

NOTES ON THE GENUS *PIRUNA* IN WESTERN MEXICO, WITH DESCRIPTION OF A NEW SPECIES (LEPIDOPTERA: HESPERIIDAE)

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ABSTRACT.— Notes on the elevational and temporal distribution of several *Piruna* species in western Mexico are presented, from several localities in the states of Sinaloa, Michoacán, and Oaxaca. *Piruna purepecha* n. sp. is described from 156 males and 46 females from the Mexican states of Jalisco, Colima, Michoacán, Guerrero, and Morelos. Adults and genitalia of *P. brunnea* are illustrated and compared to *P. purepecha*. This new species is one of the most widespread and abundant *Piruna* species in Michoacán, and has been found from 600-1700m elevation.

RESUMEN.— Se presentan notas sobre la distribución altitudinal y temporal de algunas especies de *Piruna* al occidente de México, de varias localidades en los estados Mexicanos de Sinaloa, Michoacán, y Oaxaca. Se describe *Piruna purepecha* sp. n. a partir de 156 machos y 46 hembras provenientes de los estados de Jalisco, Colima, Michoacán, Guerrero, y Morelos. Se ilustran y comparan caracteres de los adultos y genitales de *P. brunnea* y *P. purepecha*. Esta especie nueva es una de las especies de *Piruna* mejor distribuida y más abundante en Michoacán; se encuentra entre 600-1700msnm.

KEY WORDS: Arizona, biogeography, Central America, Chihuahua, Colima, *Dalla*, Durango, Guatemala, Guerrero, Jalisco, Mesoamerica, Michoacán, Morelos, Nearctic, Neotropical, New Mexico, North America, Nuevo Leon, Oaxaca, *Piruna purepecha* n. sp., Puebla, Sinaloa, Sonora, Tamaulipas, taxonomy, Texas, USA.

While no formal revision of the genus *Piruna* Evans, 1955, has been published, Hugh Avery Freeman of Garland, Texas, has been studying the genus for over 20 years, and has named 6 species and one subspecies of *Piruna* (according to the generic list presented by Warren, 1998). Freeman's recent unpublished studies in *Piruna* demonstrate the placement of *P. dampfi* (Bell, 1942) and *P. roeveri* (L. Miller & J. Miller, 1972) in *Piruna*, rather than *Dalla*, as previously placed. Publication of Freeman's manuscript, however, has been postponed so that male and female genitalia of all *Piruna* species can be intensively studied and illustrated, and a phylogenetic analysis of the entire genus can be made. In preparation for a thorough study of the genus by the senior author, 3 undescribed species from western Mexico will be described, one of which is described herein.

Mexico has 21 known species of *Piruna*, including all described and known undescribed species in the genus, with the exception of *P. pirus* (W. H. Edwards, 1878), which is a North American species that has yet to be confirmed from Mexico. Records of *P. pirus* from Chihuahua and Durango, in Stanford and Opler (1993), refer to *P. cyclosticta* (Dyar, 1920); the southernmost confirmed population of *P. pirus* is on the top of the Pinaleno Mountains in Graham County, Arizona (Bailowitz and Brock, 1991). A recent record of *P. pirus* from Jeff Davis Co., Texas, requires verification. Of the 21 *Piruna* known in Mexico, at least 15 are endemic to Mexico, and up to 6 others barely spill over into Arizona, New Mexico, Texas, or Guatemala. Records of *P. microsticta* (Godman, 1900) from Texas are questionable. A single male in the BMNH labeled simply from "Texas" is most likely mislabeled; *P. penaea* (Dyar, 1918) would be much more likely in the lower Rio Grande valley, as it is common in adjacent parts of Tamaulipas and Nuevo Leon.

Populations of many *Piruna* species are often highly localized, although some species may be generally distributed within certain elevational ranges. No *Piruna* species is known from below 300m elevation; most species are found in very humid habitats between

1000-2700m. Good *Piruna* habitats often support several *Piruna* species, each having slightly different flight times, concentrated mostly within the rainy season. Since most *Piruna* habitats are in very rainy locations at high elevations, short adult flight times are virtually guaranteed during the rainy season, which is very harsh on such small, fragile butterflies, such as *Piruna*.

On Loberas Summit (1820-2020m), on Hwy. 40 in south-east Sinaloa, 3 species of *Piruna* are known to occur, including *P. maculata* H. A. Freeman, 1970, *P. sina* H. A. Freeman, 1970, and *P. millerorum* Steinhauser, 1991. Very little is known about these species, but *P. maculata* and *P. sina* appear to have two separate broods, one at the peak of the rainy season in late July to September, and one at the peak of the dry season in late April, when the types of *P. maculata* and *P. sina* were encountered at wet sand around seeps (P. Hubbell, pers. comm.). Dry season broods may not occur in years of drought (pers. observ.). *Piruna millerorum* appears to be univoltine, and in addition to being found at Loberas Summit, Sinaloa, and further east in Durango state, it was recently found commonly on both sides of the Sonora (Mpio. Yécora)-Chihuahua (Mpio. Temósachic) border on Hwy. 16 (late July, 1997). *Piruna gyrans* (Plötz, 1884), *P. polingi* (Barnes, 1900), *P. aea mexicana* H. A. Freeman, 1979, *P. cyclosticta* (Dyar), and probably *P. brunnea* (Scudder, 1872) occur at higher elevations in Durango state.

