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A new species of *Atrytonopsis* from western Mexico (Lepidoptera: Hesperiidae: Hesperiinae: Hesperiini)

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Abstract. A new species of *Atrytonopsis* is described from the western and central Mexican states of Michoacán, México and Sinaloa. Preliminary distributional and biological notes are provided, as well as a discussion of this new species' placement within the genus *Atrytonopsis*.

Additional Key Words. biogeography, distribution, fire, Hesperioidea, skipper.

Resumen. Se describe una especie nueva de *Atrytonopsis* de los estados de Michoacán, México y Sinaloa, del occidente y centro de México. Se proporciona notas preliminares sobre su distribución y biología, asi como una discusión sobre la colocación de la especie nueva en el género *Atrytonopsis*.

Palabras claves adicionles. biogeografía, distribución, fuego, hesperido, Hesperioidea.

Introduction

The hesperiine skipper genus *Atrytonopsis* Godman, 1900, is comprised of about twelve described species (Mielke 2005, Pelham 2008), ranging from the northeastern United States and southeastern Canada, to northern Costa Rica (Godman 1900, Lindsey 1921, Lindsey et al. 1931, MacNeill 1975, Burns 1982, 1983), with the majority of species occurring in the southwestern United States and Mexico (Lindsey et al. 1931, Burns 1983, Warren 2000, Brock and Kaufmann 2006). Species of *Atrytonopsis* are brown to gray with opaque markings on the fore- and in some species, on the hindwings, and males have characteristically pointed forewings. Two species-groups of *Atrytonopsis* were reviewed in detail by Burns (1982, 1983), who also provided comparative morphological notes on other species in the genus. Most *Atrytonopsis* species are univoltine, with a single flight in the spring or summer, although a few species are bivoltine or multivoltine, with major spring and late summer-fall flights (e.g., Burns 1983). The majority of *Atrytonopsis* species occur in semi-arid habitats, including grasslands, deserts and open oak-pine woodlands, generally from 550 to 1850 m, but taxa in the southeastern United States occur at or near sea level in open xeric habitats (Opler & Krizek 1984). Males of some species (e.g., *A. edwardsii* W. Barnes & McDunnough, 1916) congregate on hilltops and ridgelines (Opler 1999).

The late Lamberto González-Cota (formerly of Uruapan, Michoacán) conducted intensive surveys on the Hesperiidae of the Mexican state of Michoacán, mainly between 1989 and 1998, which resulted in the rediscovery of several taxa only known from original type specimens (e.g., Warren and González 1996), as well the discovery of a number of species new to science (e.g., Warren and González 1999), some of

which remain unnamed. One of the undescribed hesperiids first detected among samples collected by González-Cota includes a large, striking, new species of *Atrytonopsis*, described below.

The two initially examined specimens from Michoacán of this new *Atrytonopsis* species were a female in fresh condition, collected at Cerro de la Cruz, Municipio Uruapan, in August 1991, and a male in poor condition collected at Matanguarán, Municipio Uruapan, in September, 1994, both by Lamberto González-Cota (a female specimen, collected at Santa Rosa, Mpio. Uruapan, on 2 August 1990 by González-Cota was subsequently located in the butterfly collection at the Museo de Historia Natural y Cultura Ambiental, Ciudad de México, in 2007). In an effort to obtain additional material of this new species, the author spent three days on Cerro de la Cruz in July 1996, which resulted in the collection of three males in fresh condition. Additional fieldwork in August 1996, on Cerro de la Cruz by González-Cota and his assistants resulted in the collection of five males and four females of the new species. Fieldwork in 1997 by González-Cota on Cerro de la Cruz, assisted by Maximo Martínez on July 23rd, resulted in the collection of two males and three females. The author spent two days on Cerro de la Cruz in August 1997; two females were collected on August 23rd, and one male and two females were collected on August 29th. Subsequently, Richard W. Holland forwarded a male specimen of this new *Atrytonopsis* species, from the border of Sinaloa and Durango, Mexico, collected in 1970, demonstrating that this species must be more widespread in western Mexico than our current data suggest. This assumption proved true in September, 2007, when one female of this new species, in good condition, was collected near Temascaltepec, Municipio Temascaltepec, State of México (and two others were seen that day).

