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Variation of *Stinga* Evans, 1955, with description of a new species from Mexico (Lepidoptera: Hesperiidae: Hesperiinae: Hesperiini)

ANDREW D. WARREN[1,2] & GEORGE T. AUSTIN[1]

[1]*McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, P.O. Box 112710, Gainesville, Florida 32611*
[2]*Museo de Zoología "Alfonso L. Herrera", Departamento de Biología Evolutiva, Facultad de Ciencias, Universidad Nacional Autónoma de México, Apdo. Postal 70-399, México 04510 D.F., México*

Abstract

Stinga Evans, 1955, has been considered monotypic since its description despite geographical variation that has not been elucidated. The variation of *Stinga morrisoni* (W. H. Edwards, 1878) described and figured here includes a range of superficial phenotypes segregated by a combination of geography and elevation, but united by a common genital morphology of both sexes. In addition, a second species of the genus occurring in southern Mexico (Tlaxcala, Puebla and Oaxaca), with different genitalia and superficial traits outside the range of variation seen in *S. morrisoni*, is described and named as a new species.

Key words: butterfly, genitalia, Nearctic, Poaceae, skipper

Stinga Evans, 1955 (Lepidoptera: Hesperiidae: Hesperiinae: Hesperiini), was proposed as a monotypic genus for *Pamphila morrisoni* W. H. Edwards, 1878. That species, described from Colorado, occurs as apparently localized disjunct populations (Brown *et al*. 1957, Brown and Miller 1977, Stanford 1981, Bailowitz and Brock 1991, Toliver *et al*. 1994) in central and southern Colorado, eastern Arizona, much of New Mexico, and extreme western Texas, United States, and southward into Mexico (*e.g.*, Stanford and Opler 1993, Brock & Kaufman 2003). The occurrence of *S. morrisoni* in Mexico has not been well documented. Stanford and Opler (1993) indicated records for *S. morrisoni* from the northern Mexican states of Sonora, Chihuahua, Coahuila and Nuevo León, and the species was reported from high elevations in the Eje Neovolcánico (Ajusco, Distrito Federal) by Beutelspacher (1980). Recent fieldwork has extended its known distribution in Mexico north through the central Mexican Plateau in Guanajuato and Durango, and south to the higher elevations of the Sierra Madre del Sur of Guerrero and the Cuicatlan-Teotihuacan region in Oaxaca (this study).

Although no taxa of *Stinga* have been named beyond the type species, considerable heretofore unenumerated geographical variation exists within populations ascribed to *S. morrisoni*. Some of the variation has been thought to represent species-level differentiation (Warren 2000, Luis-Martínez *et al.* 2003). This phenotypic richness is elaborated below, including the description of a new species from southern Mexico.

This study was initiated by the senior author in March 1998, while visiting the home and private collection of the late Roy O. Kendall, in San Antonio, Texas. Kendall had accumulated a long series of *Stinga* from western Texas, as well as a few specimens from Mexico, including three males from Nuevo León and one male from Tlaxcala. The male from Tlaxcala (collected in March 1977), placed apart from the rest of the series, differed from *S. morrisoni* in many ways, and generated the following note in Kendall's lab notebook: "appears to be an aberrant specimen, if not then a new species." Based on this individual, an expedition to the south-central Mexican states of Tlaxcala and México (in collaboration with the Museo de Zoología, Facultad

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de Ciencias, Universidad Nacional Autónoma de México) was conducted in March of 2000, primarily to search for populations of *Stinga*.

Before these events, Roberto G. de la Maza Elvira (of Mexico City) collected a series of five males and two females of an unusual *Stinga* in the state of Puebla (also in March, 1977); one male from this series was forwarded to the late Stephen R. Steinhauser, then at the Allyn Museum of Entomology in Sarasota, Florida. Steinhauser subsequently received a second, somewhat similar, specimen from southern Oaxaca from the late Hugh Avery Freeman (Garland, Texas). Study of these two specimens led Steinhauser to believe that two undescribed species were likely represented.

After a successful expedition to south-central Mexico for *Stinga* in March 2000, the senior author contacted Steinhauser, and discussed the situation (elaborated below) with him. At that time, it was concluded that the two specimens Steinhauser examined at the Allyn Museum (now at the McGuire Center for Lepidoptera and Biodiversity, Gainesville, Florida) represented but a single undescribed species, and at that time Steinhauser expressed his interest in having them included as paratypes of the new species described below. To that end, 798 examples of *Stinga* were examined to determine its geographic variability. These are deposited in collections abbreviated as follows: private collection of Andrew D. Warren, Castle Rock, Colorado, USA (ADW); Gillette Museum of Arthropod Diversity, Department of Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, Colorado, USA (CSU); Instituto de Biología, Universidad Nacional Autónoma de México, Mexico City, Mexico (IBUNAM); private collection of the de la Maza family, Mexico City, Mexico (MAZA); McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, Gainesville, Florida, USA (MGCL); Museo de Historia Natural y Cultura Ambiental de la Ciudad de México, Mexico City, Mexico (MHNCM); Museo de Zoologia "Alfonso L. Herrera," Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico City, Mexico (MZFC); San Diego Natural History Museum, San Diego, California, USA (SDNHM); and Texas A&M University, College Station, Texas, USA (TAMU). Forewing length is from base to furthest extent of the apex. Names for structures of genitalia generally follow those used for other hesperiines by Burns (1992).

Stinga morrisoni (W. H. Edwards, 1878)

Type locality: "Southern Colorado", restricted to Hardscrabble Canyon, Custer County, Colorado, by Brown and Miller (1977); lectotype male designated and illustrated by Brown and Miller (1977; see also illustration in Holland 1931, plate 16, fig. 26) in Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA.
(Figs. 1a–l, 2a–l, 3a–l, 5a–c, 6a–c)

Description. Male (Figs. 1g–j)—mean forewing length = 13.2 mm (12.5–14.0 mm, n=20, from Colorado); forewing apex pointed, termen slightly convex; hindwing termen convex, then slightly concave before weakly developed tornal lobe; forewing with dark gray stigma in CuA_1-CuA_2, extending from along posterior vein of discal cell proximad from origin of CuA_1, curving caudad to vein CuA_2 at about 1/8 distance to termen from its origin and in CuA_2-2A from vein CuA_2 about 1/8 distance from its origin to termen extending nearly straight almost to vein 2A just proximad of its middle; dorsum orange marked with black; orange on forewing most intense proximad of stigma extending cephalad through discal cell nearly to costa; costa thinly black, this broadening distad; apex and outer margin black to tornus; pale yellow-orange subquadrate subapical macules in R_3-R_4, R_4-R_5, and R_5-M_1; yellow-orange quadrate submarginal macules in M_1-M_2 and M_2-M_3, offset distad from subapical and postmedial macules, proximal edge of macule in M_1-M_2 more or less aligned with distal edge of macule in Rs-M_1 and M_3-CuA_1, yellow-orange postmedial macules (distad of stigma), in M_3-CuA_1, CuA_1-CuA_2, and CuA_2-2A, variable in shape, usually with distal edges concave, that in CuA_1-CuA_2 usually largest, that in CuA_2-2A subquadrate with ragged distal margin; scattered black scales within orange proximad (especially along the anterior vein of the discal cell, proximad of stigma in CuA_2-2A, and in almost all of anal cell); black scaling on both sides of stigma and may extend into

posterior portion of discal cell; fringe gray, but tipped with white near tornus. Hindwing orange broadly in postmedian from Rs to 2A, orange extending along vein 2A to termen and proximad to 1/2 distance to its origin, marginal area black; remainder of wing heavily overscaled with black, sparsest in discal cell; distal edge of darkened basal area irregular, produced furthest distad in M_1-M_3; fringe gray, tipped with white except largely pale orange caudad of vein CuA_2.

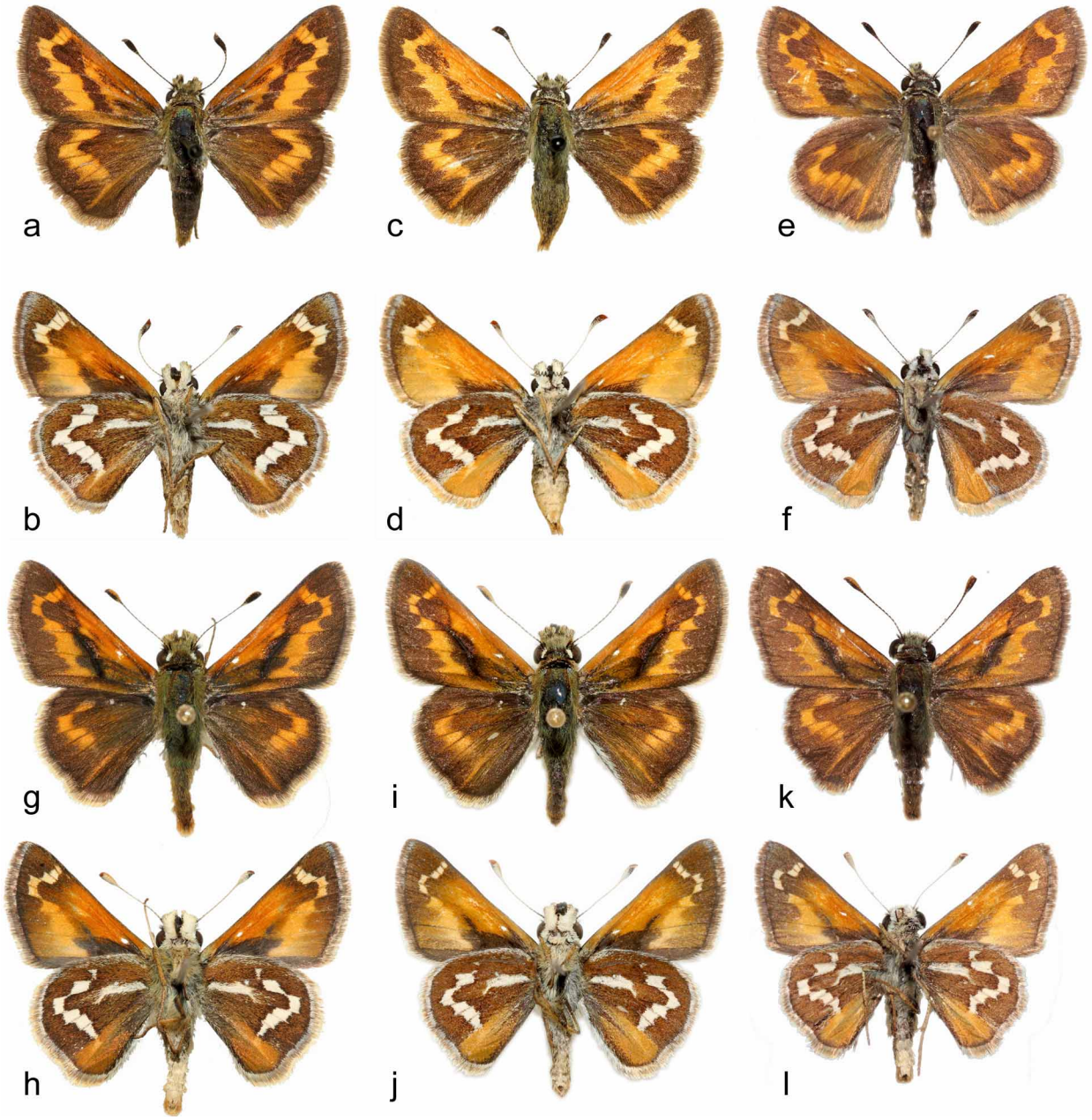

FIGURE 1. Adults of *Stinga morrisoni* from Colorado and northern Arizona: **a**), **b**), female from USA: COLORADO: El Paso Co.: Rock Creek Canyon, 3-V-1992, Andrew D. Warren; **c**), **d**), female from USA: COLORADO: Teller Co.: hill, 0.5 mi SW Crystola, 26-V-1993, Andrew D. Warren; **e**), **f**), female from USA: ARIZONA: Apache Co.: Forest Road 117, 4.5 mi. S of Hwy. 60, 18-V-1990, P. Savage; **g**), **h**), **i**), **j**), males from USA: COLORADO: Douglas Co.: Hwy. 67 at Sugar Creek, 6900-7200', ca. 2 air miles E South Platte River, 11-V-2008, Andrew D. Warren; **k**), **l**), male from USA: ARIZONA: Apache Co.: Hwy. 260, 7 mi. W of Egar, 21-V-1988, P. Savage.