At 2250m, above Cañada "La Culebra," at Canoa Alta, in Municipio San Juan Nuevo Parangaricutiro, Michoacán, 3 *Piruna* species have been found to date. *Piruna gyrans*, *P. dampfi*, and *P. polingi* all fly during the local rainy season. In 1996, *P. gyrans* was very common above Cañada "La Culebra" on 24 July, and no other *Piruna* species were found. On 6 August, *P. polingi* was scarce, and no other species were found. On 23 August, *P. dampfi* was just starting to emerge, and no other species were present. In 1997, field work was done at this site on 24 and 28 August. On both days, *P. polingi* was extremely common, and in mostly fresh condition, while *P. gyrans* was much less abundant and in very worn condition, being

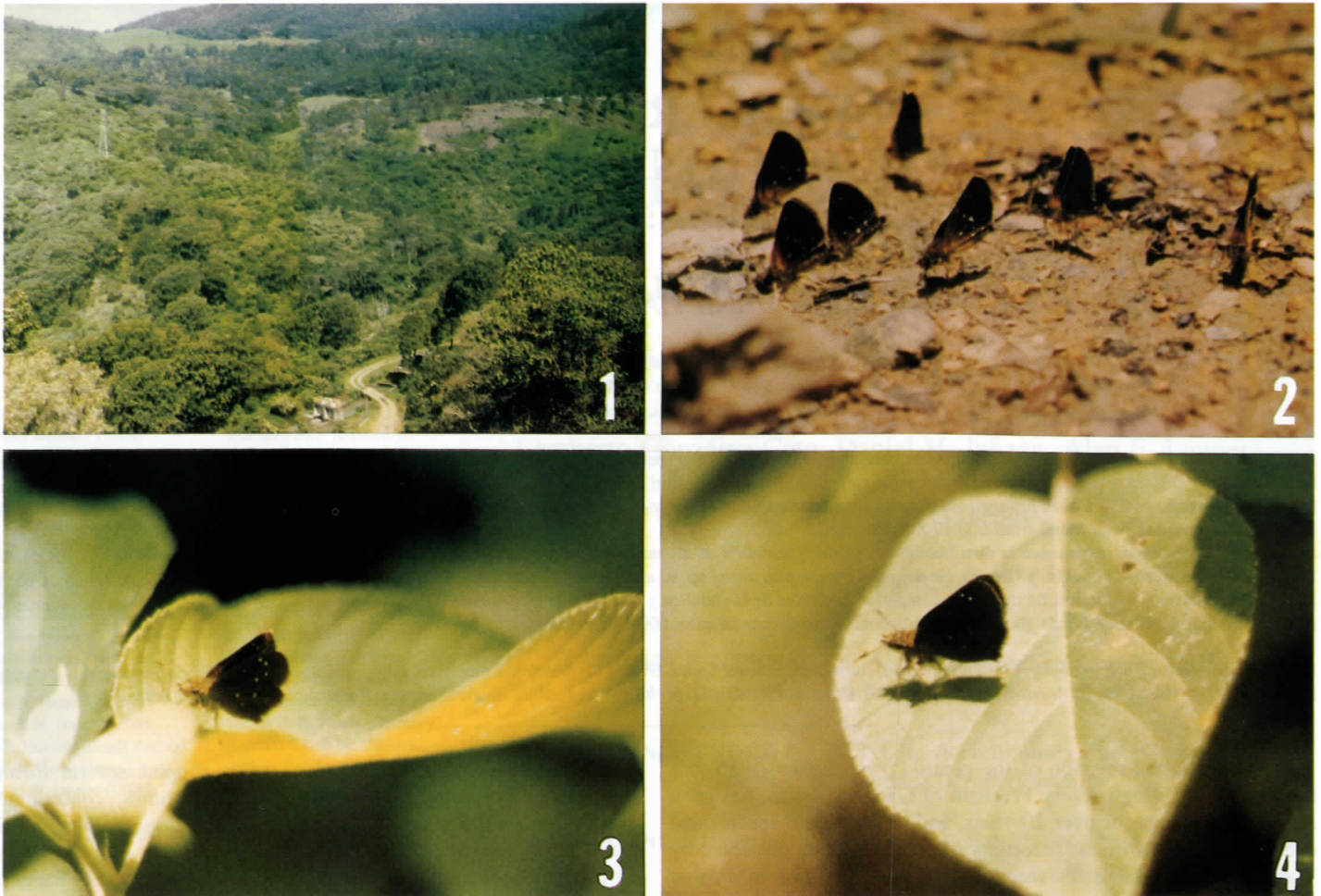


Fig. 1-4. *Piruna* species and their natural habitats. 1) Habitat of *Piruna purepecha* at Matangarán, 1370m., Mpio. Uruapan, Michoacán, Mexico, on July 28th, 1996, showing small Cupatitzio River. 2) Adult males of *Piruna penaea* (and *Dalla faula*, to the right, face forward) sipping moisture from damp sand at Chiquihuitillo, 919m., Mpio. Arteaga, Michoacán, Mexico, on July 18th, 1996. 3) Adult male of *Piruna purepecha* resting on a leaf near the sandy creek bed from which it was flushed, at Rancho "El Zorrillo," 764m., Mpio. Arteaga, Michoacán, Mexico, on July 21, 1996. 4) Different male of *P. purepecha* at same locality. Notice small droplet of water on leaf which was extruded from the tip of the abdomen just before the photo was taken.

scarce on 28 August. One very fresh pair of *P. dampfi* was taken on the 24 August, and none were seen on the 28 August. *Piruna gyrans* has also been taken at this locality in November, suggesting two separate broods for that species, at least in certain years.