Atrytonopsis llorentei A. Warren, sp. nov.
(Figs. 1, 2, 3)

Description. Male (Fig. 1a,b)– forewing length = 17.8 mm (holotype), 16.9 ± 2.3 (n = 8); forewing with pointed apex, termen evenly convex (although slightly concave between CuA_2 and 1A+2A), no stigma or brand; hindwing convex, produced at end of Rs, slightly concave between CuA_2 and 1A+2A, lobed at tornus. Dorsal forewing brown; sparse overscaling of short, flat, golden-brown scales on fresh specimens, distributed along basal half of costa and other cells, producing a subtle golden sheen; sparse pale golden-brown overscaling of setiform scales in base of discal cell, CuA_1-CuA_2, and CuA_2-2A. Opaque whitish macules as follows: subapical in mid- R_3-R_4 and near bases of R_4-R_5 and R_5-M_1, more or less quadrate, perpendicular to costa, completely overlapping, forming a straight line, macule in R_5-M_1 slightly larger than other two; postmedial (non-overlapping), mid- M_1-M_2, usually absent but present as a tiny opaque macule on one male, and linear, spaning the width of the cell on another male; mid- M_2-M_3, small, roughly triangular; in basal half of M_3-CuA_1, larger, roughly quadrate (distal edge straight or slightly concave, proximal edge slightly concave); in basal half of CuA_1-CuA_2, proximal edge under origin of CuA_1, largest, roughly quadrate, proximal edge convex, distal edge straight or slightly concave; mid-CuA_2-1A+2A, white (not opaque), small, triangular; finally, hour-glass shaped macule spanning width of discal cell at proximal section of distal third of cell, mostly overlapping macule in CuA_1-CuA_2. Wing fringe brown proximad, gray distad, with scattered whitish scales in CuA_2-1A+2A.

