

TAXONOMY AND BIOGEOGRAPHY OF *ARCHAEOPREPONA DEMOPHOON* IN MEXICO, WITH DESCRIPTION OF A NEW SUBSPECIES (LEPIDOPTERA: NYMPHALIDAE: CHARAXINAE)

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ABSTRACT.— *Archaeoprepona demophoon mexicana*, new subsp. (montane Pacific Slope of Mexico, Oaxaca to Nayarit) is differentiated from *Archaeoprepona demophoon gulina* Frühstorfer (eastern Tamaulipas southward through Atlantic and Pacific slopes of San Luis Potosi to Chiapas, to Colombia). The taxa reflect the major vicariance pattern in tropical Mexico — a segregate in the east and southeast and another in the south and west. Data on character variation, phenology and ecology are provided.

KEY WORDS: *Archaeoprepona demophoon mexicana*, new subsp., biogeography, Central America, Colombia, Costa Rica, distribution, Honduras, Neotropical, *Prepona*, South America, taxonomy, vicariance.

Since Hoffman's (1940) list of the Mexican Papilionoidea, studies of regional butterfly faunas, along with collecting in formerly poorly-known areas of Mexico and adjacent Central America, have resulted in a better biogeographic and taxonomic knowledge of the butterflies of this entire region. As a result, many new taxa have been described from Mexico in the last two decades (de la Maza, de la Maza and White 1989).

As early as Rothschild and Jordan (1906), a vicariant pattern in the southern half of Mexico was recognized between tropical and mesic communities. More recently, Descimon and Mast de Maeght (1979) and Llorente-Bousquets (1984) distinguished subspecies in the south and west of Mexico from populations in the east and southeast. In the Charaxinae, Descimon, Mast de Maeght and Stoffel (1974) first recognized this pattern in *Archaeoprepona*, describing *A. demophon occidentalis* Stoffel & Descimon from populations in southern and western Mexico while recognizing *A. demophon centralis* Frühstorfer in the east and southeast. Subsequently, de la Maza, de la Maza and de la Maza (1982) distinguished *A. amphimachus baroni* J. de la Maza from nominate *A. amphimachus* (Fabricius) based on the same biogeographic pattern, with a barrier in the Isthmus of Tehuantepec in the southern Mexican state of Oaxaca forming the disjunction between the subspecies.

Regarding *A. demophoon* (Hübner) (referred to by early authors as "*Prepona antimache*" [see Johnson and Descimon, 1989]), several studies reported the subspecies *A. d. gulina* occurring from Colombia northward to localities in the west and south of Mexico (Hoffman, 1940; Llorente, Garcés and Luis, 1986; D'Abbrera, 1987; de la Maza, 1987; and de la Maza, de la Maza and White, 1989). Though the wider distribution of *A. demo-*

phoon in Mexico was generally known to local workers, published studies of "*Prepona*" butterflies prior to Johnson and Descimon (1989) did not record *A. demophoon* north of Chiapas State.

Johnson and Descimon (1989) examined characters of *A. demophoon* subspecies distributed throughout the Neotropical Realm. Considering these data, and previously unpublished information from the first author, it is apparent that the occurrence of *A. demophoon* in Mexico can be treated as two allopatric subspecies-- *A. d. gulina* distributed in the east and southeast and a new subspecies, described herein, occurring in the west and southwest.

MATERIALS AND METHODS

Field data on *A. demophoon* in Mexico and Central America gathered by staff of the Museo de Zoología de la Facultad de Ciencias de la Universidad Nacional Autónoma de México (MZFC) was studied along with the historical materials deposited at the Allyn Museum of Entomology, Florida Museum of Natural History (AME), American Museum of Natural History (AMNH), Biedermann Collection (Zurich, Switzerland) (BC); Carnegie Museum of Natural History (CMNH), Muséum National d'histoire Naturelle (Paris) (MNHN) and the Natural History Museum (London) (NHM). Records at the MZFC included notes on regional distributions and altitudinal and ecological preferences gathered from nearly two decades of field research on mesic slope faunas in Nayarit, Jalisco, Colima, Guerrero, Veracruz and Oaxaca states, Mexico. Large voucher series of *A. demophoon* at the MZFC from these studies, collected mostly with Van

Someren-Rydon traps (Rydon, 1964) were also examined. Above-listed materials totaled some 250 specimens of *A. demophoon* from Mexico and Central America, representing about 50 localities. Also examined were historical records of specimens and distributions included in the literature or listed in the literature for collections not examined.