Ventral forewing orange, yellow-orange ventrad of dorsal macules in M_3-CuA_1, CuA_1-CuA_2, and CuA_2-2A; subapical and submarginal macules repeated from dorsum, pale ochreous to nearly white; costa thinly brown expanding distad to brown subapical patch enclosing subapical and submarginal macules and

continued along outer margin to vein CuA_1; apical brown area overscaled with pale orange, this appearing olive; base of wing largely black extending furthest distad in CuA_2-2A; variable black scaling ventrad of stigma. Ventral hindwing largely brown cephalad of middle of CuA_2-2A, overscaled with pale orange giving an olive aspect, least dense adjacent to postmedial series of shining white connected macules extending from $Sc+R_1$ or Rs to mid-cell CuA_2-2A; macule in $Sc+R_1$-Rs subquadrate (may be reduced to small dot or absent) with distal edge concave and proximal edge convex, proximal edge at about mid-cell, partially overlapping proximal portion of quadrate macule near base of $Rs-M_1$, macule connected with or disjunct from proximal corner of macule in M_1-M_3, that macule in distal 1/3 of cell irregularly-shaped and may be slightly produced distad in its middle, connected with distal edge of macule in mid-cell M_3-CuA_1, this forming curved series with macules of decreasing width in CuA_1-CuA_2 and anterior portion of CuA_2-2A, latter extended as a few white scales distad from its caudal edge; anterior 1/2 of discal cell white nearly to base of wing, white extending caudad along vein M_1-M_3, may be whitish smudge at distal end of discal cell caudad; posterior 1/2 of CuA_2-2A, and entire 2A-3A and anal cell orange, proximal 1/3 of CuA_2-2A and 2A-3A and entire anal cell overscaled heavily with black.

Dorsal head gray, white dot dorsad of eye; palpi mixture of gray and black scales on dorsum, white with a few black scales laterad, white on venter; antenna black on dorsum with variable white at base of club, sides white with black at segments, venter white with black at segments proximad, venter of club pale yellow-orange, nudum pale red-brown, distal segment dark brown, 10 (n=12), or 11 (n=1) segments; thorax and abdomen gray-brown with greenish tinge on dorsum, ventral thorax gray, pectus whitish, legs gray proximad, yellow-orange distad; ventral abdomen gray, whitish at segments.

Genitalia (Fig. 5a) - uncus thin in lateral view, narrowing to slightly hooked caudal end, broad in dorsal view, narrowing and dividing caudad into thin parallel and closely spaced arms; gnathos broad cephalad in lateral view, narrowing caudad where slightly curved upward and approximating caudal end of uncus, about width of uncus in ventral view, divided with thin arms converging caudad; tegumen narrow in lateral view, sides parallel in dorsal view, cephalic end notched centrally and flaring to its ventral arms that twist and combine with dorsal arm of saccus, the combined structure curved (lateral view) and bowing outward (in cephalic view); anterior arm of saccus short, slightly curved upward (lateral view), moderately broad in ventral view and narrowing to blunt cephalic end; valva moderately broad, broadest cephalad, harpe blunt with rounded dorsal lobe, costa-ampulla variably undulate on dorsal edge, ampulla lobed caudad slightly overlapping outer edge of dorsal lobe of harpe, lobe of ampulla exceeding height of harpe, sacculus broad; aedeagus stout, slightly (1.2–1.3 times) longer than valva, ventral edge of caudal end exceeding dorsal edge, tapering to blunt point, right side with scroll-like titillator extending laterad and caudad, with sharply toothed dorsal edge caudad, titillator on left side, bar-like expanding slightly and toothed, bent cephalad into aedeagus when not extruded, extending caudad when extruded; vesica with two thorn-like cornuti and elongate densely spinate scouring pad-like cornutus; juxta more or less triangular in caudal view.

Female (Figs. 1a–d) - mean forewing length = 14.1 mm (12.9–15.2 mm, n=9, from Colorado); forewing apex pointed, termen convex; hindwing termen convex, then slightly concave before weakly developed tornal lobe; dorsum orange marked with black; orange on forewing most intense proximad of mid-wing extending cephalad through discal cell nearly to costa; costa thinly black, this broadening distad; apex and outer margin black to tornus; pale yellow-orange subquadrate subapical macules in R_3-R_4, R_4-R_5, and R_5-M_1; yellow-orange bar-like submarginal macules M_1-M_2 and M_2-M_3, offset distad with proximal edge under distal portion of or separated by less than their width from subapical macules, contiguous with or slightly overlapping yellow-orange postmedial macules, that in M_3-CuA_1 quadrate near base of cell, in CuA_1-CuA_2 with distal edge concave and proximal edge convex, and in CuA_2-2A irregular in shape, all three with cephalic and caudal edges extending slightly along veins into dark margin; scattered black scales within orange basad (especially along anterior vein of discal cell, in CuA_2-2A, and in entire anal cell); black macules dividing base of wing from postmedial macules (in position of male's stigma) variable but as broad as or broader than postmedial

macules; fringe entirely gray-brown. Hindwing orange broadly in postmedian from Rs to 2A (usually small macule also in Sc+R_1-Rs), orange extending proximad along vein 2A 1/2 to 2/3 distance to its origin and distad to termen, marginal area black, more or less as lunules in each cell with little or no orange extending distad from postmedian along veins; remainder of wing heavily overscaled with black, distal edge of darkened basal area irregular, extended furthest distad in M_1-M_3; fringe gray-brown proximad, whitish distad except pale orange caudad of vein CuA_2.

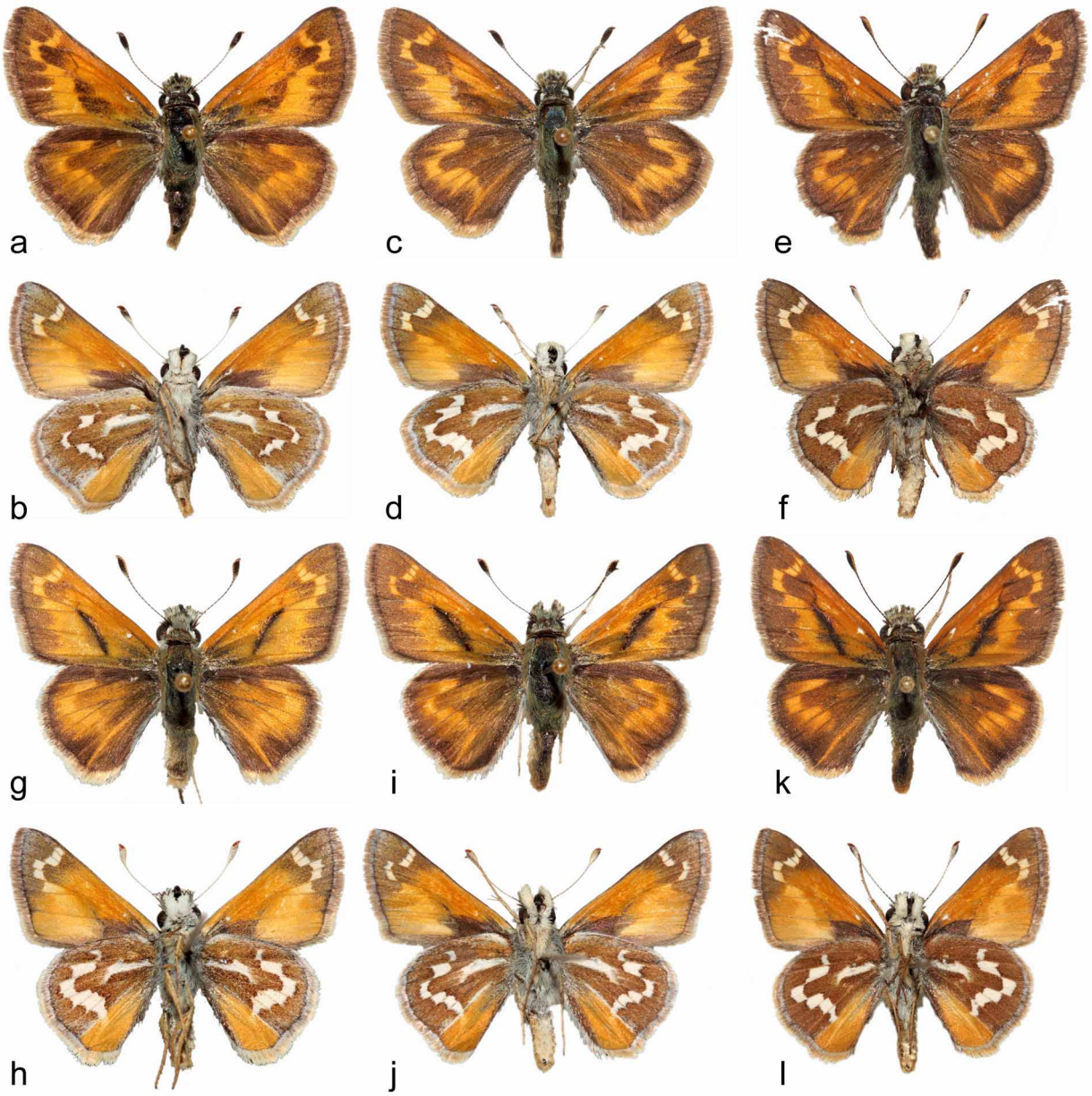

FIGURE 2. Adults of *Stinga morrisoni* from western Texas, southern Arizona, USA, and Guanajuato State, Mexico: **a**), **b**), **c**), **d**), females from USA: TEXAS: Jeff Davis Co.: Hwy. 118, vic. McDonald Observatory, 24-III-1998, Andrew D. Warren; **e**), **f**), male from USA: ARIZONA: Santa Cruz Co.: Canelo Pass, 1-IV-1988, P. Savage; **g**), **h**), **i**), **j**), males from USA: TEXAS: Jeff Davis Co.: Hwy. 118, vic. McDonald Observatory, 24-III-1998, Andrew D. Warren; **k**), **l**), male from MEXICO: GUANAJUATO: Mpio. León / San Felipe: top of mesa, N side of Hwy. 87 (camino León-San Felipe), ca 8 km NE El Zauco (28 km NE León), 2600m, 29-III-2001, Andrew D. Warren.