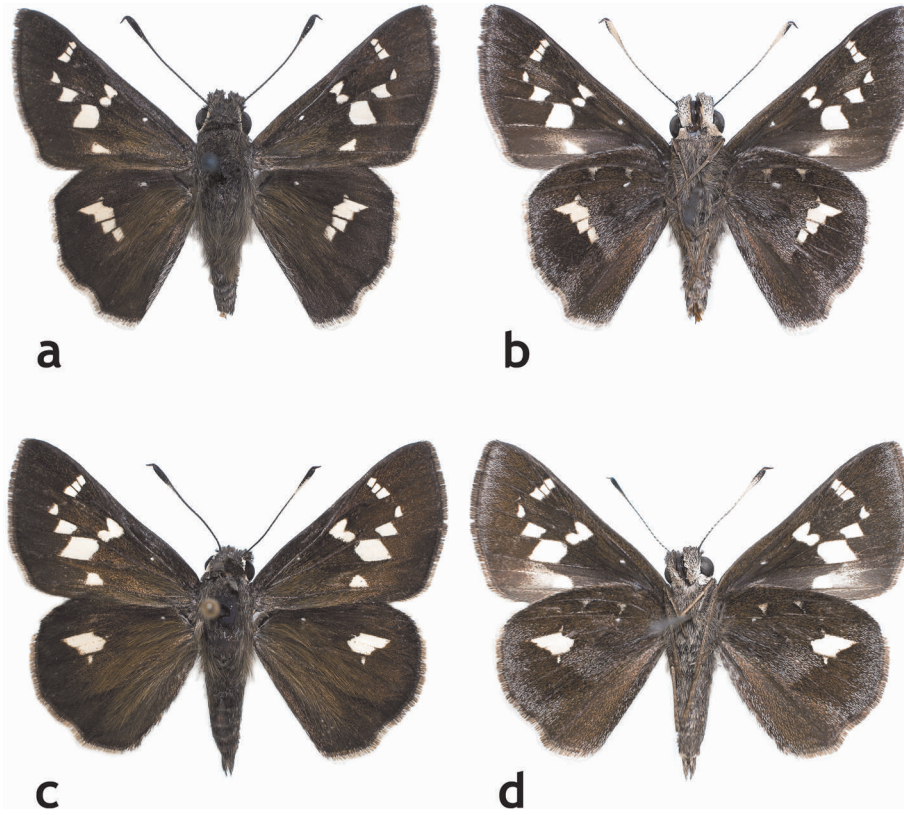

Figure 1. Adults of *Atrytonopsis llorentei*; **a)** dorsal and **b)** ventral views of holotype male from MEXICO: Michoacán: Mpio. Uruapan: Cerro de la Cruz, 2050 m., 23 July 1996, Andrew D. Warren; **c)** dorsal and **d)** ventral views of allotype female from same locality as holotype, 13 August 1996, Lamberto González-Cota.

Dorsal hindwing same ground color as forewing; prominent overscaling of pale golden-brown setiform scales in 1A+2A-3A (extending almost to termen), CuA_1-CuA_2, CuA_2-1A+2A and discal cell (basal half). Opaque whitish, mostly overlapping macules as follows: bottom half of R_5-M_1 distal of mid-cell, very small point overlapping proximal base of following macule; mid- M_1-M_2, rectangular, distal end offset distad from others in series, continuous (not separated by brown scaling along M_2) with following macule; basal third of M_2-M_3, quadrate; mid- M_3-CuA_1, smaller, quadrate, completely overlapped by macule in M_2-M_3; mid- CuA_1-CuA_2, smaller, square, offset slightly proximad from proximal edges of macules in M_2-M_3 and M_3-CuA_1. Wing fringe brown proximad, gray distad, with scattered whitish scales between Sc+R_1 and M_3, and between CuA_2 and 1A+2A.

Ventral forewing pale brown to rusty brown, opaque macules repeated from dorsal surface, white macule in CuA_2-1A+2A larger than on dorsal surface, distal borders blurred by white overscaling; prominent overscaling of short, flat, lilac-colored scales concentrated along termen from apex to CuA_2, also at end of discal cell between opaque macules in R_5-M_1 and M_3-CuA_1, where they are intermixed with ochreous scales; overscaling of short, flat ochreous scales mainly along costa

