

ATRYTONOPSIS ZWEIFELI IS A MALE OF *A. FRAPPENDA* (LEPIDOPTERA, HESPERIIDAE, HESPERIINAE, HESPERIINI)

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Abstract. – Until recently, the skipper butterfly *Atrytonopsis zweifeli* has been known from males, and the similar *A. frappenda* has been known from females. Discovery and analysis of a male *A. frappenda* from its type locality (Distrito Federal, Mexico) and an *A. frappenda*-like female from near the type locality of *A. zweifeli*, establishes *Atrytonopsis zweifeli* H. Freeman, 1969 as a **new junior subjective synonym** of *A. frappenda* (Dyar, 1920).

Over the history of butterfly studies, males and females of the same species have at times been given different names, mostly in cases of extreme sexual dimorphism. Some notable examples include the charaxine nymphalid *Paphia indigotica* Salvin, 1869 (male) – *Paphia zelica* Salvin, 1869 (female), described in the same publication on the same page (now *Memphis philumena indigotica*), and the skipper *Oxynetra hopfferi* Staudinger, 1888 (male) – *Dis annulatus* Mabilie, 1889 (female), described in different genera (now *O. hopfferi*). Association of males with females may be complicated due to dissimilarity in appearance. However, even in cases when dimorphism is far from excessive, the placement of different sexes in different taxa may occur when the number of specimens available for analysis is small. One such example with skipper butterflies involves two taxa of *Atrytonopsis* Godman, 1901, *A. frappenda* (Dyar, 1920) (described from two females from Distrito Federal, Mexico) and *A. zweifeli* H. Freeman, 1969 (described from one male from Coahuila, and one male from Sinaloa, Mexico).

The hesperiine genus *Atrytonopsis* includes about fourteen described species (Mielke 2005, Pelham 2008, Warren 2009, 2011). Most species are confined to the southwestern United States and Mexico, but the limits of the genus extend to the northeastern United States and southeastern Canada in the north, and Costa Rica in the south (Lindsey *et al.* 1931, MacNeill 1975, Burns 1982, 1983). Twelve of these fourteen species have been reported from Mexico, and four of these are thought to be endemic to the country (*A. frappenda*, *A. zweifeli*, *A. llorentei* A. Warren, 2009 & *A. austinorum* A. Warren, 2011). However, below we argue that the numbers for Mexico should be reduced to eleven recorded and three endemic species.

Atrytonopsis zweifeli was described by Freeman (1969) from Los Cedritos, [Mpio. Arteaga], [2220 m.], Coahuila, Mexico. This locality is about 40 kilometers southwest of Monterrey, Nuevo León, and about 35 kilometers east of Saltillo, Coahuila, situated about 5 kilometers to the east of the Nuevo León state line (see map, fig. 10). Other than the single male specimen (holotype) from the type locality (fig. 1, 9), Freeman included one additional male (paratype) in the type series (fig. 2), from the Sierra Madre Occidental in the state of Sinaloa (Durango-Villa Union Hwy., Ruta 40, 1981m), about 600 kilometers to the southwest (fig. 10). Other than these two males, no additional specimens of *A. zweifeli* have been reported. Freeman (1969) correctly recognized a close

relationship between *A. zweifeli* and *A. lunus* (W. H. Edwards, 1884), which he considered the closest relative of *A. zweifeli*; at the time, *A. frappenda* resided within *Lychnuchoides* Godman, 1901, a genus considered distantly related to *Atrytonopsis* (Evans 1955).