Ventral forewing orange, yellow-orange ventrad of dorsal macules in M_3-CuA_1, CuA_1-CuA_2, and CuA_2-2A; subapical and submarginal macules repeated from dorsum, pale ochreous; costa thinly brown expanding distad to brown subapical patch enclosing subapical and submarginal macules and continued along outer

margin to vein CuA_1; apical brown area overscaled with pale orange, this appearing olive; base of wing largely black extending furthest distad in CuA_2-2A. Ventral hindwing largely brown cephalad of middle of CuA_2-2A, overscaled heavily with pale orange giving olive aspect, least dense adjacent to postmedial series of shining white connected macules extending from $Sc+R_1$ (or Rs) to mid-cell CuA_2-2A; macule in $Sc+R_1$-Rs subquadrate (may be reduced to small dot or absent), sometimes with distal edge concave and proximal edge convex, proximal edge at about mid-cell, partially overlapping macule near base of Rs-M_1, macule connected with or disjunct from proximal corner of macule in M_1-M_3, that macule irregularly-shaped, connected with distal edge of macule in mid-cell M_3-CuA_1, this forming curved series with macules of similar or decreasing width in CuA_1-CuA_2 and anterior portion of CuA_2-2A, latter extended distad as a few scales from its caudal edge; anterior 1/2 of discal cell white nearly to base of wing, white extending caudad along vein M_1-M_3; posterior 1/2 of CuA_2-2A, and entire 2A-3A and anal cell orange, proximal 1/3 of CuA_2-2A and 2A-3A and often entire anal cell overscaled heavily with black.

Dorsal head gray, white dot dorsad of eye; palpi mixture of gray and black scales on dorsum, white ventrad and laterad; antenna black on dorsum with variable white at base of club, sides white with black at segments, venter white with black at segments proximad, venter of club whitish with variable black and/or red-brown scaling, nudum pale red-brown, distal segment dark red-brown or brown, 10 (n=4) segments; thorax and abdomen gray-brown with greenish tinge on dorsum, ventral thorax gray, pectus whitish, legs gray proximad, yellow-orange distad; ventral abdomen gray, whitish at segments.

Genitalia (Fig. 6a) - lamella postvaginalis largely membranous laterad, caudal edge with heavily sclerotized and somewhat lunate central area (caudal margin shallowly excavate) possessing dense elongate setae, variably sclerotized and prominently arched cephalad of this towards ostium bursae; eighth tergite with sharply pointed anterior apophysis branched to prominent lobe curving ventrad on either side of caudal portion of antrum; antrum broad, membranous, weakly folded longitudinally, with variably developed ventro-cephalic 'dewlap', remainder of ductus bursae becoming broader and curving dorsad and cephalad, moderately sclerotized with prominent longitudinal and transverse grooves; ductus bursae conjoined ventro-caudally with membranous and globular corpus bursae, about as long as wide, weakly developed longitudinal grooves.

Variation. Since its description, *Pamphila morrisoni* has been recognized as a distinctive species of unknown affinities among others of the tribe Hesperiini. Such uncertainty led to its placement within several genera (see synonymy in Mielke 2005). With the description of *Stinga* by Evans (1955), the species has experienced generic stability within that monotypic genus for over fifty years.

Although *Stinga morrisoni* has a broad geographical, elevational, and ecological distribution from Colorado to southern Mexico, no mention has been made of phenotypic variation in adults or lack thereof. Since none has been elaborated, evidenced by the absence of any infraspecific taxa, it has evidently been assumed that the species is invariable. Examination of series of specimens assembled from many localities, however, indicates the presence of considerable variation in superficial phenotype across the range of the species. The foregoing description, based upon material from Colorado, provides a point of reference for the following discussion of this variability.

Both sexes of *S. morrisoni* vary in their forewing length (Table 1), which is apparently related to elevation. The smallest individuals occur in montane areas of the greater Rocky Mountains in Colorado, northern Arizona and northern New Mexico and at higher elevations in Mexico (*e.g.*, states of México, Tlaxcala). Size is greatest among populations occurring at lower elevations in southern Arizona, western Texas, and in parts of central Mexico (*e.g.*, Guanajuato). The length of the forewing of females exceeds that of males by an average of about 1mm throughout the species' distribution (Table 1).

Individuals from northern Arizona and New Mexico (Figs. 1e–f, k–l) not only average the same size as those in Colorado, but are similar in color and pattern on the dorsum and venter. Material from southern Arizona and New Mexico (Figs. 2e–f) differs with a tendency towards less black associated with the stigma on males. On both sexes, the subapical macules on the forewing are more frequently contiguous with or

slightly overlapping the submarginal macules (usually not overlapping in Colorado) and a macule in cell Sc+R_1-Rs on the ventral hindwing is more persistent. Specimens from western Texas (Figs. 2a–d, g–j) have subapical macules resembling those in southern Arizona, but the dorsum is paler orange than seen in other populations of *S. morrisoni*, have more orange overscaling basad on the dorsal hindwing (making the postmedial orange band less distinctly defined), the dark areas on the venter have relatively prominent gray overscaling at the apex of the forewing and along the costal and outer margins of the hindwing, a white macule in Sc+R_1-Rs is nearly invariably present, the antennae have the most extensive white at the base of the club on the dorsum of any population of the species, and males have less black (occasionally none) associated with the stigma. Individuals from Guanajuato (Figs. 2k–l) and Durango resemble those from Colorado, but are larger (Table 1), have more extensive orange overscaling proximad on the dorsal hindwing, and are darker 'olive' at the apex of the ventral forewing and on the ventral hindwing. Finally, in the states of México, Tlaxcala, Guerrero and Oaxaca, the phenotype (as illustrated by Beutelspacher 1980) is not only small (about the same size as in Colorado), but very dark (Figs. 3a–l). The orange of these is deeper in color than on specimens from other populations of the species, there is little marginal overscaling, the subapical and submarginal macules on the forewing are much smaller, the subapical macules are usually slightly offset proximad from those in the submargin, the postmedial series of macules on the dorsal hindwing is narrow and well defined, the ground color at the apex of the ventral forewing and on the hindwing is very dark (even more so than on specimens from Guanajuato), the postmedial macules are very narrow, and a white macule is usually present in Sc+R_1-Rs, but is often minute and disjunct proximad from the macule in Rs-M_1. All populations have the prominent white streak, distinctive of *S. morrisoni*, in the discal cell of the ventral hindwing.

TABLE 1. Geographical variation of forewing lengths of *Stinga* as mean in mm (range, n).

taxon/location	male	female
Stinga morrisoni		
Colorado	13.2 (12.5–14.0, n = 20)	14.1 (12.9–15.2, n = 9)
northern Arizona	12.9 (11.9–14.1, n = 15)	13.9 (13.3–14.5, n = 7)
northern New Mexico	12.9 (11.9–13.9, n = 10)	-
southern Arizona	13.9 (12.3–15.3, n = 15)	15.2 (14.6–15.6, n = 8)
southern New Mexico	13.9 (12.8, 15.0, n = 2)	13.6 (13.6, 13.6, n = 2)
western Texas	14.4 (12.9–15.0, n = 14)	15.0 (14.2–16.3, n = 15)
MX: Nuevo León	13.8 (12.9–14.1, n = 3)	-
MX: Guanajuato	14.3 (14.0–15.2, n = 7)	-
MX: Durango	14.0 (n = 1)	14.9 (n = 1)
MX: México	13.0 (11.9–13.2, n = 11)	13.7 (13.0–14.9, n = 10)
MX: Tlaxcala	13.3 (13.0–13.9, n = 3)	-
Stinga kendamulaza		
MEXICO	13.7 (13.0–14.8, n = 17)	14.0 (13.4–15.1, n = 6)

Despite the considerable superficial variation seen across populations (the western Texan populations appearing considerably different from those at the higher elevations southward in Mexico), both male and female genitalia of *S. morrisoni*, although exhibiting some individual variation, are constant from Colorado through Mexico (Figs. 5a–c, 6a–c). In addition, throughout its known distribution, *S. morrisoni* is vernal (but see below).

Phenology. *Stinga morrisoni* flies in early spring (largely in March and April, but as early as late January and February in southern Mexico) in much of its distribution. Northern populations (Colorado, northern New Mexico and Arizona), however, occur later in spring, mostly in May and June. Scott (1986) reported the species in September in western Texas (also see Opler 1999); we have examined no specimens to corroborate

this. Regardless, *S. morrisoni* appears to be strictly univoltine throughout essentially all of its known range, and its early-spring flight makes it one of the earliest-flying hesperiines in most of the habitats it occupies (ADW, pers. obs.). Adult flight times are frequently centered during local dry periods with long sunny days, especially in Mexico, southern Arizona and western Texas (usually March).