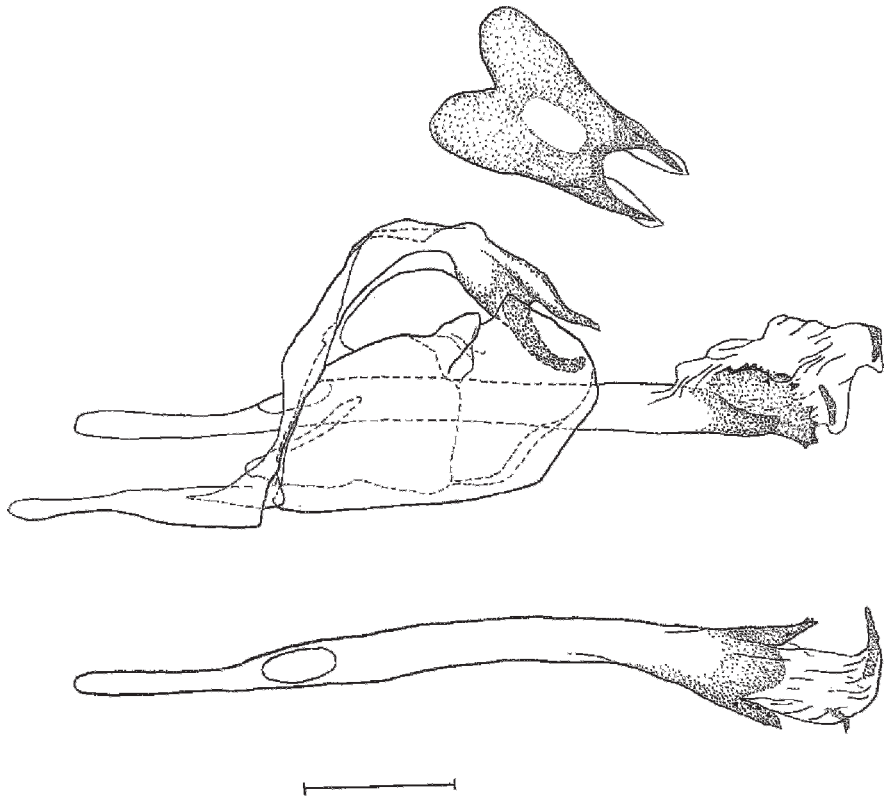

Figure 2. Male genitalia of *Atrytonopsis llorentei* from MEXICO: Michoacán: Mpio. Uruapan: Matanguarán, 1370 m., 5 September 1994, Lamberto González-Cota, Andrew D. Warren Genitalia vial # 95–116 (scale = 1.0 mm), showing tegumen, uncus and gnathos in dorsal view, complete genitalia in left-lateral view, and aedeagus in dorsal view.

and around apical macules; a few ochreous, setiform scales in the basal half of the discal cell; fringes as on dorsal surface.

Ventral hindwing rusty brown, opaque macules repeated from dorsal surface; two small, triangular whitish macules in Sc+ R_1-Rs, one proximad of mid-cell, the other just distad of mid-cell; prominent overscaling of lilac-colored scales along termen from Sc+R_1 to 3A (extending basad to opaque macule in Rs-M_1) and along tornus, also just basad of all opaque macules, extending to wing base in CuA_1-CuA_2, and in mid- CuA_2-1A+2A; fringes as on dorsal surface.

Dorsal head brown with brown and gray setiform scales, whitish behind and beneath eye; dorsal labial palpi with mix of brown and gray setiform scales, grading towards whitish laterally, ventral surface of palpi white with scattered black setiform scales; inner surface dark gray; third segment black, porrect, barely extending beyond distal scales of second segment. Antennal shaft and club black on dorsum, mostly whitish on venter with black between segments; nudum red-brown becoming darker at distal end, 10–12 nudum segments (11 segments on holotype). Dorsal thorax brown with scattered gray setiform scales, ventral thorax appearing grayish with scattered white and dark brown setiform scales. Legs brown dorsad with scattered grayish scales, pale gray ventrad, with gray and dark brown setiform scales