In the canyon carved by the Cupatitzio River south of Uruapan, in Michoacán, *Piruna* species have been studied at three sites. The highest site, P. H. Zumpimito, in Municipio Uruapan, at 1460m, has yielded 4 *Piruna* species: *P. brunnea*, *P. ajijiciensis* H. A. Freeman, 1970, and two undescribed species. The undescribed species described herein is the first *Piruna* to appear during the rainy season, in late June, and is very abundant by mid-July when *P. ajijiciensis* starts to fly. The second undescribed species is known only from the last week of August, and *P. brunnea* is on the wing in the area primarily in September and October, with very few adults present in late July. Lower in elevation at Matangarán (Mpio. Uruapan), 1370m (Fig. 1), where pine forest of high elevations blends with mixed broadleaf cloud forest, only the two undescribed species are known. The lowest site, P. H. Cupatitzio, at 919m, hosts two *Piruna* species, the undescribed species described herein, and *P. penaea*, which is one of the lowest-flying *Piruna* in Mexico (at 400m in Colima: Warren *et al.*, 1998).

A similar situation exists around Oaxaca City, in Oaxaca State. At

John Kemner's now famous site 8 km north of Oaxaca along Hwy. 175, at 1800m, 6 species of *Piruna* are known, which have mostly separate flight times (Freeman 1990, 1991). The most abundant species found by Kemner at that locality turned out to be undescribed, and was named *P. mullinsi* by Freeman in 1991 (Freeman had already named *P. kemneri* from that locality in 1990).

Adults of *Piruna* species are most frequently encountered while drinking moisture out of wet sand, especially where rivers or creeks intersect dirt roads (Fig. 1), and along sandy river banks. Fig. 2 shows adult males of *Piruna penaea* (and one male *Dalla faula* (Godman) face forward to the right) at wet sand at Chiquihuitillo, 918m, Mpio. Arteaga, Michoacán, on 18 July 1996. At Chiquihuitillo on 18 July, about 200 individual *P. penaea* males were observed along the dirt road where it was intersected by a very small creek (Fig. 2). Mixed in with *P. penaea* were very fresh individuals of the new species described herein (many males, 2 females), and only 2 fresh male *P. aea aea* (Dyar, 1912) individuals.

In the humid canyon at Rancho "El Zorrillo," 764m, also in Mpio. Arteaga, *P. penaea*, *P. aea aea*, and the undescribed species described herein were in flight on 21 July 1996. As at Chiquihuitillo three days earlier, *P. penaea* was very abundant, the new species was just emerging and was very fresh (only males were present), and one

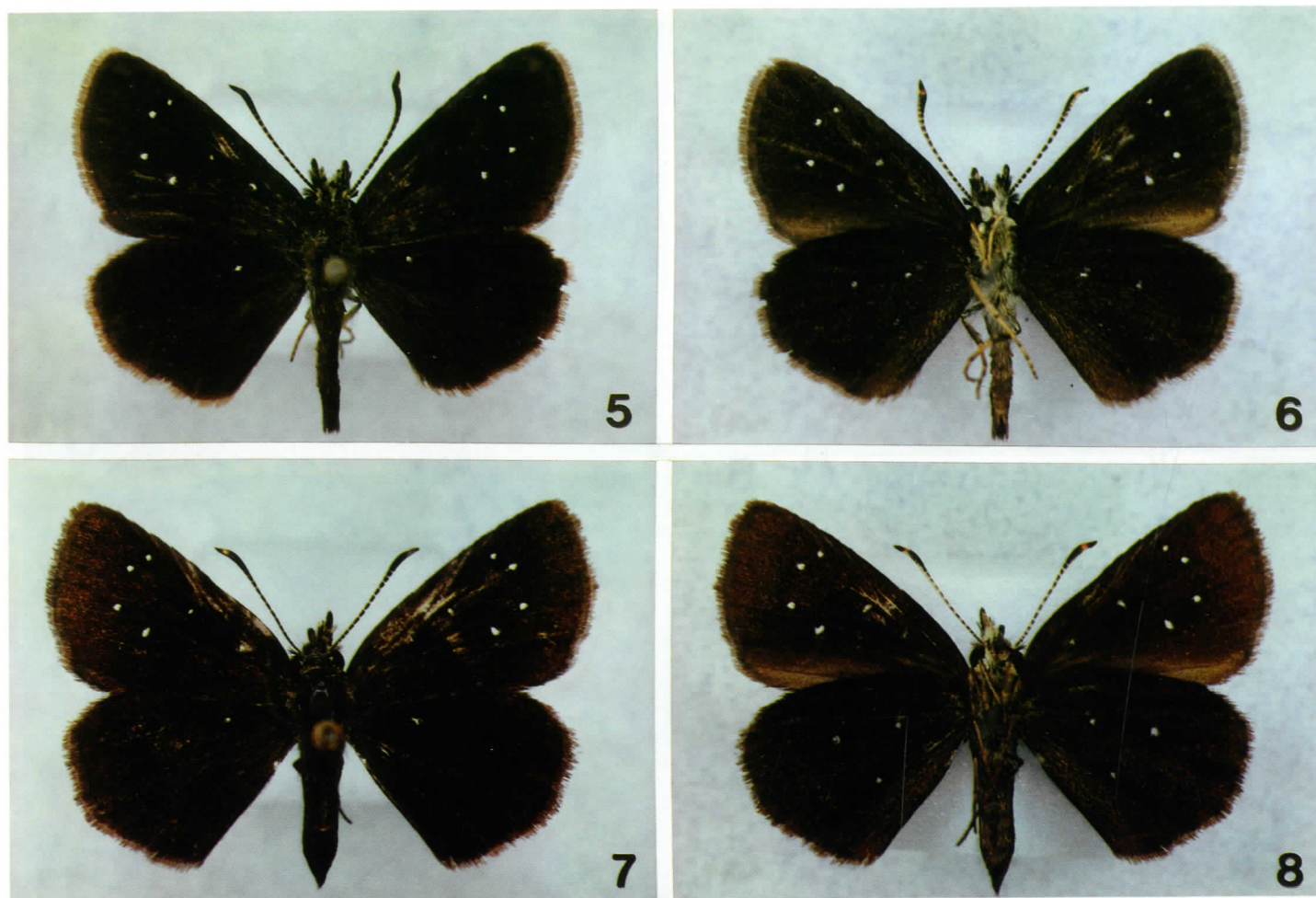


Fig. 5-8. Adults of *Piruna purepecha*. 5) Dorsal and 6) ventral views of holotype male from Rancho "El Zorrillo," 764m., Mpio. Arteaga, Michoacán, Mexico, 21 July 1996, Andrew D. Warren. Right forewing length (from base to apex) = 14.2mm. 7) Dorsal and 8) ventral views of allotype female from Chiquihuitillo, 919m., Mpio. Arteaga, Michoacán, Mexico, 18 July 1996, Andrew D. Warren. Right forewing length = 15.4mm.