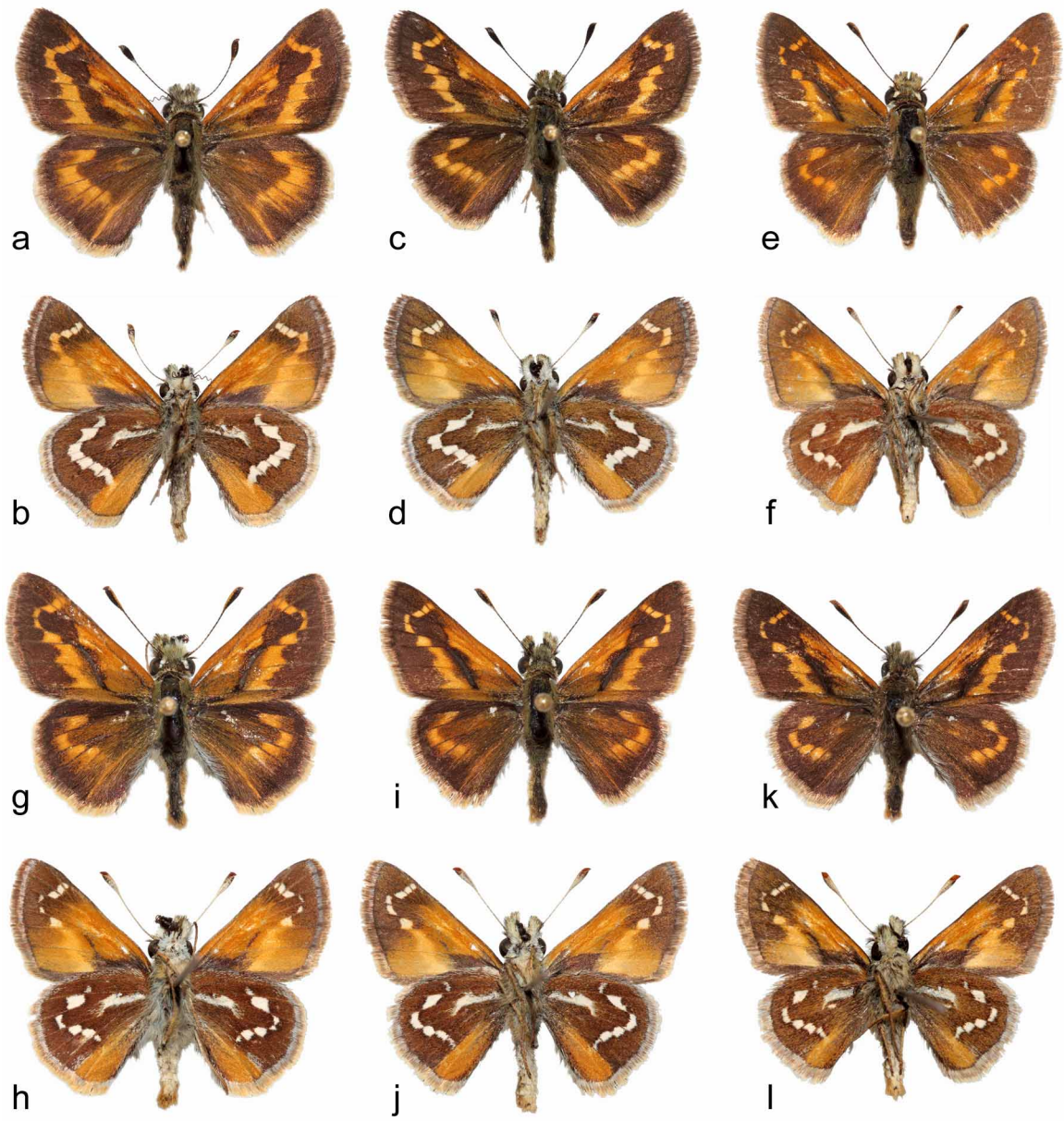

FIGURE 3. Adults of *Stinga morrisoni* from southern Mexico: **a**), **b**), **c**), **d**), females from MEXICO: MEXICO STATE: Mpio. Amecameca: S slope Iztaccíhuatl: grassy slopes above Paso de Cortés, 3400-3900m, 18-III-2000, Andrew D. Warren; **e**), **f**), male from MEXICO: TLAXCALA: Mpio. Tlaxco: 5-8 km N Tlaxco (Hwy. 119, km. 30), forest and hilltop, ca. 2800-3100', 19-III-2000, Andrew D. Warren; **g**), **h**), **i**), **j**), **k**), **l**), males from MEXICO: MEXICO STATE: Mpio. Amecameca: S slope Iztaccíhuatl: grassy slopes above Paso de Cortés, 3400-3900m, 18-III-2000, Andrew D. Warren.

Behavior and ecology. Adult males of all populations studied by the authors (see below) vigorously defend perches on hilltops, as well as perches along roadsides (western Texas) and in gullies (as well as on hilltops) above 3600m on the grassy lower slopes of Volcán Iztaccíhuatl in the state of México. Populations of *S. morrisoni* are associated with a range of grasses (Poaceae) from Colorado to Oaxaca, and are documented to use seven species as larval foodplants in Colorado (Scott 1992, 2006). Most populations of *S. morrisoni*

occur in forested (usually *Quercus* and/or *Pinus*) habitats with numerous sunny, grassy clearings, although an apparently very extensive population occurs above (and below, in lower density) tree-line on the grassy slopes of several of southern Mexico's volcanic peaks, including Volcán Iztaccíhuatl, Volcán Popocatépetl, and Volcán Ajusco, to at least 3900m (but apparently absent from Volcán Toluca), making it one of the few resident butterflies of these specialized grassland habitats (Luna-Reyes 2007; ADW, pers. obs.). Freshly eclosed males are very strongly attracted to damp ground under dry seasonal conditions (ADW, pers. obs.).

Specimens examined. MEXICO: **CHIHUAHUA**: 13.0 mi NE Rch. Gavilan, 10.7 mi SW Rch. Agua Salada, 30°11'N 108°24'W, 6400', 13-IV-1978, R. W. Holland (1 male: CSU); **CHIHUAHUA-SONORA**: Mex. Hwy. 2 at state line, San Luis Microwave relay, 6500', 2-IV-1985, R. W. Holland (1 male: CSU); **DISTRITO FEDERAL**: Ajusco, 6-III-1971, Hector González Almada (2 males: IBUNAM); Del. Magdalena Contreras: San Nicolás Totolapan, Magdalena Patlatlalco, 3000–3500m, 27-28-II-2009, Claudia Hernández-Mejía (8 males, 4 females: MZFC); same locality and dates, Marysol Trujano Ortega (14 males, 4 females: MZFC); San Nicolás Totolapan, Valle del Tezontle, 3500m, 1-III-2009, Claudia Hernández-Mejía (10 males: MZFC); same locality and dates, Marysol Trujano Ortega (22 males, 11 females: MZFC); Del. Milpa Alta: Bienes Comunales de Milpa Alta, Tzompoli, 3162–3358m, 13-15-II-2009, Claudia Hernández-Mejía (30 males, 5 females: MZFC); same locality and dates, Marysol Trujano Ortega (27 males, 6 females: MZFC); **DURANGO**: La Michilia: Piedra Herrada, 21-III-1984, Ma. E. Díaz Batres (1 female: MGCL); same locality and collector, 18-IV-1984 (1 male: MHNCM); La Michilia: Potrero, 23-III-1984, Ma. E. Díaz Batres (1 male: MGCL; 5 males, 1 female: MHNCM); same locality and collector, 3-III-1988 (1 female: MHNCM); **GUANAJUATO**: Mpio. Dolores Hidalgo: hilltop, ca. 5 km NE Santa Rosa on Hwy. 110, 2600m, 28-III-2001, Andrew D. Warren (1 male: ADW); Mpio. Dolores Hidalgo / Guanajuato: hilltop with watch tower, ca. 3 km NE Santa Rosa on N side of Hwy. 110, ca. 2700m, 28-III-2001, Andrew D. Warren (1 male: ADW): same locality and date, Tom W. Ortenburger (2 males: ADW); Mpio. Guanajuato: 3 hilltops, ca. 6 km SW Santa Rosa on Hwy. 110, ca. 2400m, 28-III-2001, Tom W. Ortenburger (1 male: ADW); Mpio. León / San Felipe: top of mesa, N side of Hwy. 87 (camino León-San Felipe), ca 8 km NE El Zauco (28 km NE León), 2600m, 29-III-2001, Andrew D. Warren (5 males: ADW); **GUERRERO:** Mpio. General Heliodoro Castillo: Cerro Teotepec, 3100m, 20-III-2009, Jean Cristian Blancas Hernández (1 male: MZFC); **MÉXICO**: Mpio. Amecameca: Popo[catépetl], 27-I-1952, Workman (1 male: IBUNAM); Mpio. Amecameca: S slope Iztaccíhuatl: grassy slopes above Paso de Cortés, 3400–3900m, 18-III-2000, Andrew D. Warren with MZFC crew (38 males, 18 females: ADW); **NUEVO LEÓN**: Hwy. 61, ca. 16 km SSE Jct. Hwy. 60, 2460m, 20-III-1977, R. O. & C. A. Kendall (3 males: TAMU); **OAXACA**: Mpio. Concepción Pápalo: camino a Cueva Cheve, N 17°51', W 68°48', 9000–9400', 19-III-2006, J. Kemner (8 males, 1 female: MZFC); same locality and collector, 5-IV-2006 (5 males, 3 females: MZFC); same locality and collector, 19-IV-2006 (3 males, 1 female: MZFC); **TLAXCALA**: Mpio. Tlaxco: 5–8 km N Tlaxco (Hwy. 119, km. 30), forest and hilltop, ca. 2800–3100', 19-III-2000, Andrew D. Warren (3 males: ADW); **USA**: **ARIZONA**: White Mts., 17-VI-1936, unkown collector (1 female: MGCL); White Mts., 9 mi S Alpine, 8100', 14-VI-1963, W. A. Hedges (2 males: SDNHM); **Apache Co.**: AZ 264 at Jct. to Sawmill, 7800', 11-V-1978, R. W. Holland (4 males: CSU); Forest Rd. 117, 3 mi S Hwy. 60, 21-V-1988, Pat Savage (4 males, 1 female: MGCL); Forest Rd. 117, 4 mi S Hwy. 60, 21-V-1988, Pat Savage (4 males, 2 females: MGCL); Forest Rd. 117, 4.5 mi S Hwy. 60, 18-V-1990, Pat Savage (2 females: MGCL); Hwy. 260, 7 mi W of Eagar, 21-V-1988, Pat Savage (1 male: MGCL); Roof Butte, 9700', Chuska Mts., 14-VI-1971, R. W. Holland (1 male: CSU); Springerville, FR 117, 1-VI-2000, Ray Thomas (1 female: MGCL); **Cochise Co.**: Huachuca Mts., Garden Canyon, 18-IV-1987, Doug Mullins (1 female: MGCL); same locality, 18-III-1999, Bruce A. O'Hara (2 males: MGCL); **Greenlee Co.**: 8 mi S Alpine, 7-VII-1964, W. A. Hedges (1 female, SDNHM); **Santa Cruz Co.**: Canelo Pass, 31-III-1988, Pat Savage (1 male, 1 female: MGCL); same locality and collector, 1-IV-1988 (3 males: MGCL); **COLORADO**: **Custer Co.**: Wet Mtn. Valley, nr. Rosita, 9000–9700', 24-VI-1973, Ray E. Stanford (1 male: ADW); **Douglas Co.**: Deckers, 23-V-1970, Ray E. Stanford (6 males: ADW; 4 males, 2 females: MGCL); nr. Deckers, 25-V-1965, Bart B. Brinkman (1 male: ADW); same locality, 18-V-1969, Ray E. Stanford (1 female: ADW; 7 males, 2 females: CSU); same locality and collector, 22-V-1969 (3 females: CSU; 9 males, 1 female: MGCL);