Numerous specimens were dissected for a comparative analysis of male and female genitalia (Appendix 2, Fig. 2). Since Johnson and Descimon (1989, Figs. 1-5) illustrated adults and male and female genitalia for nine subspecies in the *A. demophoon* complex, we limit our comparisons (and accompanying figures) to *A. d. gulina* and the new subspecies described below.

TAXONOMY

Keys

The two subspecies of *A. demophoon* occurring in Mexico can be readily identified by character couplets distinguishing features of the upper surface forewing:

GULINA

Maximal width of "blue" band more than 10mm
Outer radial spot rectangular angular and blue, apex not invaded by beige or fuscous scales.

MEXICANA n. ssp.

Maximal width of "blue" band 10mm or less
Outer radial spot with apex invaded by beige or fuscous scales, relatively reducing size of spot

Archaeoprepona demophoon mexicana, new subsp.

Figs. 1, 2AC

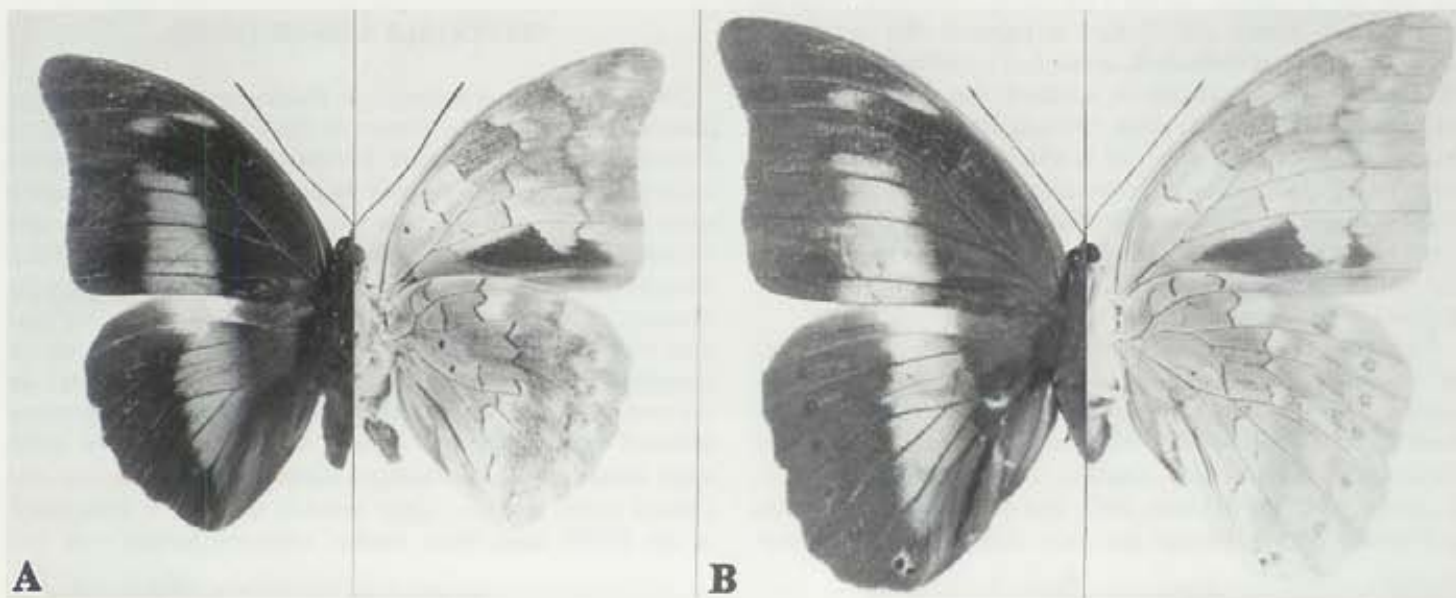
DIAGNOSIS.— Differing from *A. d. gulina* (eastern Mexico from Veracruz to Chiapas; Chiapas south to Colombian Cordillera, Figs. 2BC, 3) as follows: maximal width of "blue" band $10 < \text{mm}$ (*gulina* $10 > \text{mm}$), outer forewing radial spot reduced, apex invaded by beige or fuscous (*gulina* radial spot large and blue). Male with genital valvae terminally inclined, length not exceeding tegumen/uncus; female with dorsal genital sterigma robust (see Remarks).