fresh specimen of *P. aea aea* (Dyar) was found. Most male *Piruna* were encountered at the wet sandy banks of a small creek, where adults of the new species could be approached while sipping moisture, but were too wary to be photographed at the sand. Once adults were scared up from damp sand, if not further disturbed, they would alight on the dorsal surface of a leaf near the sandy area (Fig. 3-4), wait up to two minutes (often extruding a drop of liquid from the tip of their abdomen, as in Fig. 4), and then return to the sandy area.

The new species described herein is by far the most widely distributed *Piruna* species in Michoacán, and is also known from Jalisco, Colima, Guerrero, and Morelos. Occurring in an unusually wide elevational range, from 600-1700m, it has an extended principal flight period, from early July into October, which may comprise two broods (a single specimen from Chiquihuitillo from mid-November suggests at least a partial later flight at the lower extreme of its elevational range). As with all other strictly Mexican *Piruna* species, nothing is known of the larvae or hostplants of this new species, although careful observation of females during its peak flight period should reveal local hostplants.

Piruna purepecha A. D. Warren & L. González-C., new sp.

Diagnosis.— *Piruna purepecha* (Fig. 5-8) is likely to be confused only with *P. brunnea* (Fig. 9-12) to which it is superficially very similar (specimens of *P. purepecha* were found mixed in with *P. brunnea* at the AMNH). These

two species are the largest described *Piruna* species (remaining two undescribed species are as large or larger). Fresh specimens of *P. purepecha* have three prominent, small, whitish spots on the ventral hindwing (Fig. 6, 8): two in the discal cell, and one near the inner margin. Very sparse submarginal white overscaling is also present on very fresh *P. purepecha*. All ventral hindwing white spotting quickly wears off after a couple of days of flight, or when wings are handled with fingers.

Description.— MALE. Average forewing length (from base to apex): 13.4mm (holotype 14.2mm, 20 male paratypes measured, extremes of 11.2mm and 14.8mm). **Wing Upperside:** Ground color very dark brown-black throughout on fore- and hindwings. Very sparse ochraceous overscaling over entire wing surface of fore- and hindwings on very fresh individuals only; usually present only at base of forewings and on outer third of wings. Forewing maculation variable: from not a single trace of a white spot present, to fairly well spotted: two very small, white subapical spots in R3-R4, and R5-M1, a postmedian spot in M3-Cu1, a median spot in Cu1-Cu2, and minute spot at end of discal cell (often absent). Dorsal hindwing never spotted. Fore- and hindwing fringes brown, lighter than ground color. **Wing Underside:** Fore- and hindwing ground color as on upperside. Forewing light brown- gray at tornus and along inner margin below and slightly above 2A. Sparse ochraceous overscaling present throughout hindwing, and on forewing at apex, along costa to base, and along outer margin, almost to tornus: obvious on very fresh specimens only. Spotting pattern from dorsal surface repeated, spots usually slightly larger on ventral side. Forewing spot at end of discal cell usually prominent. Hindwing with three distinct spots (absent on worn individuals): small median spot in Cu2-2A, small basal discal spot, larger spot at end of discal cell, often elongate, expanding width of cell. Very sparse whitish submarginal overscaling on hindwing on fresh individuals, concentrated in Cu1-Cu2 and M3-Cu1. Fore- and hindwing fringes as on