same locality and collector, 26-V-1975 (1 male: CSU); Hwy. 67 at Sugar Creek, 6900–7200', ca. 2 air miles E South Platte River, 11-V-2008, Andrew D. Warren (7 males: ADW); same locality and collector, 18-VI-2007 (1 male: ADW); hilltop N of Hwy. 67, ca 2 rd. mi. SSW Sprucewood, 7600', 18-VI-2007, Andrew D. Warren (2 males: ADW); **El Paso Co.**: Blodgett Peak Open Space, off Woodmen Rd., Colorado Springs, 7080', 12-VI-2009, Andrew D. Warren (1 male: ADW); Cheyenne Mtn., 19-V-1969, Ray E. Stanford (1 male: CSU); same locality and collector, 24-V-1969 (1 female: MGCL); Rock Creek, 8200', 12-VI-1932, unknown collector (1 female: MGCL); same locality, 20-VI-1933, unknown collector (1 female: MGCL); Rock Creek Canyon, 3-V-1992, Andrew D. Warren (1 male, 1 female: ADW); Telephone Line Rd., US Air Force Base, 22-V-1964, J. Justice (1 female: MGCL); USAFA, N tributary W Monument Lake, 7050', 5-VI-1995, unknown collector (1 male: CSU); US Air Force Academy, Pine Dr. at International Dr., 27-VI-1995, S. Simonsen & P. Pineda (3 males: CSU); US Air Force Academy, S of filtration plant, 28-VI-1995, S. Simonsen & P. Pineda (1 male, 1 female: CSU); **Fremont Co.**: hilltops 1.5 mi S of mouth of Bear Cr., 15-VI-1969, J. Scott (1 male: MGCL); wooded hilltop, 1 mi NE Swissvale, 20-VI-1966, J. Scott (1 male: MGCL); 1 mi up Bear Ck., 9-VI-1970, J. Scott (3 males, SDNHM); same locality, 19-VI-1970, J. Scott (2 females: MGCL); **Gilpin Co.**: N Clear Ck., 7000–7500', 18-VI-1978, Ray E. Stanford (1 female: ADW); **Jefferson Co.**: Golden Gate State Park, 22-V-1982, C. P. Slater (1 male: CSU); Mt. Lindo, ca. 1 air mi E Tinytown, 29-V-1989 (1 male: ADW); same locality and collector, 4-VI-1997 (1 male: ADW); Mt. Lindo nr. Tinytown, 5-V-1997, B. B. Brinkman (1 male, ADW); Pine Valley Ranch, ponderosa woodland, S facing slope, 17-V-1994, S. Simonsen (1 female: CSU); Ralston Creek, 8200–8400', 24-V-1975, Ray E. Stanford (1 female: CSU); Ralston Creek, 8000', 4-VI-1988, C. P. Slater (1 male: CSU); 0.5 mi. E of Tinytown, 27-V-1991, Andrew D. Warren (1 male: ADW); **Larimer Co.**: Buckhorn Cyn., 20-VI-1997, Paul A. Opler (1 female: CSU); Horsetooth Mt. Park, 14-VI-1988, Paul A. Opler (2 males: CSU); Moody Hill Rd., Roosevelt NF, 13-VI-1995, Paul A. Opler (1 male: CSU); **Park Co.**: Bailey, 17-VI-1962, Charles P. Slater (1 male: MGCL); same locality, 27-VI-1968, Ray E. Stanford (1 male: CSU); **Teller Co.**: Crystola Creek, 8000–9000', 9-VI-1973, Ray E. Stanford (2 males: CSU); hill, 0.5 mi SW Crystola, 26-V-1993, Andrew D. Warren (15 males, 1 female: ADW); 1 mi NW Crystola, 8700', 9-VI-1973, Ray E. Stanford (2 males: MGCL); **NEW MEXICO**: **Catron Co.**: cattle tank W of Coyote Peak, 7500', Sec 34 T75 R14W, 28-V-1994, R. W. Holland (1 male: CSU); Gallo Mts., Fox Mt. Lookout, 9200', 29-V-1994, R. W. Holland (1 male: CSU); Gallo Mts., 1 mi SW Fox Mt. Lookout, 8500', 27-VI-1994, R. W. Holland (1 female: CSU); Gallo/ Mangas Mts., Escondido Mt., SE slope, Cyn. de Lolo, 8500', 22-V-1974, R. W. Holland (1 male: CSU); Gallo/ Mangas Mts., N slope, mesa E of Cyn. de Lolo, 8500', 24-VI-1995, R. W. Holland (1 male: CSU); SW end of USFS 106, N of Big Pine Cyn., 5000', Sec17, T12S R21W, 1-IV-1995, R. W. Holland (1 male: CSU); **Chaves Co.**: Guadalupe Mts. Rim Rd., 1 mi N Otero Co. line, 7000', 4-V-1987, R. W. Holland (2 males: CSU); Sacramento Mts., SE Slope, Mule Cyn., 2 mi S US 82, 6500', Sec30, T16S R17E, 17-IV-1994, R. W. Holland (3 males, 1 female: CSU); **Cibola Co.**: Mt. Taylor, Coalmine Cyn. CG, 7400', 7-V-1967, R. W. Holland (1 male, 1 female: CSU); Mt. Taylor, El Dado Cyn., 8100', 22-V-1966, R. W. Holland (1 female: CSU); Mt. Taylor, Elk Tank, 8800', 7-V-1966, R. W. Holland (7 males: CSU); same locality and collector, 14-V-1966 (13 males: CSU); same locality and collector, 15-V-1966 (4 males: CSU); same locality and collector, 14-VI-1966 (1 female: CSU); Mt. Taylor, San Mateo Lake, 7300', 13-V-1967, R. W. Holland (2 females: CSU); Mt. Taylor, Twin Spring, 9300', 15-V-1966, R. W. Holland (2 males: CSU); same locality and collector, 14-VI-1966 (1 female: CSU); Zuni Mts., Mt. Sedgewick, 9200', 14-V-1976, R. W. Holland (1 male: CSU); same locality and collector, 21-V-1976 (2 males: CSU); Zuni Mts., NE slope, Pole Cyn., 8000', 14-V-1976, R. W. Holland (3 males: CSU); same locality and collector, 21-V-1994 (1 male: CSU); Zuni Mts., NE slope, Pole Cyn., quarry, 7000', 14-V-1976, R. W. Holland (1 male: CSU); Zuni Mts., Zuni Cyn., 2 mi inside NF, 7000', 5-V-1977, R. W. Holland (1 male: CSU); Zuni Mts., Zuni Cyn., Cerro Colorado, 8200', 1-V-1976, R. W. Holland (1 male: CSU); Zuni Mts., Zuni Cyn., logging chute at 7300', 15-V-1977, R. W. Holland (1 male: CSU); **Eddy Co.**: Pickett Hill, 6441', Rd. 523, 1 mi NW Rd. 137, Lincoln NF, 24-III-1986, Ray E. Stanford (1 male: ADW); W slope Guadalupe Mts., Devils Den Spr., 27-III-1986, R. W. Holland (1 male: CSU); **Grant Co.**: NM 90, 11 mi E of 61, Devil's Backbone 6800', 15-IV-1966, R. W. Holland (1 male: CSU); W slope Black Range, 9 mi up FS

152 (McKnight Rd.), 9-IV-1989, R. W. Holland (1 male: CSU); **Lincoln Co.**: Capitan Mts., Capitan Gap, 7800', 12-IV-1981, R. W. Holland (1 male: CSU); Capitan Mts., Capitan Mt., Peppin Cyn., 7000', 11-IV-1981, R. W. Holland (1 male: CSU); crest of Capitan Mts., W of gap, 1 mi W of Sawmill Tank, 8600', 22-VI-1997, R. W. Holland (1 male: CSU); Sacramento Mts., Nogal Cyn., 7500', 5-V-1974, R. W. Holland (1 male, 1 female: CSU); Sierra Blanca, 11,000', 15-VI-1975, R. W. Holland (1 male: CSU); **McKinley Co.**: Chuska Mts., Chuska Peak, 8700', 18-VI-1978, R. W. Holland (2 males: CSU); Chuska Mts., Tohatchi Pk., 8300', 22-V-1978, R. W. Holland (1 male: CSU); same locality and collector, 4-VI-1978, R. W. Holland (1 male: CSU); Chuska Mts., 1 mi. below Tohatchi Pk., 18-VI-1978, R. W. Holland (1 female: CSU); **Otero Co.**: Glencoe, 5600', 10-V-1974, R. W. Holland (2 females: CSU); Guadalupe Mts., Rim Rd. (FS 67), 5 mi N Panama, 6000', 2-V-1987, R. W. Holland (1 male: CSU); Guadalupe Mts., 6 mi WNW of Powers Tank, Wildhorse Hill 6000', 24-III-1986, R. W. Holland (1 female: CSU); Sacramento Mts., 6800', Jct. NM 130 & 24, 22-IV-1973, R. W. Holland (1 male: CSU); Sacramento Mts., Sacramento Cyn., 5400', 22-IV-1973, R. W. Holland (2 males: CSU); Sacramento Mts., Sacramento Cyn., Fleming Ranch, 5200', 19-IV-1975, R. W. Holland (2 males, 1 female: CSU); **Rio Arriba Co.**: NE slope Jemez Mts., Polvadera Cr., Sec 17, 8000', 26-V-1984, R. W. Holland (1 male: CSU); N slope Jemez Mts., Cerro Pelon, 10,000', 19-VI-1983, R. W. Holland (1 male: CSU); **Sandoval Co.**: Jemez Mts., Jemez Spgs., 25-VI-1914, J. Woodgate (1 male, 1 female: MGCL); SW corner Jemez Mts., Pajarito Peak, 9000', 19-V-1984, R. W. Holland (1 male: CSU); same locality and collector, 4-VI-1983 (2 males: CSU); same locality and collector, 26-VI-1983 (1 male: CSU); **San Juan Co.**: Chuska Mts., summit N of Washington Pass, 8200', 17-VI-1978, R. W. Holland (6 males: CSU); **San Miguel Co.**: Gallinas Ck., 7000', 9-V-1973, Ray E. Stanford (1 male: ADW); **Sierra Co.**: crest of Black Range, 7500', 1 mi NW Monument Park Cabin, 30-IV-1988, R. W. Holland (1 female: CSU); NW slope Black Range, 1.5 mi W Continental Divide, FS 226, Seventyfour Draw, 12-VI-1988, R. W. Holland (1 male: CSU); **Socorro Co.**: Magdalena Mts., 7500', 6-IV-1969, R. W. Holland (2 males: CSU); Magdalena Mts., Cyn. W of Pound Ranch, 7000', 3-V-1970, R. W. Holland (5 females: CSU); Magdalena Mts., Jordan Cyn., 7400', 9-V-1970, R. W. Holland (1 male: CSU); Magdalena Mts., North Baldy, 9600', 13-VI-1970, R. W. Holland (1 male: CSU); Magdalena Mts., North Cyn., 7500', 2-V-1970, R. W. Holland (3 males, 3 females: CSU); Magdalena Mts., Ryan Mill Cyn., 6000', 10-V-1970, R. W. Holland (5 males, 1 female: CSU); Magdalena Mts., Water Cyn. CG, 7100', 9-V-1970, R. W. Holland (7 males, 2 females: CSU); San Mateo Mts., Beartrap CG, 8000', 4-V-1974, R. W. Holland (2 females: CSU); San Mateo Mts., Big Pidgeon Cyn., 8000', 10-VI-1972, R. W. Holland (1 male: CSU); San Mateo Mts., Monica Cyn., 6500', 2-V-1971, R. W. Holland (1 male, 1 female: CSU); same locality and collector, 4-V-1974, R. W. Holland (1 male, 3 females: CSU); same locality and collector, 20-V-1973 (1 female: CSU); same locality and collector, 4-VI-1973 (1 male: CSU); San Mateo Mts., Nogal Cyn., 6000', 28-III-1971, R. W. Holland (4 males: CSU); San Mateo Mts., Nogal Cyn., Weir Tank, 6500', 5-IV-1971, R. W. Holland (1 female: CSU); same locality and collector, 10-IV-1971 (1 female: CSU); San Mateo Mts., Rock Spr. Cyn., 7000', 20-III-1971, R. W. Holland (1 male, 1 female: CSU); same locality and collector, 28-III-1971 (2 males, 4 females: CSU): same locality and collector, 5-IV-1971 (4 males, 4 females: CSU); San Mateo Mts., 12 mi E Dusty, 7500', 11-IV-1971, R. W. Holland (1 male: CSU); **TEXAS**: **Culberson Co.**: Guadalupe Mts. NP, Guadalupe Mts., Bowl, 8000', 26-III-1986, R. W. Holland (2 males, 1 female: CSU); Guadalupe Mts. NP, Guadalupe Mts., Bush Mt., 8000', 11-IV-1987, R. W. Holland (1 male: CSU); **Jeff Davis Co.**: Davis Mts., Hwy 166, 9.3 mi SW Hwy 118, 7-IV-1982, unknown collector (1 male, 2 females, SDMNH); Fort Davis State Park, 3-IV-1988, Paul A. Opler (1 male: CSU); Hwy. 118, vic. McDonald Observatory, 31-III-1971, R. O. & C. A. Kendall (10 males, 26 females: TAMU; 2 females: ADW); same locality, on roadside *Astragalus* flowers, 24-III-1998, Andrew D. Warren (38 males, 45 females: ADW); L. E. Wood Picnic Area, 5800', 15-IV-2005, June & Floyd Preston (1 female: MGCL); McDonald Observatory, 6800', 15-IV-1994, R. W. Holland (7 males, 2 females: CSU); Mt. Locke, 26-IV-1981 (1 male: MGCL); 4.5 mi NW McDonald Observatory, Davis Mts., 5000', 19-III-1995, R. W. Holland (1 male: CSU); 24.7 mi S of Kent, along TX 118, 6200', 24-IV-2003, June and Floyd Preston (1 female: MGCL).