DESCRIPTION.— Forewing length: (Table 2) 46mm ♂, 55mm ♀.

MALE.— Wing upper surface ground color blackish brown. Forewing with (a) two radial blotches (radial area and cell M1), inner one beige to gray-blue, outer one bluer but greatly invaded by beige to fuscous scales, (b) blue band, trapezoidal to rectangular in shape, from cell CuA1 to inner margin. Hindwing with blue band extending from center of cell M1 to slight invasion of cell CuA1. Both bands variously tinged with a distal silver hue. Wing under surface: ground color mottled gray.



Fig. 1. Types of *Archaeoprepona demophoon mexicana* (upper surface left, under surface right): A) holotype male; B) allotype female (color and half-tone).



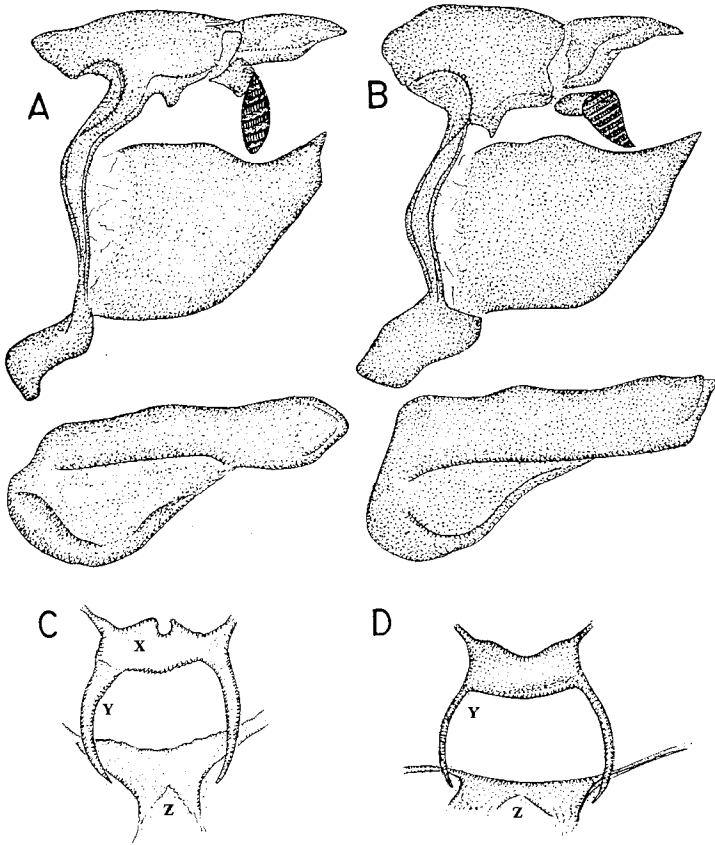


Fig. 2. Genitalia of *Archaeoprepona d. mexicana* and *A. d. gulina*. A, B. Male Genitalia, lateral view with aedeagus removed and placed below. A, *A. d. mexicana*, holotype male; B, *A. d. gulina* of Fig. 1. C, D. Female Genitalia, ventral view of dorsal (above) and ventral (below) sterigma. C, *A. d. mexicana*, allotype female; D, *A. d. gulina*, Sayaxache, El Peten, Guatemala, 30 August 1968, leg. E. C. Welling (AMNH).

Forewing suffused blackish (cell CuA2 from medial area to submargin) and marked with costally directed, jagged, brown lines in the basal, postbasal, discal and medial areas; ground basad of lines suffused gray and gray brown. Hindwing with basal disc of dark tawny ground, outlined in all cells by medial blackish brown lines (costa to cell CuA2); ground color basad of lines suffused gray and gray brown; submargin with small dots from cell 3A to M1, usually brown, occasionally suffused centrally with iridescent blue. **Male Genitalia:** Fig. 2A. Typical of species but differing from other subspecies primarily by prominent dorsal shoulder on valvae and by length of valvae not exceeding length of tegumen and uncus; compared to other subspecies, tegumen and uncus generally flat and uncus with wider and more curvate lateral margin.