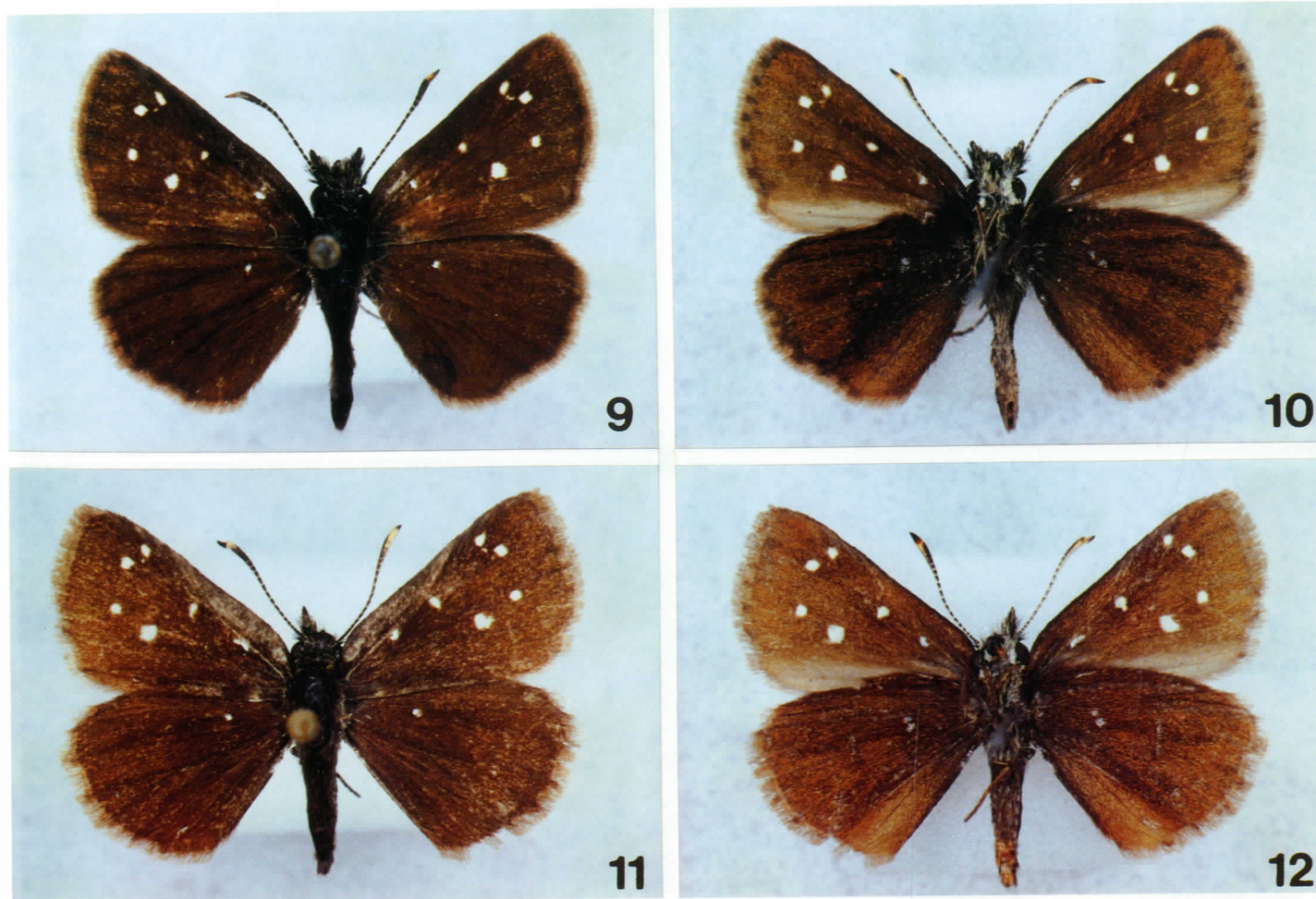


Fig. 9-12. Adults of *Piruna brunnea*. 9) Dorsal and 10) ventral views of male from Santa Rosa, 1620m., Mpio. Uruapan, Michoacán, Mexico, 11 October 1991, Lamberto González-C. Right forewing length (from base to apex) = 13.5mm. 11) Dorsal and 12) ventral views of female from same locality, 21 October 1991, L. González-C. Right forewing length (from base to apex) = 13.6mm.

dorsal surface. *Head*: antennal nudum of 9 segments on the holotype; males average 8.8 nudum segments (20 males counted, extremes of 8 and 9). Antennal club and apiculus black dorsally, yellow-cream ventrally, with nudum centered laterally on the inner side of club. Basal nudum segments bright gold-brown. Shaft mostly black dorsally, with faint light rings around base of each segment; ventrally are strongly checkered, with basal 1/3 of each segment yellow-cream. First and second palpal segments densely clothed in long scales: mostly black with scattered yellow scales dorsally, mostly cream with scattered black scales ventrally. Third segment long and porrect, clothed in very short scales flat against surface of segment: black dorsally, scattered yellow and black ventrally. Dorsally, head clothed mostly in short, spatulate yellow and black scales, with long yellow and black scales concentrated in a line between the eyes. Eyes bordered by white ring of scales, densest ventrally. *Body*: ventrally, head and thorax clothed in long, dirty gray scales, which extend onto all femora, ventrally. Dorsal surface of thorax densely clothed in very long, shin scales of various colors: yellow, gray, black, greenish, orange. Colored scaling ends abruptly at abdomen, which is clothed dorsally in short brown and yellow scales; ventrally in gray and brown scales, all flat against surface of abdomen. Prothoracic tibiae of males and females lack epiphysis. Mesothoracic tibiae have one pair of ventral spurs at distal end, as well as five, shorter, skinnier lateral spurs more-or-less evenly spaced up the tibia to the femur. Metathoracic tibiae have two ventral pairs of spurs at distal end. Tarsi of all legs have three longitudinal rows of spines that run from junctin with tibiae to claws. Dorsally, all legs are clothed in brown, with scattered yellow scales; ventrally (below femora) in dirty cream scales. *Genitalia*: Saccus fairly short, tegumen broad, constricted laterally at center, swollen at proximal margin. Uncus bifurcate with short, narrow arms. Gnathos bifurcate, narrow, only visible in dorsal view where tegumen is constricted laterally. Valvae long, dorsal margin

slightly concave to origin of ampulla. Ampulla expanded dorso-distally, rounded at distal end, slightly overlapping outer surface of harpe. Harpe narrow, dorsally produced. Distal tip of harpe with 3-4 short spines. Aedeagus fairly narrow, straight, with ventral lobe at distal tip. Juxta broad, elongate, dorsal half more distally positioned than ventral half.