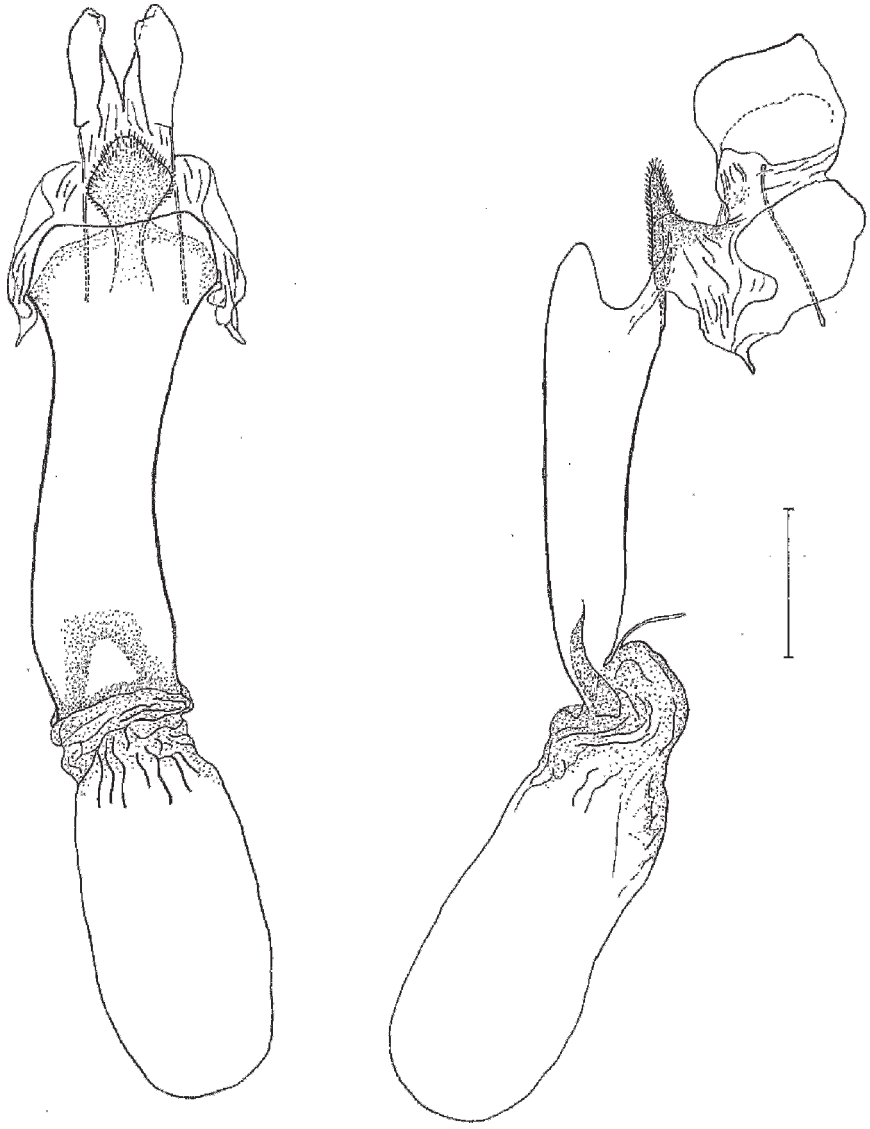

Figure 3. Female genitalia of *Atrytonopsis llorentei* from MEXICO: Michoacán: Mpio. Uruapan: Cerro de la Cruz, 2050 m., 24 August 1991, Lamberto González-Cota, Andrew D. Warren Genitalia vial # 95–117 (scale = 1.0 mm), showing ventral (left) and right-lateral (right) views of papillae anales, lamella postvaginalis, ductus bursae and corpus bursae (ductus seminalis visible in lateral view).

along ventral edge of femur; tarsi with three longitudinal rows of short spines; foretibiae not spined, grayish epiphysis short (0.6 mm), extending distad to distal end of tibia; mid-tibiae unspined, pair of spurs distad, outer spurs about 4/5 length of inner; hind-tibiae unspined, two pairs of spurs, outer spurs about 1/2 length of inner. Dorsal abdomen dark brown, with long olive to grayish setiform scales cephalad; ventral abdomen brown with scattered pale whitish setiform scales.

Male genitalia (Fig. 2). Uncus in lateral view narrow, slightly convex, pointed caudad; in dorsal view broad, divided, narrow prongs widely spaced from each

other, pointed at distal ends; gnathos about same length as uncus, divided prongs widely spaced, narrow in lateral view, convex, hooked at distal end, prongs in dorsal view broader than those of uncus; tegumen broad cephalad, divided into two lobes separated by a deep notch, narrowing caudad to junction with uncus; combined ventral arm of tegumen and dorsal arm of saccus essentially straight, cephalic arm of saccus long, 3/4 length of valvae, narrow and nearly straight in lateral view, fairly narrow in dorsal view, pointed at caudal end; valvae symmetrical, length about 1.5 times width, costa convex to ampulla; ampulla short, length 1.3 times width, angled slightly dorsad, caudal end slightly pointed; harpe pointed dorsad, evenly rounded distad, caudal end slightly overlapping distal edge of ampulla; juxta-transtilla prominent, pointed dorsad and caudad in lateral view, sub-quadrate in ventral view; aedeagus long, 2.2 times length valvae, relatively straight in dorsal and lateral views, narrow proximad with rounded end, broader distad; terminal end divided in dorsal view, prongs adorned with 4–5 very small spines; vesica with two short, sclerotized cornuti.