FEMALE.— Wing shape broader, more marginally rounded than males. Ground color blackish-brown, medial blue to blue-green bands located as on males but slightly broader; forewing radial spots larger but colored as on male. Wing under surface: marked as males. **Female Genitalia.** Fig. 2C. Typical of species, resembling most the subspecies of north and western South America (Johnson and Descimon 1989, fig. 5) with ventral sterigma compact and irregular to membranous along ventral margin.

TYPES.— All from Mexico, Guerrero State, Sierra de Atoyac, collected with traps, leg. Jorge Llorente and Armando Luis except the holotype. **Holotype** ♂ (Figs. 1-2): MEXICO: Las Parotas, 25 Oct 1985, leg. Gregorio Rodriguez, habitat "Bosque Tropical Subcaducifolio (cafetales)" ("Bts(c)", see Appendix ["App."] 1) at 300m ("masl"), deposited AMNH. **Allotype** ♀ (Figs. 1-2): same data as holotype except 25 Nov 1985, deposited AMNH.

Paratypes.— MZFC: 2 ♂-- El Faisanal, 4 Sep and 25 Oct 1983, habitat "Bosque Mesófilo de Montaña (cafetales)" ("Bmm", see App. 1) at 1200m; 6 ♂-- Puntos del Rey-de los Lugardo, 29 Mar 1984, 26-29 Oct and 28 Nov 1985; 4 ♀-- Puntos del Rey-de los Lugardo, 29 Oct 1983 and 30 Mar 1984, habitat Bts(c) (see App. 1) at 900-950m; 3 ♂-- Rio Santiago, 26 Jul 1984, 7-8 Aug, 1 ♀-- 25 Nov 1985, habitat "Bosque Tropical Subcaducifolio" ("Bts", see App. 1) at 680m; 2 ♂-- same data as allotype but 11 Sep and 25 Oct 1985. AMNH: 1 ♂, 1 ♀-- "Atoyac", Guerrero, Mexico, Hoffman Collection.

TABLE 1

LENGTH OF FOREWING OF SEVERAL POPULATIONS *Archaeoprepona demophoon*

IN MEXICO

AREA	#specimens	♂		♀		
		extremes	average	extremes	average	
1 GULINA (Gulf of Mexico Slope)	4	50-53.5	52.25	12	51-61.5	57.29
2 Sierra de Atoyac, Guerrero State	28	47-50.5	48.64	14	53-57.5	55.6
3 Sierra de Manantlán, Jalisco State	9	46-51	48.4	6	53-57	55.25
4 Sierra de San Juan, Nayarit State	58	41.5-50	46.41	21	49-60	54.3

TABLE 2

**LENGTH OF FOREWING OF *Archaeoprepona demophoon mexicana* ssp nov. IN
TWO ALTITUDINAL GRADIENTS**

I NAYARIT STATE (SIERRA DE SAN JUAN)	altitude (masl*)	♂ ♂	♀ ♀
San Blas ¹	10	---	53.5
Singayta ²	50	45.74	55.5
Jumatán ³	350	47	54.8
Mirador del Aguila ³	530	47	57
La Bajada ⁴	250	45	51
Palapita ⁴	650	47.5	55.33
La Yerba ⁵	750-890	45.8	---
Venustiano Carranza ⁵	1100	47	53
II GUERRERO STATE (SIERRA DE ATOYAC)			
Las Parotas ³	300	49.25	56.29
Río Santiago ⁴	650	48	56
Puente del Rey ⁴	900	48.22	53.58
El Faisanal ⁵	1200	47.25	56.5

1- Mangrove, 2-*Orbygnia* Palm Forest, 3-Deciduous Tropical Forest, 4-Semievergreen Tropical Forest, 5-Cloud Forest
* meters above sea level