FEMALE. Average forewing length (from base to apex): 13.9mm (allotype 15.4mm, 20 female paratypes measured, extremes of 12.0mm and 15.4mm). Overall wing morphology is nearly identical to that of the male. Maculation just as variable as in males, from no spotting, to full spotting pattern, as described above. Dorsal and ventral ochraceous overscaling often better developed on female than male. Antennal nudum of 9 segments on allotype female; females average 8.6 segments (20 females measured, extremes of 8 and 9). All other antennal, thoracic, and abdominal characters, including legs, as in male. *Genitalia*: Ovipositor lobes short and poorly developed. Lamella postvaginalis consisting of a broad, nearly flat, sclerotized plate, slightly concave along outer margin, with prominent "V" notch at midline. Lamella antevaginalis strongly wrinkled, but continuous in width from lateral extremes of lamella postvaginalis to junction with ductus bursae. Ductus bursae membranous, fairly broad near junction with lamella antevaginalis, and very short; a vaguely formed, weakly sclerotized structure at proximal end near cervix. Corpus bursae in two distinct sections: most distal section roughly oval in shape, with a spiculate area at most proximal end of oval, and a laterally distorted, narrowed junction leading to cervix; most proximal section of the double corpus bursae without spiculate interior, and roughly twice the size of distal section: three times as long as wide, more-or-less evenly rounded. Ductus seminalis entering cervix ventrally at its caudal end. See Steinhauser (1991) for a discussion of the terminology of these structures. *Types*.— *Holotype* ♂ (Fig. 5-6): with the following labels: white (printed) MEXICO.- Michoacán: Mpio. Arteaga: Rancho "El Zorrillo", 764m, 21-VII-

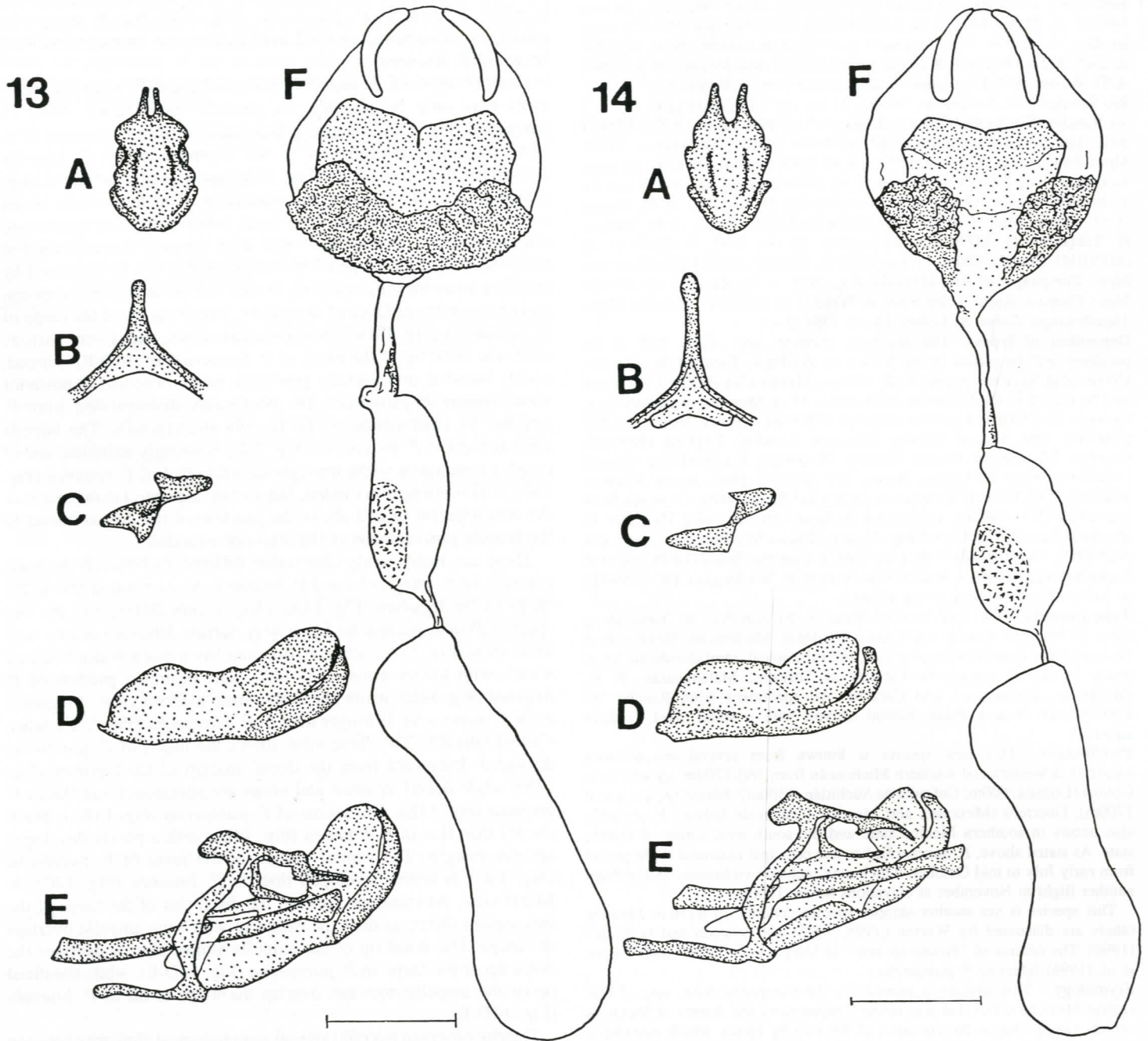


Fig. 13. Genitalia of *Piruna purepecha*. A) Tegumen, uncus and gnathos in dorsal view, B) saccus in ventral view, C) juxta in left lateral view, D) left valve in left lateral view, E) complete male genitalia, minus left valve, from P. H. Zumpimito, 1460m., Mpio. Uruapan, Michoacán, Mexico, 25 October 1991, L. González-C. Andrew D. Warren genitalia vial # 95-90. F) Complete female genitalia in ventral view from same locality, 7 July 1992, L. González-C. Andrew D. Warren genitalia vial # 95-121. Scale = 1.0mm.

Fig. 14. Genitalia of *Piruna brunnea*. A) Tegumen, uncus and gnathos in dorsal view, B) saccus in ventral view, C) juxta in left lateral view, D) left valve in left lateral view, E) complete male genitalia, minus left valve, from Santa Rosa, 1620m., Mpio. Uruapan, Michoacán, Mexico, 16 June 1990, L. González-C. Andrew D. Warren genitalia vial # 95-88. F) Complete female genitalia in ventral view from same locality, 21 June 1990, L. González-C. Andrew D. Warren genitalia vial # 95-120. Scale = 1.0mm.