Burns (1982) recognized *Lychnuchoides frappenda* as an *Atrytonopsis*, and formally transferred the species into the genus. He provided a detailed analysis of the type specimens of *A. frappenda* from Distrito Federal (two females, figs. 3, 4) and *A. zweifeli* (two males, detailed above), and reported a third female of *A. frappenda* from Morelos Cañada, [Mpio. Cañada Morelos], [2300 m.], Puebla, which is about 80 kilometers southeast of Puebla City, and about 180 kilometers southeast of Distrito Federal (see fig. 10). This record not only extended the known distribution of *A. frappenda* considerably to the southeast, but also established it as an element of the Tehuacán Desert and Sierra Madre Oriental (Morelos Cañada is situated where these two regions meet). Burns (1982) included *A. lunus*, *A. frappenda* and *A. zweifeli* in his “*lunus* group” of *Atrytonopsis*, united primarily by the large size of adults, lack of stigmata in males, and shared wing pattern elements, and considered them to form a superspecies.

Shortly after arriving at the McGuire Center for Lepidoptera and Biodiversity (MGCL) in 2006, the senior author encountered a female *Atrytonopsis* in the collections from the northeastern Mexican state of Nuevo León (fig. 6), dissected and determined as *A. frappenda* by S. Steinhäuser. Indeed, this specimen is a very close match to females from Distrito Federal (figs. 3-4, 6-8) and Puebla (Burns 1982), and shows no obvious differences in genitalia from them, as figured by Burns (1982). This specimen differs from females to the south only in the somewhat reduced size of forewing spots. Determination of this specimen (from 10 mi. S Galeana, Ruta 61, 1676 m.) as *A. frappenda* extended the known distribution of that skipper by about 600 kilometers to the north, from Distrito Federal, and placed the northern end of its distribution only about 100 kilometers to the southeast of the type locality of *A. zweifeli* in the Sierra Madre Oriental (fig. 10). Alternatively, if the specimen is considered to represent *A. zweifeli*, females of *A. zweifeli* and *A. frappenda* would therefore be essentially identical, a situation otherwise unknown in the genus, and further evaluation of the status of *A. zweifeli* would have to await the discovery and examination of a male of *A. frappenda*.

In November, 2008, while researching HesperIIDae in

the Lepidoptera collection at the Museo de Historia Natural y Cultura Ambiental de la Ciudad de México (MHNCM), in Mexico City, the senior author encountered three specimens of *A. frappenda*, one male (fig. 5) and two females (figs. 7, 8), from the R. Müller collection. The male was previously cited by Bell (1942) as *A. lunus*, an identity questioned by Burns (1982), who, however, did not examine the specimen. The females are both labeled from “Guadalupe, D. F., VIII”, and the male is labeled as follows: white, printed and handprinted: / México / D.F. VIII /; white, printed and handprinted: / R. Müller / Coll. / 5522 /; white, printed: / Gen. 5522 /; white, handprinted: / Atrytonopsis / lunus [male symbol] / Edwards / Det. E. L. Bell /; white, printed: / CNIABM / 2209 /. The genitalia label is in the same style as other such labels made by E. Bell at the American Museum of Natural History (AMNH), and the style in which the cleared abdominal pelt was glued to the thorax was consistent with Bell’s other genitalic preparations. A search of the collections at the MHNCM failed to locate this genitalic preparation, and it is unknown if it was retained at the AMNH by Bell or returned to Mexico.