Female (Fig. 1c,d)– forewing length = 19.5 mm (allotype), 19.3 ± 1.2 (n = 4); forewing termen convex, more rounded than in male, not concave between CuA_2 and 1A+2A, hindwing termen convex, much more rounded than in male, only slightly concave between CuA_2 and 1A+2A, lobe at tornus weakly developed; forewing pattern, dorsal and ventral, as in male but with broader white opaque spots, especially in CuA_1-CuA_2 and discal cell; dorsal and ventral hindwing as in male, except opaque macule in CuA_1-CuA_2 absent, macule in M_3-CuA_1 tiny on allotype, absent on three female paratypes; macules in M_1-M_2 and M_2-M_3 broader than in male. Characters of the head, palpi, antennae, thorax (including legs) and abdomen as in male.

Female genitalia (Fig. 3). Lamella postvaginalis roughly diamond-shaped (although broader proximad), densely clothed in fine setae; ductus bursae slightly bowed to left, broad, heavily sclerotized, flared distad, with slight bilateral swelling proximad; corpus bursae entirely membranous, 0.8 times length of ductus bursae, length 2 times width, heavily wrinkled distad, smooth and evenly curved proximad.

Specimens examined. Holotype male with the following labels: white, printed: / MEXICO: MICHOACÁN: / Mpio. Uruapan: / Cerro de la Cruz, 2050 m., / 23-VII-1996 / Andrew D. Warren /; red, printed and handprinted: / HOLOTYPE / *Atrytonopsis llorentei* / A. Warren. Allotype female: / MEXICO: MICHOACÁN: / Mpio. Uruapan / Cerro de la Cruz, 2050 m. / 13-VIII-1996 / Lamberto González-Cota /; red, printed and handprinted: / ALLOTYPE / *Atrytonopsis llorentei* / A. Warren. Paratypes with white, printed locality labels, and yellow, printed and handprinted paratype labels (all from same location as holotype, leg. L. González-Cota, unless noted otherwise): same data as holotype (1 male); same data as allotype (1 male, 2 females); 22 July 1996, Andrew D. Warren (1 male); 24 August 1991 (1 female); 23 July 1997, M. Martínez (2 males, 3 females); 23 August 1997, Andrew D. Warren (2 females); 29 August 1997, Andrew D. Warren (1 male, 2 females); cañada obscura, Cerro de la Cruz, 1800 m., 16 August 1996 (4 males, 1 female); Mpio. Uruapan: Matanguarán, 1370 m., 5 September 1994 (1 male); Mpio. Uruapan: Santa Rosa, 1640 m, 2 August 1990 (1 female); STATE OF MÉXICO: Mpio. Temascaltepec: camino Temascaltepec – Zacazonapan, 3.0 rd. mi NW Jct. Hwy. 134 & 0.5 rd. mi SW Jct. camino a Valle del Bravo, 6400′ (1940 m), 19°03′15″N 100°03′41″W, 6-IX-2007, Andrew D. Warren (1 female); SINALOA: Mpio.

Figure 4. Type locality of *Atrytonopsis llorentei* in Michoacán: Cerro de la Cruz, Mpio. Uruapan, 2050 m, 23 July 1996. Foreground with charred tree trunks and tall grasses is primary habitat of *A. llorentei*. Background showing intact pine-oak forest at lower elevations, and the city of Uruapan at the base of the mountain (upper left and upper right).

Concordia: Canyon below El Palmito (near Durango State line), 5500′ (1670 m), 7-X-1970, R. W. Holland (1 male). The holotype, allotype, and various paratypes are deposited in the Museo de Zoología "Alfonso L. Herrera", Facultad de Ciencias, Universidad Nacional Autónoma de México, in Mexico City (MZFC). One female paratype is at the Museo de Historia Natural y Cultura Ambiental, Mexico City. Other paratypes will be placed in the National Museum of Natural History, Smithsonian Institution (Washington, D.C.), Carnegie Museum of Natural History (Pittsburgh, PA), American Museum of Natural History (New York, NY), McGuire Center for Lepidoptera and Biodiversity (Gainesville, FL), The Natural History Museum (London, England), and other collections.

