ; larger, roughly triangular, in the basal half of CuA_1-CuA_2 (this spot somewhat more rectangular in shape on the Mexican specimen) slender, semi-rectangular, in the lower half of cell $CuA_2-1A+2A$; very small, circular, in the discal cell aligned with the base of the spot in CuA_1-CuA_2 . Ventrally, the pale hindwing band on the Mexican male matches that of the lectotype and paralectotype, in all details, extending from $Sc+R_1$ to $1A+2A$, narrow at the ends and broad in the middle, and ending in a "hook" in cell $1A+2A$ pointed towards the base of the wing. Based on this, we have no reason to question the application of the name *P. l. luctuosa* to this Mexican specimen, despite the apparent disjunction between the area where it was collected and the nearest known records in "Venezuela". We look forward to future molecular studies that may provide additional information on the relationship of the Mexican specimen to the lectotype and paralectotype specimens of *P. l. luctuosa*. We have not seen the female of *P. l. luctuosa*, and the degree to which there may be sexual dimorphism in wing shape



Figure 1. Specimens of *Panoquina luctuosa luctuosa* (Herrich-Schäffer, 1869) in dorsal and ventral views, with respective labels. A) Male lectotype (MNHU); B) male paralectotype from Venezuela (NHMUK); C) male from Santiago Miahuatlán, Puebla, Mexico (JG).

and/or markings, as displayed by most *Panoquina* species, remains unknown (but see below).

The site at Santiago Miahuatlán, Puebla, where the specimen of *P. l. luctuosa* was encountered (Fig. 2), is within the Tehuacán-Cuicatlán Valley, a region in Puebla and Oaxaca

supporting a very large number of endemic plants and animals. This region is comprised of alternating mountain systems and river valleys leading to a diverse array of microhabitats in a predominantly arid landscape. The majority of the northern half of the Tehuacán-Cuicatlán Valley in Puebla, including the site



Figure 2. Habitat of *Panoquina l. luctuosa* at Santiago Miahuatlán, Puebla, Mexico, 22 August 2020, photo by García-Díaz.

at Santiago Miahuatlán (Fig. 2), is comprised of xeric shrubland (Canseco-Márquez & Gutiérrez-Mayén, 2010; García-Díaz & Turrent-Carriles, 2019a, 2019b, 2020), dominated by *Agave* L., *Hechtia* Klotzsch, *Tillandsia* L., *Opuntia* Mill., *Acacia* Martius, *Asclepias* L., and *Echinocactus* Link & Otto, among others. Butterfly species found flying together with *P. luctuosa* at Santiago Miahuatlán include *Battus p. philenor* (Linnaeus, 1771), *B. p. polydamas* (Linnaeus, 1758), *Pterourus m. multicaudata* (W. F. Kirby, 1884), *Aphrissa s. statira* (Cramer, 1777), *Atlides gaureri* (Godman, 1901), *Nymphalis a. antiopa* (Linnaeus, 1758), *Aegiale hesperiaris* (Walker, 1856), *Astrartes anaphus annetta* Evans, 1952, and *Achalarus tehuacana* (Draudt, 1922), among others.

The overall distribution of *P. l. luctuosa* in Mexico remains unknown. Considering the habitat at Santiago Miahuatlán, Puebla, it is possible that *P. l. luctuosa* is more widespread in dry habitats in Mexico than our current record suggests, especially within the Tehuacán-Cuicatlán Valley of Puebla and Oaxaca. Search for *P. l. luctuosa* should also be conducted in dry habitats elsewhere in Oaxaca, Veracruz and Chiapas, as well as within the Balsas Basin of Michoacán and Guerrero. The discovery of *P. l. luctuosa* in Mexico, representing the first report of this species from Mesoamerica, hints at the possible but thus far undetected presence of this species in Central America. The Lepidoptera fauna of dry habitats in Mexico

and Central America remain understudied compared to that of humid ones, despite the high level of endemism in these dry areas (e.g., Trujano-Ortega *et al.* 2020).

As noted above, the only mention of *P. luctuosa* from Colombia (Vargas & Salazar, 2006) is based on a single specimen, which we noticed was subsequently designated the holotype of *P. neblina* by the same authors in Constantino *et al.* (2013). While these authors stated that this unique specimen is a male, details of its wing shape and spotting pattern (longer wings, smaller wing spots, extra forewing spot in cell M_2-M_3) and abdomen (short, broad at distal end) lead us to believe that this specimen is actually a female. The original description (Constantino *et al.*, 2013) states that the genitalia had not been examined, and no illustrations of the genitalia were provided. Other than these subtle differences, the Colombian specimen differs from the known males of *P. l. luctuosa* only in the width of the pale ventral hindwing band, which is slightly broader in the Colombian specimen. If the Colombian specimen is indeed a female, as we suspect, the subtle difference in the width of the pale ventral hindwing band could possibly represent normal sexual dimorphism in the species, which would render *P. neblina* as a synonym of *P. l. luctuosa*. Additional specimens and DNA comparisons are needed to determine the true status of *P. neblina*.

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