1996, A. D. Warren/ red (printed and handwritten) HOLOTYPE *Piruna purepecha* A. D. Warren & L. González. Allotype ♀ (Fig. 7-8): with the following labels: white (printed) MEXICO.- Michoacán: Mpio. Arteaga: Chiquihuitillo, 919m, 18-VII-1996, A. D. Warren/ red (printed and handwritten) ALLOTYPE *Piruna purepecha* A. D. Warren & L. González-C.

Paratypes (155 ♂, 45 ♀, all from Mexico): same data as holotype (15 ♂); same locality as holotype, 13 Nov 1995, L. González-C. (1 ♀); same data as allotype (25 ♂, 1 ♀); same locality as allotype, 18 Jul 1996, Máximo Martínez

(2 ♂); same locality as allotype, 18 Jul 1996, I. Vargas-F. (1 ♂). Michoacán: Mpio. Arteaga, Toscano, 760m, 17 Jul 1996, M. Martínez (1 ♀). Mpio. Gabriel Zamora, P. H. Cupatitzio, 918m, 12 Jun 1997 (1 ♂), 8 Jul 1990 (2 ♂), 30 Aug 1994 (2 ♂), 16 Sep 1994 (1 ♂), 28 Sep 1994 (1 ♀) (all L. González-C.). Mpio. Taretan, Las Góteras, Taretan, 1130m, 9 Jul 1996 (1 ♂), L. González-C. Mpio. Uruapan, Matangarán, 1370m, 25 Jul 1994 (1 ♂), 29 Jul 1994 (3 ♂, 1 ♀), 6 Aug 1994 (2 ♂, 2 ♀), 20 Aug 1994 (1 ♀), 9 Sep 1994 (1 ♀), 15 Sep 1994 (2 ♂), 21 Sep 1994 (2 ♂), 22 Sep 1994 (1 ♂), 12 Oct 1991 (1 ♂)

(all L. González-C.). P. H. Zumpimito, 1460m, 7 Jul 1992 (1 ♂, 1 ♀), 9 Jul 1992 (2 ♂), 13 Jul 1992 (1 ♀), 16 Jul 1992 (1 ♂), 18 Jul 1992 (1 ♂), 22 Aug 1992 (1 ♀), 22 Sep 1991 (1 ♀), 5 Oct 1991 (1 ♀), (all L. González-C.); same locality, 26 Jul 1996, D. González (7 ♂, 6 ♀); same locality, 10 Jul 1997 (18 ♂, 2 ♀), 26 Jul 1996 (9 ♂, 9 ♀), (all M. Martínez); same locality, 26 Jul 1996, A. D. Warren (9 ♂, 6 ♀); same locality, 26 Jul 1996, I. Vargas-F. (9 ♂, 3 ♀). Río San Antonio, Zumpimito, 1520m, 21 Jul 1997, L. González-C. (12 ♂, 3 ♀). Rancho "San Jorge," Cutzato, 1700m, 22 Jul 1995 (2 ♂), 18 Sep 1994 (1 ♂), L. González-C. Santa Rosa, 1620m, 28 Jul 1990, L. González-C. (1 ♀). Mpio. Ziracuaretiro, Caracha, 1320m, 8 Jul 1996, L. González-C. (2 ♂); same locality, 27 Aug 1997, A. D. Warren (2 ♂). Zirimicuaro, 6 Jul 1996 (7 ♂, 1 ♀), 17 Jul 1997 (2 ♂), L. González-C.; same locality, 27 Aug 1997, A. D. Warren (1 ♂). *Colima*: Mpio. Comala, Cofradía de Suchitlán, 1300m, 18 Jul 1981, S. H. Tobias (1 ♂) (MZFC); same locality, 10 Oct 1982, P. Spade (1 ♂) (SDNHM). Comala, 600m, 17 Aug 1967, R. Wind (1 ♂) (AMNH). *Guerrero*: Mpio. Zumpango del Río, Mexcala, Aug 1958, T. Escalante (1 ♂). *Jalisco*: Mpio. Chapala, Ajijic, 3 Sep 1966, R. Wind (1 ♀) (AMNH). *Morelos*: Mpio. Tlquiltenango, Cañon de Lobos, 14 Jul 1984 (3 ♂).

Deposition of types.— The holotype, allotype, and nearly half of the paratypes will be placed in the Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico City (MZFC). Paratypes will be placed in the following collections: Allyn Museum of Entomology, Sarasota, FL (AME); American Museum of Natural History, New York, NY (AMNH); The Natural History Museum, London, England (BMNH); Carnegie Museum of Natural History, Pittsburgh, PA (CMNH); Cornell University Insect Collection, Ithaca, NY (CUIC); Hugh Avery Freeman (Garland, TX); Gillette Museum of Arthropod Biodiversity, Colorado State University (Fort Collins, CO); John A. Shuey (Indianapolis, IN); Ray E. Stanford (Denver, CO); San Diego Natural History Museum, San Diego, CA (SDNHM); Universidade Federal do Paraná, Curitiba, Brazil (UFPC); United States National Museum, Smithsonian Institution, Washington, DC (USNM), as well as the collections of the authors.

Type Locality.— The type locality, Rancho "El Zorrillo," at 764m, along Hwy. 37 between Arteaga and Lázaro Cárdenas, Michoacán, Mexico, is at the local blend zone between pine-oak, and subtropical, semi-deciduous forest types, as are *P. purepecha* habitats at Toscano, Matangarán, P. H. Zumpimito, Zirimicuaro, and Caracha. All specimens from Rancho "El Zorrillo" are from a shady, humid canyon with a small creek (cañada humeda).