REMARKS.— Differences among related taxa are as follows: *Wings* smaller (Tables 1,2). Upper surface, forewing— band trapezoidal to rectangular, maximal width 10mm or less (*gulina* band more triangular, maximal width exceeding 10mm); band color distally more silver-tinged (*gulina* azure in at least basal one-half); bluish radial spots small, outer spot much invaded by beige or fuscous scales (*gulina* radial spots larger and brightly suffused blue throughout). Under surface (although appearing more variable)— jagged dark brown lineal elements, bordering forewing discal area to cell CuA1 and hindwing basal disc from costa to cell CuA2, prominently marked and inwardly suffused with gray (*gulina* with lines more obsolescent and wing ground generally light tawny). *Genitalia*, male valvae short (length of valve less than length of tegumen/uncus), dorsal margin prominently shouldered and terminus markedly inclined (*gulina* valve length exceeding that of tegumen/uncus, dorsal margin undulate, and terminus only slightly inclined, if at all); female dorsal sterigma robust caudally (Fig. 2Cx) and along lateral curvate processes (Cy), ventral sterigma compact at the ventrally directed prongs (Cz) (*gulina* dorsal sterigma narrow along lateral processes (Fig. 2Dy), ventral sterigma less compact (Dz).

Variation.— Table 1 summarizes the latitudinal trend in forewing reduction from north to south for males of *A. demo-*

phoon; the reduction in females is less pronounced. This latitudinal trend does not clearly reflect the altitudinal correspondence shown in the two other gradients studied (Guerrero and Nayarit, Table 2); only males in the Sierra de Atoyac (Guerrero) showed wing reduction with increasing altitude. Table 2 also shows size differences between *A. d. mexicana* and *A. d. gulina*.

Collection Notes.— *Archaeoprepona demophoon* is frequently captured by Van Someren-Rydon traps (Rydon, 1964) and is often seen perching in the canopy, exhibiting territorial displays when approached by other males while perching. In the Sierra de Atoyac, *A. demophoon* often visits human excrement.

ETYMOLOGY.— Named for the Mexican region.

DISTRIBUTION AND BIOGEOGRAPHY

DISTRIBUTION

Spatial: Fig. 3. *Archaeoprepona d. mexicana* ranges in the Pacific Slope from Oaxaca to Nayarit. *Archaeoprepona d. gulina* ranges in Mexico from both slopes of Chiapas to San Luis Potosi and, probably, southern Tamaulipas in the eastern slope. Southward, syntype localities for *A. d. gulina* include "Honduras" and "Costa Rica" (Martin, 1922) and Johnson and Descimon (1989, fig. 4) identified this subspecies south to the Colombian cordillera.