***Stinga kendamulaza* A. Warren & Austin, new species**
(Figs. 4a–l, 5d, 6d)

Description. Male (Figs. 4e–l) - mean forewing length = 13.7 mm (13.0–14.8 mm, n=15, from type series); forewing apex pointed, termen slightly convex; hindwing termen convex, then slightly concave before weakly developed tornal lobe; forewing with gray stigma narrowly outlined with black in CuA_1-CuA_2, extending from along posterior vein of discal cell proximad of origin of CuA_1, extending nearly to vein CuA_2 at about 1/4 distance to termen from its origin and in CuA_2-2A from vein CuA_2 about 1/4 distance from its origin to termen extending slightly curved (excavate proximad) almost to vein 2A just proximad of its middle; dorsum tawny-orange marked with black; forewing tawny most intense proximad of stigma extending cephalad through discal cell nearly to costa; costa thinly black, this broadening distad; apex and outer margin black to tornus; pale yellow-tawny subquadrate subapical macules in R_3-R_4, R_4-R_5, and R_5-M_1, narrowly outlined with dark tawny-orange; tawny bar-like submarginal macules outlined with dark tawny-orange in M_1-M_2 and M_2-M_3, offset distad from subapical macules by about twice their width and by about their width from tawny-orange postmedial macules (distad of stigma), that in M_3-CuA_1 triangular in base of cell, in CuA_1-CuA_2 more or less trapezoidal, and in CuA_2-2A subquadrate with ragged distal margin, all three with cephalic and caudal edges extending along veins into dark margin; scattered black scales within tawny on basal 1/8 of wing and in entire anal cell; black scaling associated with stigma variable from that restricted to along the vein of the discal cell to more extensive, especially distad; fringe gray. Hindwing tawny-orange broadly in postmedian from M_1 to 2A, orange extending proximad along vein 2A 1/2 distance to its origin, marginal area black, more or less as chevrons in each cell with orange extending from postmedian along veins distad but not reaching termen; remainder of wing heavily overscaled with black, sparsest in discal cell and in postmedian of Rs-M_1 and sometimes Sc+R_1-Rs vaguely extending the postmedial band cephalad; distal edge of darkened basal area conspicuously squared; fringe gray except mixed pale orange and gray caudad of vein CuA_2.

Ventral forewing largely deep tawny-orange, paler ventrad of dorsal macules in M_3-CuA_1, CuA_1-CuA_2, and CuA_2-2A; subapical and submarginal macules repeated from dorsum, ochreous; costa thinly brown expanding distad to brown subapical patch enclosing subapical and submarginal macules and continued along outer margin almost to vein CuA_1; distal portion of apical brown area overscaled with pale ochreous giving an olive aspect, densest proximad of black terminal line; base of wing largely black extending furthest distad in CuA_2-2A; a few black scales ventrad of stigma. Ventral hindwing largely brown cephalad of middle of CuA_2-2A, overscaled heavily with pale ochreous appearing olive or olivaceous orange, this densest in marginal area, least dense adjacent to postmedial series of shining white connected macules extending from Sc+R_1 to mid-cell CuA_2-2A; macule in Sc+R_1-Rs subquadrate with distal edge concave and proximal edge convex, proximal edge at about mid-cell, completely overlapping macule near base of Rs-M_1, junction extended both distad and proximad as white on vein Rs, macule somewhat comma-shaped, decreasing in width to almost a point at vein M_1, connected with proximal corner of macule in mid-cell M_1-M_3, that macule irregularly-shaped, produced distad in its middle, connected with distal edge of macule in mid-cell M_3-CuA_1, this aligned with macules of similar width in CuA_1-CuA_2 and anterior portion of CuA_2-2A, latter extended as thin line distad and proximad from its caudal edge; small and irregular whitish macule at base of discal cell; posterior portion of CuA_2-2A and entire 2A-3A and anal cell ochreous, latter overscaled heavily with black in proximal half.

Dorsal head red-brown, white dot dorsad of eye; palpi mixture of red-brown, gray, and black scales on dorsum, white with a few black scales laterad, white ventrad; antenna black on dorsum, rarely with a few white scales at base of club, sides whitish, vaguely darker at segments, venter white with vague red-brown at segments, venter of club yellow-orange, nudum pale red-brown, distal segment dark red-brown or brown, 10 (n=9) or 11 (n=2) segments; thorax red-brown and abdomen dark gray-brown with ochreous setiform scales cephalad on dorsum, ventral thorax whitish with red-brown tinge, pectus whitish, legs ochreous; ventral abdomen whitish mixed with pale red-brown scales.

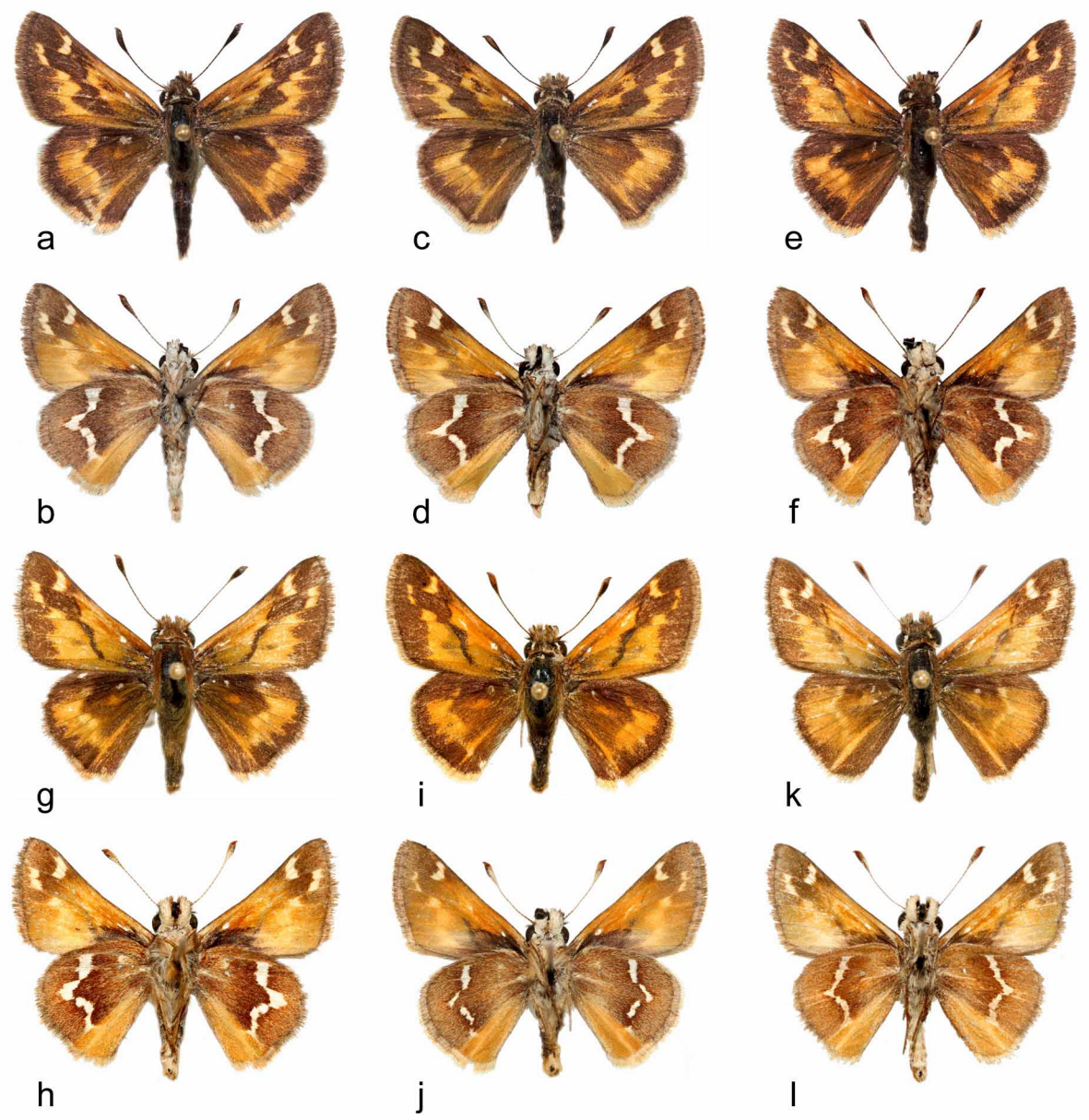

FIGURE 4. Adults of *Stinga kendamulaza* from southern Mexico: **a**), **b**), allotype female; **c**), **d**), paratype female; **e**), **f**), holotype male; **g**), **h**), **i**), **j**), **k**), **l**), paratype males from MEXICO: TLAXCALA: Mpio. Tlaxco: hilltop, ca. 2800m, WSW of Tecomalucan, W of Atotonilco, 20-III-2000, Andrew D. Warren.

Genitalia (Fig. 5d) - uncus thin in lateral view, narrowing to slightly hooked caudal end, broad in dorsal view, narrowing and dividing into thin parallel and closely spaced arms; gnathos broad cephalad in lateral view, narrowing caudad where slightly curved upward and approximating caudal end of uncus, about width of uncus in ventral view, divided with thin arms converging caudad; tegumen narrow in lateral view, sides parallel in dorsal view, cephalic end notched centrally and flaring to its ventral arms that twist and combine with dorsal arm of saccus, the combined structure prominently curved (lateral view) and bowing outward (in cephalic view); anterior arm of saccus short, slightly curved upward (lateral view), moderately broad in ventral view and narrowing to blunt cephalic end; valva moderately broad, broadest cephalad, harpe blunt with rounded dorsal lobe, costa-ampulla variably undulate on dorsal edge, ampulla lobed caudad slightly overlapping outer edge of dorsal lobe of harpe, these lobes of about same height, sacculus broad; aedeagus stout, slightly (1.2–1.3 times) longer than valva, ventral edge of caudal end exceeding dorsal edge, tapering to point, right side with lobate titillator extending laterad and caudad**,** titillator on left side bar-like, expanding

slightly and toothed caudad, bent cephalad into aedeagus when not extruded, extending caudad when extruded; vesica with two thorn-like cornuti and elongate densely spinate scouring pad-like cornutus; juxta more or less triangular in caudal view.