Type locality (Fig. 4). Cerro de la Cruz, in Municipio Uruapan, Michoacán, Mexico, is situated at the northern edge of the city of Uruapan, which is visible in the upper left and upper right portions of Fig. 4. This steep mountain is blanketed in dense pine-oak forest, with scattered open grassy areas created by fires (presumably resulting from lightning strikes). *Atrytonopsis llorentei* has been found between 1800 and 2050 m on Cerro de la Cruz, exclusively in grassy openings, most commonly in the area shown in Fig. 4.

Etymology. This new species is named in honor of Jorge E. Llorente-Bousquets (of Mexico City), who has made a profound impact on the study of Mexican butterflies over the past 35 years, and has enabled the author's studies on Mexican Hesperioidea.

Distribution and Phenology. To date, *Atrytonopsis llorentei* is known from the Eje Neovolcánico in west-central Michoacán (Mpio. Uruapan) and southwestern

Figure 5. Known distribution of *Atrytonopsis llorentei* in Mexico. Lines indicate state boundaries.

México State (Mpio. Temascaltepec), as well as in the Sierra Madre Occidental in southern Sinaloa (Mpio. Concordia), near the Durango border (Fig. 5). This species likely also occurs in suitable habitats in Durango, Nayarit, and Jalisco. Dates of capture of the available specimens (22 July–5 September, 7 October in Sinaloa) suggest one annual brood, during the peak of the local rainy season. *Atrytonopsis llorentei* has been taken between 1340 and 2050 m in Michoacán, at 1940 m in México State, and at 1670 m in Sinaloa.

Biogeography. Atrytonopsis llorentei appears to be endemic to the western portion of Mexico's Eje Neovolcánico and the Sierra Madre Occidental. As noted by Espinosa and Ocegueda (2007), a large percentage of the species occurring in the western portion of Mexico's Eje Neovolcánico are shared with the Sierra Madre Occidental and the southern portion of the Altiplano Mexicano.

Ecology. The open grassy areas on Cerro de la Cruz where *A. llorentei* was found between 1991 and 1997 are noteworthy because they appear to have been created by fires resulting from lightning strikes (note charred tree trunks in Fig. 4). A large (usually 0.5–2.0 m tall) unidentified grass (Poaceae) dominates these openings within the pine-oak forest, as shown in Fig. 4, which likely represents the larval foodplant of *A. llorentei*. All specimens collected in July 1996, and on 13 August 1996, were taken on small *Salvia* L. flowers growing between grasses. Females collected in August 1997, were perching on blades of their suspected larval foodplant (grass), or on the ground near the grasses, from 10:00 hrs to 14:30 hrs, under sunny and cloudy conditions. The habitat where *A. llorentei* was found in México State in 2007, near Temascaltepec, is remarkably similar to that found on Cerro de la Cruz, being a pine-oak forest at 1940 m, with small grassy openings (also likely created or maintained by fires as suggested by charred tree trunks), and the dominant grass appears to be the same or a closely related species as that on Cerro de la Cruz. It is possible that *A. llorentei* is dependant on fires to create and maintain suitable open

habitats within the dense pine-oak forest. The adult nectar sources and likely larval foodplants of *A. llorentei* flourish in open, recently burned areas on Cerro de la Cruz, while they are very scarce in adjacent heavily forested areas (where *A. llorentei* was not found). Two other essentially unknown species of skippers, *Paratrytone omiltemensis* Steinhauser, 1996, and an undescribed species of *Piruna* Evans, 1955, are found on Cerro de la Cruz at the same time of year as *A. llorentei*; larvae of both are suspected to feed on the same grass that *A. llorentei* apparently utilizes. An additional undescribed species of *Piruna* (closely related to that on Cerro de la Cruz) flies with *A. llorentei* near Temascaltepec, México State, where both skippers apparently share the same larval foodplant (grass).