While originally determined by Bell as *A. lunus*, the male specimen from Distrito Federal in the MHNCM is clearly of *A. frappenda*. It is unknown exactly when Bell (1876-1964) dissected this specimen and determined it as *A. lunus*, but *A. frappenda* resided within *Lychnuchoides* at the time, and *A. zweifeli* had not yet been described. This specimen differs from males of *A. lunus* in several ways (images of *A. lunus*, including the lectotype male, are provided by Warren *et al.* 2012). In dorsal aspect, it has two small but well-defined pale spots in cell CuA2; one very small, positioned in the upper end of the cell immediately below the distal end of the spot in cell CuA1, and a larger spot in the bottom half of the cell, centered below the lower margin of the spot in cell CuA1. The presence and arrangement of these spots approaches the condition seen in cell CuA2 on females of *A. frappenda*, with one continuous, somewhat arrowhead-shaped spot in this cell (spots are rarely present in cell CuA2 in males of *A. lunus*). In addition, the male from Distrito Federal has larger pale spots in cell CuA1 and the discal cell than on *A. lunus*, which unlike on *A. lunus*, are nearly aligned; in these characters, again, the male reflects the larger spots in these cells, and their positioning, as seen on females of *A. frappenda*. In ventral aspect, the male from Distrito Federal differs from males of *A. lunus* in having a broad pale area (with indistinct borders, appearing somewhat smudged) in cell CuA2, again, a feature shared with females of *A. frappenda*. Compared to the two males of *A. zweifeli*, the male from Distrito Federal barely differs. In cell CuA2, the holotype of *A. zweifeli* is the least well-marked, with only the suggestion of an upper spot (in dorsal and ventral aspect), on the right wing only, and a rather suffused pale area in ventral view. The overall shape and size of the discal cell spots are similar between the two specimens, and the pale spot in cell CuA1 is slimmer on the holotype of *A. zweifeli* than on the male from Distrito Federal. The hindwing shape of the holotype of *A. zweifeli* appears somewhat narrower on fig. 1 than that of the male from Distrito Federal, but on closer examination (fig. 9), this is an artifact of specimen preparation and an illusion given by the two-dimensional photographic image, as there is an apparent buckling in the hindwings

adjacent to the nearby pinholes, and the specimen is set with wings at an angle away from a plane. Co-planar photographs of either side (fig. 9) show the convex hindwing margin very similar to that in the male from Distrito Federal, and illustrate that it can be dangerous to base conclusions on photos alone without examination of actual specimens. The paratype male of *A. zweifeli* from Sinaloa differs from the male from Distrito Federal only in lacking a lower pale spot in CuA2 (the upper spot in that cell is well-developed), and in having somewhat larger spots in CuA1 and the discal cell. Considered together, the male from Distrito Federal seems to be intermediate in most wing markings between the holotype and paratype of *A. zweifeli*, perhaps slightly closer to the paratype, except that it has the lower pale spot in CuA2. While we were unable to locate the genitalic preparation for the male from Distrito Federal, as detailed by Burns (1982), genitalic differences apparently don’t exist between *A. lunus* and *A. zweifeli*, so we do not expect the male genitalia from Distrito Federal to differ in any significant way from those of *A. lunus*.

Based on these findings, we herein treat *A. zweifeli* as a **new junior subjective synonym** of *A. frappenda*. This action reduces the number of taxa in the *lunus* group to just two, *A. frappenda* and *A. lunus*. As stressed by Burns (1982), our knowledge of this group in northern Mexico remains poor. Since Burns (1982), *A. lunus* has been confirmed from Sonora, Mexico, specifically from the Mesa Campañero area near Yecora, south of Hwy. 16 (ADW, pers. obs., 1997). However, no specimens of the *A. lunus* group are known from the Sierra Madre Occidental between Mesa Campañero in Sonora and Hwy. 40 in Sinaloa, a distance of over 600 kilometers. Given the remoteness of this region, we speculate that the lack of records is likely due to the general inaccessibility of higher-elevation habitats in the range, and suggest that further studies on the *A. lunus* group in this area are needed to further clarify the relationship of *A. lunus* and *A. frappenda*. As noted by Burns (1982), the two taxa cannot reliably be separated genitally.

In 2008, while reviewing papered material at the MZFC (Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico City) recently collected in the Cuicatlan-Tehuacán Biosphere Preserve of southern Puebla and northern Oaxaca, by John Kemner, additional specimens of *A. frappenda* were briefly reviewed (but not examined in detail) from Puebla (near Cañada Morelos, 1 male) and Oaxaca (Mpio. Tepelmeme: Cañon La Unión – Las Flores, 7150’, 16-VII-2006, 1 male; Mpio. Nacaltepec: nr. Nacaltepec, 2 males). These Oaxaca records represent an additional range extension for *A. frappenda*, of about 150 kilometers to the south-southeast, from east-central Puebla (Morelos Cañada) to north-central Oaxaca (Nacaltepec).