Female (Figs. 4a–d) - mean forewing length = 14.0 mm (13.4–15.1, n=6, from type series); forewing apex pointed, termen convex; hindwing termen convex, then slightly concave before weakly developed tornal lobe; dorsum tawny-orange marked with black; forewing tawny most intense proximad of mid-wing extending cephalad through discal cell nearly to costa; costa thinly black, this broadening distad; apex and outer margin black to tornus; pale yellow-tawny subquadrate subapical macules in R_3-R_4, R_4-R_5, and R_5-M_1, narrowly outlined with dark tawny-orange; tawny bar-like submarginal macules outlined with dark tawny-orange in M_1-M_2 and M_2-M_3, offset distad from subapical macules by about twice their width and by about their width from tawny-orange postmedial macules, that in M_3-CuA_1 quadrate near base of cell, in CuA_1-CuA_2 with distal edge concave and proximal edge convex, and in CuA_2-2A subquadrate, all three with cephalic and caudal edges extending along veins into dark margin; scattered black scales within tawny on basal 1/8 to 1/4 of wing and in entire anal cell; black macules dividing base of wing from postmedial macules (in position of male's stigma) variable but as broad as or broader than postmedial macules; fringe entirely gray except caudad of CuA_2 where pale gray distad. Hindwing tawny-orange broadly in postmedian from Rs to 2A, orange extending proximad along vein 2A 1/3 to 1/2 distance to its origin, marginal area black, more or less as chevrons in each cell with orange extending from postmedian along veins distad but not reaching termen; remainder of wing heavily overscaled with black, sparsest in discal cell and in postmedian of Rs-M_1 and sometimes Sc+R_1-Rs vaguely extending the postmedial band cephalad; distal edge of darkened basal area conspicuously squared; fringe gray proximad, pale gray distad except pale orange caudad of vein CuA_2.

Ventral forewing largely deep tawny-orange, paler ventrad of dorsal macules in M_3-CuA_1, CuA_1-CuA_2, and CuA_2-2A; subapical and submarginal macules repeated from dorsum, pale ochreous; costa thinly brown expanding distad to brown subapical patch enclosing subapical and submarginal macules and continued along outer margin almost to vein CuA_1; distal portion of apical brown area overscaled with pale ochreous giving an olive aspect, densest proximad of black terminal line; base of wing largely black extending furthest distad in CuA_2-2A. Ventral hindwing largely brown cephalad of middle of CuA_2-2A, overscaled heavily with pale ochreous appearing olive or olivaceous orange, this densest in marginal area, least dense adjacent to postmedial series of shining white connected macules extending from Sc+R_1 to mid-cell CuA_2-2A; macule in Sc+R_1-Rs subquadrate, sometimes with distal edge concave and proximal edge convex, proximal edge at about mid-cell, completely overlapping macule near base of Rs-M_1, junction extended both distad and proximad as white on vein Rs, macule narrowing caudad on occasion and somewhat comma-shaped, decreasing in width to almost a point at vein M_1, connected with proximal corner of macule in mid-cell M_1-M_3, that macule irregularly-shaped, produced distad in its middle, connected with distal edge of macule in mid-cell M_3-CuA_1, this aligned or forming slightly curved series with macules of similar width in CuA_1-CuA_2 and anterior portion of CuA_2-2A, latter extended as thin line distad and proximad from its caudal edge; small and irregular whitish macule at base of discal cell; posterior portion of CuA_2-2A and entire 2A-3A, and anal cell tawny-orange, latter often overscaled heavily with black in proximal half.

Dorsal head red-brown, white dot dorsad of eye; palpi mixture of red-brown, gray, and black scales on dorsum, white with a few black scales laterad, white ventrad; antenna black on dorsum, rarely with a few white scales at base of club, sides whitish, vaguely darker at segments, venter white with vague red-brown at segments, venter of club yellow-orange, nudum pale red-brown, distal segment dark red-brown or brown, 10 (n=2) segments; thorax red-brown and abdomen dark gray-brown with ochreous setiform scales cephalad on dorsum, ventral thorax whitish with red-brown tinge, pectus whitish, legs ochreous; ventral abdomen whitish.

Genitalia (Fig. 6d) - lamella postvaginalis largely membranous laterad, caudal edge with broad heavily sclerotized and somewhat lunate central area (caudal margin shallowly excavate) possessing dense elongate setae, variably sclerotized and prominently arched cephalad of this towards ostium bursae; eighth tergite with

sharply pointed anterior apophysis branched to prominent lobe curving ventrad on either side of caudal portion of antrum; antrum broad, membranous, weakly folded longitudinally, with variably developed ventrocephalic 'dewlap', remainder of ductus bursae becoming broader and curving dorsad and cephalad, moderately sclerotized with prominent longitudinal and transverse grooves; ductus bursae conjoined ventrocaudally with membranous and globular corpus bursae, about as long as wide.

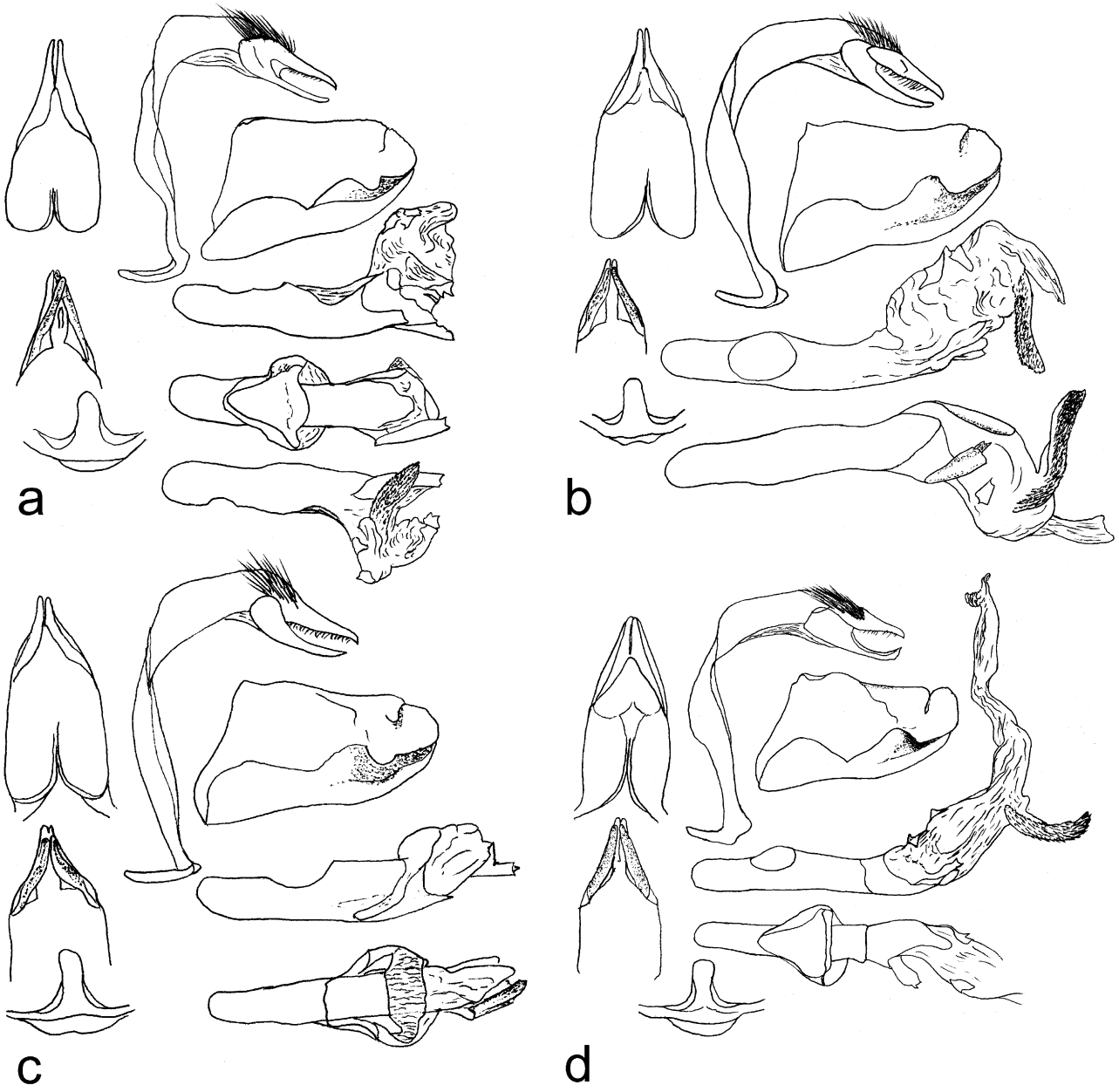

FIGURE 5. Male genitalia of *Stinga* species, showing the uncus, gnathos and tegumen in dorsal view, uncus and gnathos in ventral view, ventral view of the saccus, left lateral view of uncus, gnathos, tegumen and saccus, left lateral view of right valva, left lateral view of aedeagus, and ventral view of aedeagus (also including right lateral view of aedeagus in a). **a**), *Stinga morrisoni*, with vesica partly everted, from USA: COLORADO: Jefferson Co.: 0.5 mi. E of Tinytown, 27-V-1991, Andrew D. Warren, ADW genitalia vial #00-112; **b**), *Stinga morrisoni*, with vesica fully everted, from USA: TEXAS: Jeff Davis Co.: Mt. Locke, 26-IV-1981 ADW #08-30; **c**), *Stinga morrisoni*, without vesica everted, from MEXICO: MEXICO STATE: Mpio. Amecameca: S slope Iztaccíhuatl: grassy slopes above Paso de Cortés, 3400–3900m, 18-III-2000, Andrew D. Warren; **d**), *Stinga kendamulaza*, paratype with vesica fully everted, from MEXICO: TLAXCALA: Mpio. Tlaxco: hilltop, ca. 2800m, WSW of Tecomalucan, W of Atotonilco, 20-III-2000, Andrew D. Warren.