Diagnosis and Discussion. Atrytonopsis llorentei cannot be easily confused with any other *Atrytonopsis*. The large size of adults is matched only by *A. lunus* (W. H. Edwards, 1884), *A. zweifeli* Freeman, 1969, *A. frappenda* (Dyar, 1920), and unusually large individuals of *A. deva* (W. H. Edwards, 1877), but all of those species lack opaque spots on the hindwing. Among *Atrytonopsis* with opaque spots on the hindwing, *A. pittacus* (W. H. Edwards, 1882), *A. python* (W. H. Edwards, 1882), and *A. cestus* (W. H. Edwards, 1884) bear some resemblance to *A. llorentei*, but all taxa are considerably smaller (Burns 1982, 1983), have very different ventral hindwing markings, and occur at lower elevations in drier habitats (although *A. pittacus* may overlap in altitudinal range with *A. llorentei*). *Atrytonopsis ovinia* (Hewitson, 1866) and *A. edwardsii* have small opaque spots on the hindwing (see Burns 1983), but both taxa have more rounded forewings, compared to *A. llorentei*, and males of both possess stigmata (absent in *A. llorentei*); in addition, both of these species are smaller than most specimens of *A. llorentei*.

Burns (1982, 1983) reviewed two species-groups of *Atrytonopsis*, the *A. lunus* group (1982, including *A. lunus*, *A. zweifeli* and *A. frappenda*) and the superspecies *A. ovinia* (1983, including *A. ovinia* and *A. edwardsii*). The *A. lunus* group was defined mainly on the basis of the large size of adults, the long apiculus of the antennae (11 to 15 nudum segments), a slight bilateral swelling of the anterior end of the ductus bursae, and the lack of stigmata in males, as well as superficial similarities in wing markings, with the spot in forewing cell CuA_2-1A+2A situated directly under the spot in CuA_1- CuA_2 (Burns 1982). The superspecies *A. ovinia* is immediately identified by its unique (within *Atrytonopsis*), rounded forewing shape (Burns, 1983), quite different from that seen in *A. llorentei*.

While the large size of *A. llorentei* adults, coupled with the lack of stigmata in males and a slight bilateral swelling of the anterior end of the ductus bursae in females, suggest a possible relationship with the *A. lunus* group (see Burns 1982), as noted above, no members of the *A. lunus* group have opaque hindwing spots, and the spot in forewing cell CuA_2-1A+2A is offset proximad with respect to the spot in cell CuA_1- CuA_2 in *A. llorentei*. In addition, the antennal apiculus averages somewhat shorter in *A. llorentei* than in members of the *A. lunus* group, with 10–12 nudum segments in *A. llorentei*. Characters of the uncus and gnathos of the male genitalia serve to exclude *A. llorentei* from the *A. ovinia* superspecies (where the uncus prongs converge towards their distal ends, see Burns 1983), but provide little additional insight into relationships, as males of most *Atrytonopsis* without opaque hindwing spots have genitalia similar to those of *A. llorentei*, with an uncus and gnathos that end in long, paired prongs that are widely separated from one another, horizontally and vertically, and uncus prongs that do not converge towards their distal ends

(Scudder 1889, Godman 1900, Skinner & Williams 1924, Williams & Bell 1930, Lindsey et al. 1931, Evans 1955, Forbes 1960, Freeman 1969, Burns 1982). However, the uncus prongs of some *Atrytonopsis* with opaque hindwing spots (including *A. pittacus* and *A. python*) are not as widely separated as they are in *A. llorentei* and *Atrytonopsis* lacking opaque hindwing spots (Godman 1900, Skinner & Williams 1924, Lindsey et al. 1931, Evans 1955). Thus, the relationship of *A. llorentei* to other members of *Atrytonopsis* remains ambiguous, although it might be most closely related to the *A. lunus* group.

Despite the unique appearance of *A. llorentei*, its placement in *Atrytonopsis* is clearly demonstrated by characters of the male and female genitalia. Burns (1982) noted that the genitalia of all *Atrytonopsis* are remarkably similar, and stated, "Both sexes of *Atrytonopsis* have genitalia so conservative in essential form that they loudly proclaim their genus and so individually variable that they may scarcely whisper which species." Indeed, genitalic features of *A. llorentei* clearly place it within *Atrytonopsis*, including details of the valvae, uncus and gnathos, saccus, aedeagus and cornuti of the male genitalia, and the lamella postvaginalis, lamella antevaginalis, ductus bursae and corpus bursae of the female genitalia.

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