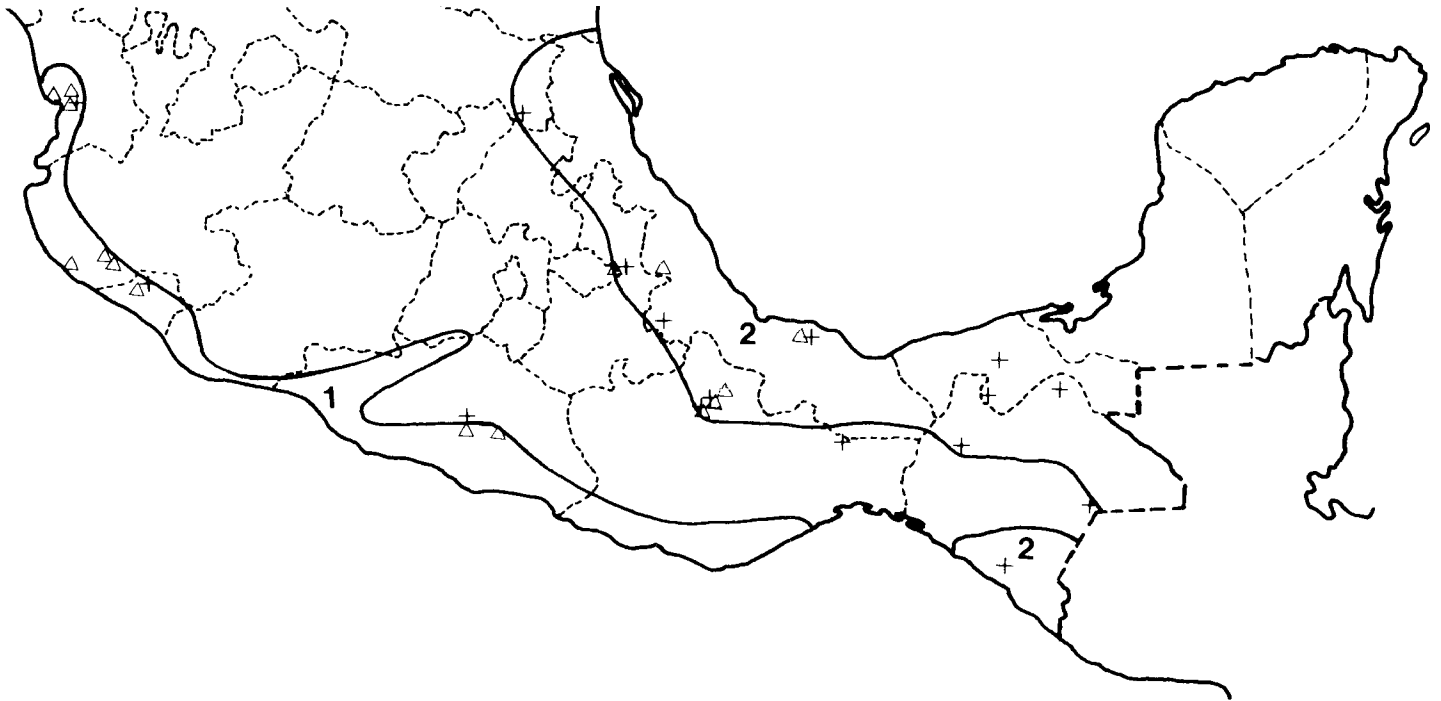
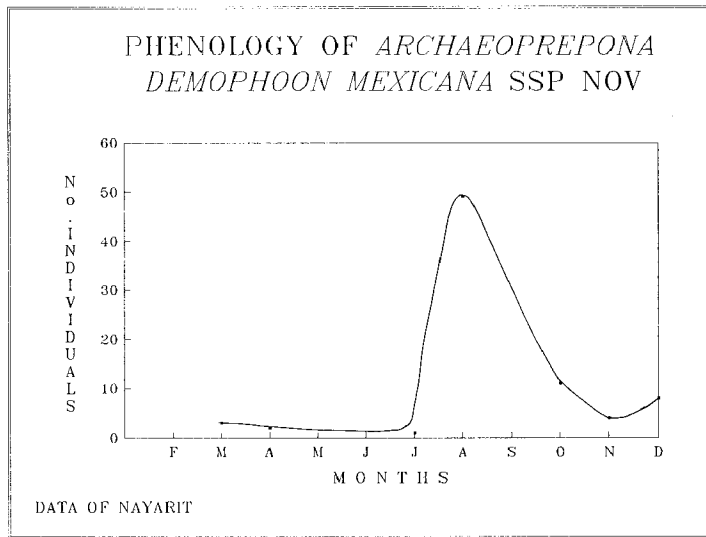


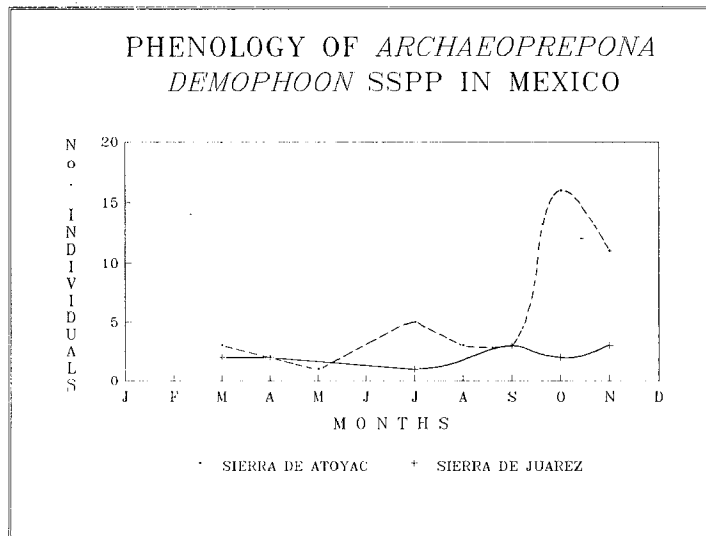
Fig. 3. Geographic Distribution of *Archaeoprepona demophoon* in Mexico. 1. *A. d. mexicana*; 2. *A. d. gulina*: Δ records from collections; + records from the literature.