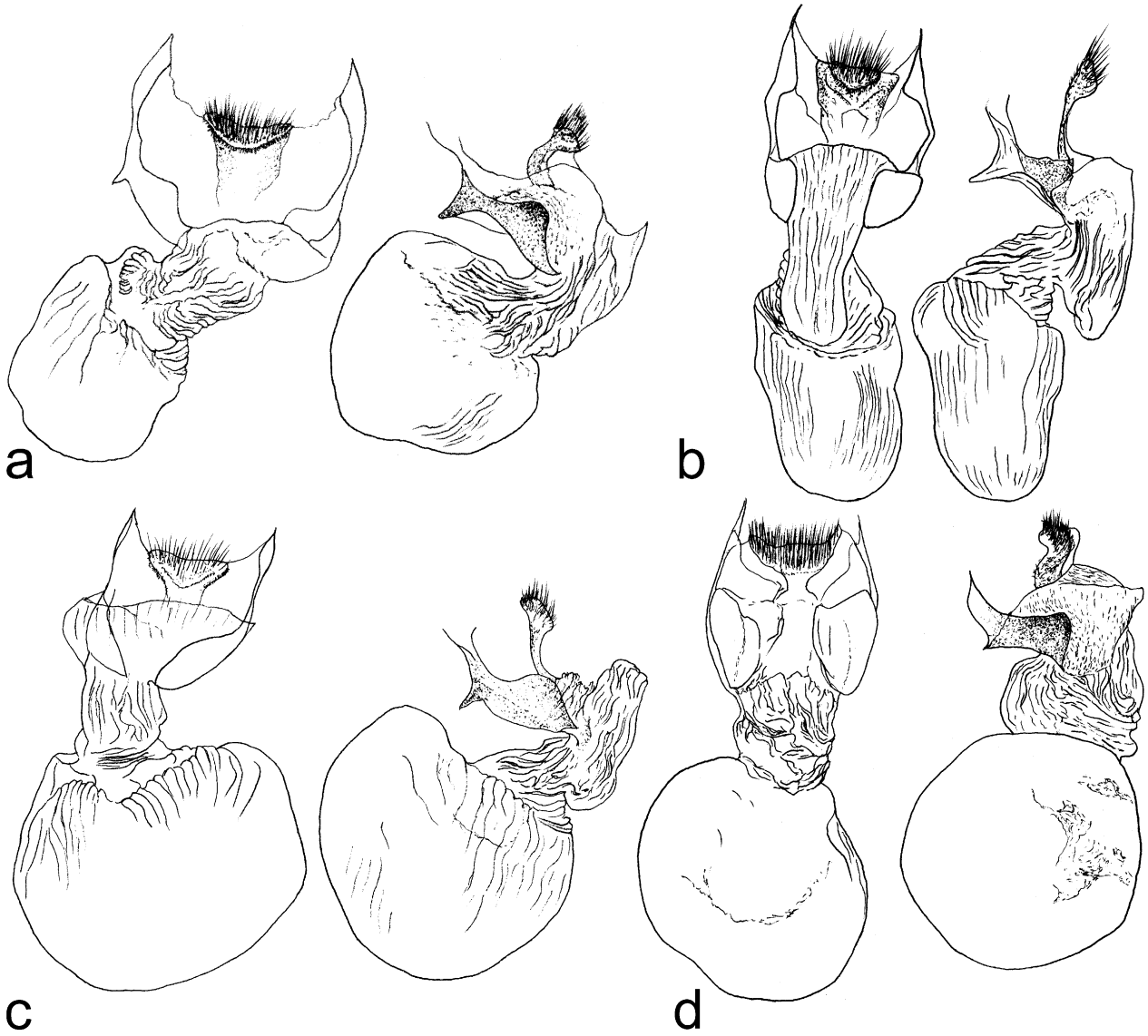

FIGURE 6. Female genitalia of *Stinga* species, showing the eighth abdominal tergite, lamella postvaginalis, antrum, ductus bursae and corpus bursae in ventral and left lateral views. **a**), *Stinga morrisoni*, from USA: COLORADO: El Paso Co.: Rock Creek, 8200', 20-VI-1933, SRS #3205; **b**), *Stinga morrisoni*, from USA: TEXAS: Jeff Davis Co.: Hwy. 118, vic. McDonald Observatory, 24-III-1998, Andrew D. Warren, GTA vial #14073; **c**), *Stinga morrisoni*, from MEXICO: MEXICO STATE: Mpio. Amecameca: S slope Iztaccíhuatl: grassy slopes above Paso de Cortés, 3400–3900m, 18-III-2000, Andrew D. Warren; **d**), *Stinga kendamulaza* paratype from MEXICO: TLAXCALA: Mpio. Tlaxco: hilltop, ca. 2800m, WSW of Tecomalucan, W of Atotonilco, 20-III-2000, Andrew D. Warren.

Types. Holotype male - **MEXICO: TLAXCALA**: Mpio. Tlaxco: hilltop, ca. 2800m, WSW of Tecomalucan, W of Atotonilco, 20-III-2000, Andrew D. Warren, to which is attached a red, printed label - / HOLOTYPE / *Stinga kendamulaza* / A. Warren & Austin /. Allotype female - same locality, date, and collector as holotype. Paratypes: same locality and date as holotype, collected by Andrew D. Warren, Jose Luis Salinas-Gutierrez, Olivia Yañez Ordoñez, Marysol Trujano Ortega and Ismael Alejandro Inojosa-Díaz (46 males, 6 females); **MEXICO: TLAXCALA**: Mpio. Tlaxco: Hwy. 119, ca. 5 km N Tlaxco, near state line, 31-III-1977, R. O. & C. A. Kendall (1 male); **MEXICO: TLAXCALA**: Mpio. Tlaxco: 5-8 km N Tlaxco (Hwy. 119, km. 30), forest and hilltop, ca. 3100', 19-III-2000, A. D. Warren (1 male); **MEXICO: TLAXCALA**: Mpio. Tlaxco: hill SE side Xalostoc, 2800m, 20-II-2009, Andrew D. Warren (15 males, 1 female); same locality, 1-III-2009, Andrew D. Warren (17 males, 3 females); **MEXICO: PUEBLA**:

Xalapazco [Xalapaxco], 9-III-1977, Roberto G. de la Maza Elvira (5 males, 2 females); **MEXICO: OAXACA**: Sierra Madre del Sur: Rte. 175, Zapotitlán, 2800m, 26-III-1986, Doug Mullins (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, Mexico City. Additional paratypes are distributed among the MAZA, MGCL, TAMU, and other collections.

Type locality. MEXICO: TLAXCALA: Mpio. Tlaxco: hilltop, ca. 2800m, WSW of Tecomalucan, W of Atotonilco. The hill where much of the type series was collected is located just WSW of Tecomalucan and W of Atotonilco, and is surrounded by agricultural fields (mostly corn), which extended only onto the lower slopes of the hill in 2000. Native vegetation remained only on the top third of this hill in 2000, at about 2800m, including various *Quercus* (Fagaceae) and several species of grasses. By 2009, the corn fields had expanded to occupy most of the top of the hill, further reducing areas of native vegetation. While *S. kendamulaza* was not found at the type locality in 2009, it was found on a similar hill at the southeast side of the town of Xalostoc, just a few kilometers to the west, indicating that the species is probably widespread in the Municipality of Tlaxco.

Etymology. The name for this species is a combination of the names of Roy Kendall, Doug Mullins, and Roberto G. de la Maza Elvira, who independently discovered this species and made their specimens available for study.

Distribution and phenology. *Stinga kendamulaza* appears to be endemic to seasonally dry regions of southern Mexico, at least from northern Tlaxcala and western Puebla, to the south end of the Oaxaca Valley, where it meets the Sierra Madre del Sur. Much of the region between northern Tlaxcala-western Puebla, and the Valley of Oaxaca comprises the Cuicatlan-Teotihuacan Biosphere Preserve, and remains poorly surveyed for spring-flying butterflies. Thus, the actual range of *S. kendamulaza* in southern Mexico remains to be elucidated. As with *Stinga morrisoni*, *S. kendamulaza* appears to be univoltine in spring; the entire type series was collected between February 20 and March 31. All known localities for *S. kendamulaza* are situated between about 2800 and 3100m elevation, in partly forested (*Quercus-Juniperus* or *Quercus-Pinus*) habitats with numerous grassy openings.

Stinga kendamulaza and *S. morrisoni* occur in exact sympatry and synchrony at least in northern Tlaxcala. On 19 March 2000, the senior author found one male of *S. kendamulaza* flying on a hilltop at 3100m (ca. 5-8 km N Tlaxco, W of Hwy. 119, km. 30), where three males of *S. morrisoni* were also encountered; in flight the two species were not separable. In this region, *S. morrisoni* can be abundant at higher elevations (*e.g.*, Iztaccihuatl, 3400–3900m, México State, Del. Milpa Alta, Distrito Federal), but was not found at 2800m, below the local pine forests, at the type locality of *S. kendamulaza*.

Behavior and ecology. Males of *S. kendamulaza* vigorously defend perches on hilltops, which may include tips of vegetation or bare ground (including rocks) on these hilltops, at least from 10:30 to 15:30 hrs. Males also guard grassy openings on hillsides and ridgelines, below hilltops. Adults of both sexes were observed to visit flowers of a pink *Salvia* L. (Lamiaceae) at the type locality in 2000, and females were encountered only at those flowers. Adults of *S. kendamulaza* at the type locality were flying with other hesperiines, including *Paratrytone pilza* Evans, 1955, which were about twice as abundant as *Stinga*, and the scarcer *Atalopedes campestris huron* (W. H. Edwards, 1863). One or more of the several grasses (Poaceae) present at sites with *S. kendamulaza* are the suspected larval foodplants, but no oviposition events have yet been witnessed and immature stages remain unknown.

Diagnosis. *Stinga kendamulaza* is immediately distinguished from *S. morrisoni* by its ventral hindwing where the pale markings consist of a narrow white line strongly produced distad in its middle. These markings on *S. morrisoni* appear as a more curvate series of offset macules. Additionally, the white in the discal cell of the ventral hindwing is represented by an indistinct whitish macule proximad in strong contrast with the broad and prominent white bar extending the full length of the discal cell on all *S. morrisoni*. *Stinga kendamulaza* also notably differs from *S. morrisoni* by having the distal margin of the basal black area on dorsal hindwing wedge-shaped (irregularly shaped on *S. morrisoni*), having the subapical macules of the forewing broadly offset proximad from the submarginal macules (conjoined or at most narrowly separated on *S. morrisoni*), and

the orange of the postmedian on the hindwing blends into the marginal area (more sharply defined on *S. morrisoni*).

Male genitalia of *S. kendamulaza* differ from those of *S. morrisoni* by the dorsal lobes of the ampulla and harpe extending about the same distance dorsad (lobe of harpe shorter on *S. morrisoni*) and the expanding lobate form of the right titillator (scroll-like on *S. morrisoni*). Female genitalia differ most prominently in the breadth of the caudal sclerotized and heavily setose portion of the lamella postvaginalis; this area is broad on *S. kendamulaza* (about 3/4 width of caudal edge on *S. kendamulaza* vs. 2/3 or less on *S. morrisoni*).

It is of interest that the phenotype of *S. morrisoni* sympatric with *S. kendamulaza* is the darkest and among the smallest of the species. *Stinga morrisoni* from lower elevations in Mexico and those from the United States are more broadly orange and in this regard more similar to *S. kendamulaza*. Further, *S. morrisoni* from its lowest known elevational range in western Texas has little black associated with the stigma resembling this trait on *S. kendamulaza*.

Discussion

Since its description, *Stinga* has been considered monotypic and its geographical variation has not been recognized or described. The discovery of a phenotype occurring in southern Mexico that is strikingly different from that traditionally associated with *S. morrisoni* prompted examination of examples of the genus from across its distribution. This investigation revealed considerable superficial (including size), but not genital, variation within *S. morrisoni* apparently related largely to geography and elevation. However, at this time, our knowledge of patterns of geographical variation in *S. morrisoni* remains preliminary, as there are vast parts of northern and central Mexico from which records of *Stinga* are lacking.

The distinctive southern Mexican phenotype, *S. kendamulaza*, differs not only superficially, but also in its genital morphology, from *S. morrisoni*. With the discovery of *S. kendamulaza*, *Stinga* becomes yet another hesperiid genus, joining such genera as *Cephise* Evans, 1952, and *Venada* Evans, 1952, that has abandoned its monotypic status as faunas and their component species become better known (Burns 1996, Austin and Mielke 2000, Burns and Janzen 2005).

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