Distribution.— This new species is known from several mountainous localities in western and southern Michoacán from 760–1700m, as well as in Colima (Comala, 600m; Cofradía de Suchitlán, 1300m), Jalisco (Ajijic, about 1700m), Guerrero (Mexcala), and Morelos (Cañon de Lobos). It probably also occurs in southern Mexico state and the south-west corner of Puebla state. As stated above, *P. purepecha* has one principal extended flight period from early July to mid October, which may include two broods, and perhaps another flight in November at elevations below 1000m.

This species is yet another skipper species endemic to western Mexico; others are discussed by Warren (1995, 1996) and Warren and González (1996). The citation of "*Piruna* sp. nov." in Vargas *et al.* (1996) and Warren *et al.* (1998) refers to *P. purepecha*.

Etymology.— This species is named for the Purepecha tribe, one of few central Mexican tribes that was never conquered by the Aztecs of Mexico's central valley. Before the conquest of Mexico by Spain, which essentially destroyed the Aztec and Purepecha empires, the Purepecha dominated most of what makes up present day Michoacán. Today, the Purepecha are concentrated mainly in the highlands around Uruapan, where many villages still primarily speak in the native tongue (also called Purepecha).

Remarks.— While the dorsal spotting pattern of *P. purepecha* and *P. brunnea* are the same, spots on *P. brunnea* are consistently larger than on *P. purepecha* (over 300 *P. brunnea* have been examined from around Uruapan, Michoacán), and in Michoacán, *P. brunnea* never lack any elements of the forewing spotting pattern. Where *P. brunnea* and *P. purepecha* fly together in Michoacán (P. H. Zumpimito, 1460m: one *P. brunnea*, 88 *P. purepecha* collected; Santa Rosa, 1620m: one *P. purepecha*, over 300 *P. brunnea* collected, and Caracha, 1320m: 4 *P. purepecha*, one *P. brunnea* collected), male and female *P. purepecha* often lack some or all forewing spots, so *P. brunnea* individuals are easily differentiated from *P. purepecha*. Specimens of *P. brunnea* from Guerrero and Oaxaca, however, often lack elements of the forewing spotting pattern, and often have very

small forewing spots, as in *P. purepecha*. *Piruna brunnea* (Fig. 8–12) is never as dark as *P. purepecha* (Fig. 5–8), but *P. purepecha* paratypes collected before 1992 have faded to the characteristic light brown of *P. brunnea*.

Determination of damaged *P. purepecha* and *P. brunnea* specimens may only be possible via genitalic examination. Male *P. purepecha* (Fig. 13A) are easily distinguished from *P. brunnea* (Fig. 14A) by dorsal examination of the tegumen, which is laterally constricted in *P. purepecha* (Fig. 13A), and laterally produced in *P. brunnea* (Fig. 14A). When wet dissection of male genitalia is not convenient (other genitalic differences between the two species are discussed below), males can be told apart via careful examination of the distal end of the harpe of the valvae, which can be examined by brushing away the long scales on the 8th and 9th abdominal sternites, and on the outer surfaces of the valvae. The distal tip of the harpe of *P. purepecha* (Fig. 13D–E) has 3–4 short spines, and is very narrow, while the distal tip of the harpe of *P. brunnea* (Fig. 14D–E) is broad, evenly rounded, and laterally produced; easily observed in posterior view. Female *P. purepecha* are most easily distinguished from *P. brunnea* by examination of the lamella antevaginalis. The lamella antevaginalis of *P. purepecha* (Fig. 13F) is strongly wrinkled, and of roughly continuous width throughout, while that of *P. brunnea* (Fig. 14F) is also strongly wrinkled, but in two separate lateral sections; the area adjacent to and above the junction of the ductus bursae to the lamella postvaginalis is flat, and not wrinkled.

There are many easily observable differences between the male genitalia of *P. purepecha* and *P. brunnea*. As mentioned above, the shape of the tegumen (Fig. 13A, 14A) is very different in the two species. *Piruna purepecha* has a very narrow bifurcate uncus, with short arms (Fig. 13A), while *P. brunnea* has a much wider bifurcate uncus, with longer arms (Fig. 14A). The bifurcate gnathos of *P. brunnea* (Fig. 14E), while not visible from a dorsal view of tegumen as in *P. purepecha*, is longer than in *P. purepecha* (Fig. 13E), when viewed laterally. The same view shows the uncus of *P. purepecha* displaced downward from the dorsal margin of the tegumen (Fig. 13E), while dorsal tegumen and uncus are continuous and flat in *P. brunnea* (Fig. 14E). The saccus of *P. purepecha* (Fig. 13B) is much shorter than that in *P. brunnea* (Fig. 14B), with a poorly developed anterior margin. The ventral margin of the juxta of *P. purepecha* (Fig. 13C) is better developed than in *P. brunnea* (Fig. 14C), in lateral view. As mentioned above, the distal tips of the harpe of the two species differ, as does the extent to which the ampulla overlaps the harpe. The distal tip of the ampulla almost always overlaps the distal tip of the harpe in *P. purepecha* (Fig. 13D–E), while the distal tip of the ampulla does not overlap the harpe at all in *P. brunnea* (Fig. 14D–E).

Despite observed overall external morphological similarity between *P. brunnea* and *P. purepecha*, the three white ventral hindwing spots (prominent in Fig. 3), and the toothed, narrow distal tip of the harpe of the valvae of *P. purepecha* suggest that it may be more closely related to species such as *P. microsticta*, *P. penaea*, *P. sina*, or *P. ajijiciensis* than to *P. brunnea*, but only a future cladistic analysis of the entire genus could confirm this hypothesis.

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