Temporal: Figs. 4-5. *Archaeoprepona d. mexicana* is strongly seasonal in both the Sierra de Atoyac (Guerrero) and Sierra de San Juan (Nayarit) being most abundant from July to October. This contrasts the relatively uniform phenology of *A. d. gulina*.

BIOGEOGRAPHY

Both *A. d. gulina* and *A. d. mexicana* are found between 0-1200m, especially in lower cloud forest and semideciduous-semievergreen tropical forest, frequently in riparian vegetation of both habitats (Table 2 and "Habitat(s)", App. 1). Geographic distribution of *A. demophoon* reflects the major vicariance pattern in tropical Mexico — one segregate in the east and southeast and another in the south and west. Consistent with the distributions of other taxa mentioned in our Introduction, *A. d. mexicana* is here described to denote the southern and western component of this vicariant pattern. Typical of the pattern, the distribution of *A. d. mexicana* is disjunctive in Mexico, extending from Nayarit to Oaxaca; *A. d. gulina*, on the otherhand, extends southward through Central America to Colombia.



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Fig. 4. Seasonal Phenology of *Archaeoprepona d. mexicana* in Nayarit. Fig. 5. Contrast of Seasonal Phenology in *Archaeoprepona d. mexicana* and *A. d. gulina* in Montane Southern Mexico.

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Specimens Examined from Mexico

Collectors: JAL (Jorge Llorente B.), AC (Alma Garcés), FP (Felipe Palomera), PS (Patricia Sandoval), GI (Guadalupe Intriago), RL (Raúl López), SL (Sofía López), IL (Isolda Luna); AM (Adolfo Machorro), AV (Alicia Villela), AL (Armando Luis); EM (Eduardo Moreales), LG (Luis González)

Habitats: [in brackets], using terminology of MZFC: [Sbc], Selva Baja Caducifolia; [Sbc(r)], Selva Baja Caducifolia (riparia); [Bmm], Bosque Mesófilo de Montaña, [Po], Palmar de Orbygnia; [Sms] Selva Mediana Subperennifolia; [Sms(c)], Selva Mediana Subperennifolia (cafetales), [Sap], Selva Alta Perennifolia (unless a briefer notation is spelled out completely in certain individual cases). ♂(♂)= male(s); ♀(♀)= female(s); *dissected.

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Archaeoprepona demophoon mexicana. NAYARIT: Tepic, Jumatan, 14 ♂♂, 5 ♀♀, 10-29 Sep, 13 Oct and 1 Dec 1979, and 22-23 Oct 1980, leg. JL, AG, FP, PS, [Sbc(r)], 220-350 masl; Tepic, Mirador del Aquila, 1 ♂, 1 ♀, 29 Sep 1979, leg. JL and GI, [Sbc], 530 masl; Tepic, Venustiano Carranza, 1 ♀, 1 Oct 1979, leg. RL, [Bmm], 1,100 masl; Tepic, La Yerba - Tepetitile, 5 ♂♂ 14 Oct 1979, 15-16 Oct 1981 and 24 Mar 1982, 1 ♀, 19 Nov 1980, leg. JL, SL, [Bmm], 780-890 masl; San Blas, Singayta, 21 ♂♂, 7 ♀♀, 14-15 Sep 1978, 20-28 Sep and 3 Dec 1979, and 21-22 Apr 1982, leg. JL, AM, AG, IL, SL, [Po], 50 masl; Ban Blas, 1, 27 Sep 1979, leg. JL, [manglar], 10 masl; San Blas, La Bajada, 1 ♂, 1 ♀ 30 Sep 1979, leg. FP, AV, [Sms(c)], 250 masl. JALISCO: Palapita, 11 ♂♂, 3 ♀♀, 5 Dec 1979, 27 Jul and 20 Nov 1980, 13 Oct 1981 and 26-27 Mar 1982, leg. JL, [Sms], 650 masl; Autlán, Ahuacapán, 4 ♂♂, 2 ♀♀, 20 Mar and 14 Nov 1990, leg. JL, AL, [Sbc(r)], 900 masl; Casimiro Castillo, La Calera, 4 ♂♂, 3 ♀♀, 25 Oct 1989, 1 May, 22 Aug and 13 Nov 1990, leg. JL, AL, [Sms], 600-650 masl; Chamela, Estación Biológica UNAM, 1 ♂, Nov 1989, leg. EM, [Sbc], 80 masl. COLIMA: Villa de Alvarez, Agua Dulce, 2M, 21 Jul and 23 Oct 1989, leg. JL, AL, [Sms], 250 masl. GUERRERO: (in addition to types [all*]); El Faisanal, 2 ♀♀, 25-29 Oct 1983, no other data recorded [nod]; Puentes del Rey - de los Lugardo, 3 ♂♂, 20 Oct 1983, 31 Mar 1984 and 29 Nov 1985, nod; Las Parotas, 9 ♂♂, 6 ♀♀, 2 May, 9-10 Jul, 24-25 Oct and 25 Nov 1985, nod. AMNH. COLIMA: *"Colima", nod, 1 ♂, 18 Dec 1915, 1 ♂, 20 Jul 1915. GUERRERO: *"Atoyac", nod, Hoffman Collection, 1 ♀, 1 ♀.