The overall range of *A. frappenda* in Mexico remains poorly known. Although few specimens are extant in collections, *A. frappenda* appears to have a broad distribution away from its type locality in Distrito Federal. It occurs along the western flank of the Sierra Madre Oriental, perhaps disjunctly, at least from northern Oaxaca and eastern Puebla north to southeastern Coahuila, and also occurs in the Sierra Madre Occidental of southern Sinaloa. It remains unknown how broadly distributed *A. frappenda* may be in northern Mexico, and if its presence



Fig. 1-4. *Atrytonopsis frappenda* specimens. 1. Holotype of *A. zweifeli*, male, MEXICO: Coahuila, 1.6km S Los Cedritos, 23-Jun-1957, R. Zweifel collector [AMNH]; **2.** Paratype of *A. zweifeli*, male, MEXICO: Sinaloa: Durango-Villa Union Hwy., Ruta 40, 6500', 29-IV-1966, P. Hubbell collector [AMNH]; **3.** Holotype of *A. frappenda*, female, MEXICO: [D.F.]: Mexico City, Aug-1917, R. Müller collector, Genit.# X-1059, Type No. 23620 [USNM]; **4.** Paratype of *A. frappenda*, female, MEXICO: [D.F.]: near Mexico City, July, R. Müller collector, Genit.#X-1068, Type no. 23620 [USNM]; d-dorsal, v-ventral.



Fig. 5-8. *Atrytonopsis frappenda* specimens. 5. male, MEXICO: D.F.: August, R. Müller collector, E. L. Bell Gen. 5522 [MHNCM]; 6. female, MEXICO: Nuevo León: 10 mi. S of Galeana, Ruta 61, 5500', 01-VII-74, S. Roman & M. Douglas, Genitalic Vial No. SRS-5277, Allyn Museum Acc. 1999-7, MGCL/FLMNH Specimen No. 35826; 7. and 8. females, MEXICO: D.F.: Guadalupe, August R. Müller collector [MHNCM]; d – dorsal, v – ventral. Scale is approximate.



Fig. 9. Holotype of *A. zweifeli*, data in text. This specimen was set with left and right sides not aligned in the same plane; as a result, wings appear pushed up to form a broad “V”. Due to this lack of planarity, single photographs shown in fig. 1 and in other publications (e.g., Burns 1982) hinder proper assessment of wingshape, especially of the hindwing. Here, we show individual images of each side, oriented in the plane of each image: dorsal left (top left) and right (top right), ventral right (bottom left) and left (bottom right). The pronounced non-planarity is clear from the out-of-focus and oddly-shaped halves shown in the images on the right.

in the Sierra Madre Occidental represents a true disjunction in distribution, or simply the lack of records from areas of the northern and central Mexican Altiplano.

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Fig. 10. Distribution of *Atrytonopsis frappenda*; 1 = Mexico City, Distrito Federal: Type Locality of *A. frappenda*; 2 = 1.6 km S Los Cedritos, Mpio. Arteaga, Coahuila: Type Locality of *A. zweifeli*; 3 = Durango-Villa Union Hwy., Ruta 40, Sinaloa: collection locality of paratype male of *A. zweifeli*; 4 = Morelos Cañada, Mpio. Cañada Morelos, Puebla: collection locality for one pair of *A. frappenda*; 5 = 10 mi. S of Galeana, Ruta 61: collection locality for one female of *A. frappenda*; 6 = Cañon La Unión – Las Flores, Mpio. Tepelmeme, Oaxaca, collection locality for one male of *A. frappenda*; 7 = nr. Nacaltepec, Mpio. Nacaltepec, Oaxaca, collection locality for two males of *A. frappenda*.

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