Archaeoprepona demophoon gulina. MZFC. PUEBLA: Tequesquitla, 1 ♀, 27 Oct 1980, leg. LG. VERACRUZ: Teocelo, 2 ♀♀, 5-8 May 1978-1981, leg. JL, AG, [Bmm], 1,100 masl; Los Tuxtlas, Popocotépetl, 2 ♂♂, 1 ♀♀, Jul 1981 and 20 Jul and 20 Aug 1982, leg. LG, [Sap], 200 masl; Tapalapan, 1 ♀, 20 Jul 1982, leg. LG, [Sapp], 300 masl. OAXACA: San Jose Chiltepec, Naranjal, 1 ♀, 5 Jul 1979, leg. LG, [Sap], 50 masl; Valle Nacional, Yetla, 1 ♀, 3 Nov 1987, leg. JL, AL, [Sap], 250 masl; Santiago Comaltepec, Puerto Eligio, 1 ♂, 12 Sep 1987, leg. JL, AL, [Sap-Bmm], 650 masl. AMNH. CHIAPAS: *San Jeronimo, 1 ♂, 18 Jul 1922, 600 m., 1 ♂, 24 Sep 1970, leg. E. C. Welling; *La Grania, 1 ♀, 27 Jul 1930, leg. Hoffman; *"Chiapas", nod, 1 ♀, F. Johnson Collection. OAXACA: *Yetla, 1 ♀, 6 Sep 1961, leg. E. C. Welling. TABASCO: *Tepescuintla, 1 ♂, 14 Aug 1962, leg. E. C. Welling. VERACRUZ: *Presidio, 1 ♂, Jul 1940, leg. Hoffman.

APPENDIX 2

Dissections of Archaeoprepona demophoon gulina Outside Mexico

COSTA RICA. Guapiles, nod, 1 ♀ (CMNH); EL SALVADOR. San Salvador, nod, leg. L. Reynolds, 1 ♀ (AMNH); GUATEMALA. San Juan, nod, 1 ♂ (AMNH); Bermudas, nod, 1 ♂ (AMNH); Rabinal, nod, 1 ♂ (AMNH); Sayaxache, El Peten, 30 Aug 1968, leg. E. C. Welling, 1 ♂, 1 ♀ (AMNH). HONDURAS. Petuc, nod, leg. F. C. Nicks, 1 ♀ (AMNH). MEXICO. Yetla, Oaxaca, 8 Sep 1961, leg. E. C. Welling (1 ♀); La Grania, Chiapas, nod, leg. Hoffman (1 ♀); San Jeronimo, Chiapas, 18 Apr 1972, leg. E. C. Welling (1 ♂, 1 ♀); Tepescuintla, Mpo. Tenosique, Tabasco, 14 Aug 1962, leg. E. C. Welling (1 ♂) (all AMNH); NICARAGUA. Chontales, nod (1 ♂), 13 mi. S Managua, 5 Apr 1976, leg. R. A. Anderson (1 ♂, 1 ♀) (all AMNH); PANAMA. Chiriqui, nod (1 ♂); Lion Hill, nod (1 ♂), Balboa, Canal Zone, 18 Feb 1935 (one ♂) (all AMNH).