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A review of Mexican *Stamnodes* (Lepidoptera: Geometridae) with the description of 16 new species

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Abstract. The Mexican *Stamnodes* Guenée, [1858] fauna is reviewed. Thirty-six species are documented, including sixteen new species: *S. aumatlapalli* sp. nov., *S. calcarea* sp. nov., *S. carota* sp. nov., *S. catarina* sp. nov., *S. ceniza* sp. nov., *S. churro* sp. nov., *S. clara* sp. nov., *S. disrupta* sp. nov., *S. erupta* sp. nov., *S. favilla* sp. nov., *S. ferropulvisa* sp. nov., *S. fuego* sp. nov., *S. mariachi* sp. nov., *S. matrona* sp. nov., *S. saltillo* sp. nov., and *S. tenebrosa* sp. nov.; and two new synonymies are proposed: *S. artemis* Rindge, 1958 syn. nov. is synonymized with *S. agapetica* (Dyar, 1916), and *S. similis* Wright, 1927 syn. nov. is synonymized with *S. ululata* Pearsall, 1912. Illustrations and a brief summary of the taxonomic status, biology, and distribution for each species are provided. Full descriptions accompany new species accounts. Genitalic descriptions and illustrations are provided for new species and species described from Mexico without past genitalic study, and COI barcode data are presented for 27 of the 36 species treated herein.

Keywords. *Cercocarpus*, Lamiaceae, Larentiinae, *Salvia*, Stamnodini.

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Introduction

Stamnodes Guenée, [1858] the most species-rich genus of Stamnodini Forbes, 1948 (Larentiinae), ranges from the Palearctic to southeastern China and throughout the New World with elevated species diversity across the mountainous regions of Mexico and the American West (USA). Fifty-five species of *Stamnodes* are presently recognized (Rajaei *et al.* 2022) following the recent exclusion of some South American taxa considered incertae sedis or placed in other genera by Brehm *et al.* (2019), and the recent description of a new taxon in North America (Matson & Wagner 2020). Phylogenetic contributions by Brehm *et al.* (2019) place *Stamnodes* sister to a clade of related Neotropical Stamnodini: *Synneuria* Mabille, 1885, *Pseudopsodos* Thierry-Mieg, 1903, *Scordyliodes* Thierry-Mieg, 1903, and *Callipia* Guenée, [1858]. Stamnodini are sister to the newly described Erebochlorini Brehm, Murillo-Ramos & Õunap, 2019 and among a group of closely related tribes in the "Larentiini complex" (Brehm *et al.* 2019).

Stamnodes are often recognized by their ornate hindwing underside pattern that is visible on account of their butterfly-like resting position with wings held upright over the body. While several species appear to be diurnal or semidiurnal (Mikkola *et al.* 1987; Furniss *et al.* 1988), most *Stamnodes* are likely nocturnal. Life history data are generally minimal; however, several genera of Rosaceae Juss., Lamiaceae Martinov, and Boraginaceae Juss. have been recorded as hosts in the American West (Hardy 1961; McFarland 1965; Matson & Wagner 2020). In the Palearctic region, Lamiaceae has been recorded (Mikkola *et al.* 1987). So far as known, *Stamnodes* species are dietary specialists, rarely feeding on multiple plant genera, and never spanning multiple host families.

As is commonly the case, the Mexican *Stamnodes* fauna has been historically overlooked – the last Mexican *Stamnodes* to be described was *Stamnodes agapetica* (Dyar, 1916) over a century ago. Today, many species remain undescribed, and for those described species, life history and molecular data are nonexistent, and no known descriptions or illustrations of genitalic morphology have been published for endemic Mexican taxa.

In this paper, 36 species are treated with 16 of these representing new species: *S. aumatlapalli* sp. nov., *S. calcarea* sp. nov., *S. carota* sp. nov., *S. catarina* sp. nov., *S. ceniza* sp. nov., *S. churro* sp. nov., *S. clara* sp. nov., *S. disrupta* sp. nov., *S. erupta* sp. nov., *S. favilla* sp. nov., *S. ferropulvisa* sp. nov., *S. fuego* sp. nov., *S. mariachi* sp. nov., *S. matrona* sp. nov., *S. saltillo* sp. nov., and *S. tenebrosa* sp. nov. Abbreviated diagnostic comments are provided in a Diagnostic remarks section for previously described taxa. Male and female genitalia are illustrated and described for new species and for endemic Mexican taxa without previous genitalic study. For species found primarily in the USA, I provide a brief account of the biology, distribution, and adult illustrations – these the subject of my doctoral research, will be treated in greater detail in a separate monograph of the Stamnodini of North America north of Mexico (Matson & Wagner in prep.). That work includes detailed information addressing the taxonomy, phylogeny, early stages and life histories, and distribution of ~37 species/species complexes.

Material and methods

Over the course of this study, the Mexican *Stamnodes* holdings (including primary types) were examined from the following institutions and personal collections:

AMNH = American Museum of Natural History, New York City, NY, USA
BMEC = Bohart Museum Entomology Collection, University of California, Davis, CA, USA
CAS = California Academy of Sciences, San Francisco, CA, USA
CMNH = Carnegie Museum of Natural History, Pittsburgh, PA, USA
CNIN = Colección Nacional de Insectos de México / Instituto de Biología, Ciudad de México, Mexico
CSU = C.P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, CO, USA
DLW = Research Collection of Dr David L. Wagner, Storrs, CT, USA
EMEC = Essig Museum Entomology Collection, University of California, Berkeley, CA, USA
JDP = Research Collection of Dr John D. Palting, Tucson, AZ, USA
MCZ = Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA
NHMUK = Natural History Museum, London, UK
SDNHM = San Diego Natural History Museum, San Diego, CA, USA
TAM = Research Collection of Dr Tanner A. Matson, Elkridge, MD, USA
UAIC = University of Arizona Insect Collection, Tucson, AZ, USA
UCMS = Biodiversity Research Collections, University of Connecticut, Storrs, CT, USA
USNM = National Museum of Natural History, Smithsonian Institution, Washington DC, USA

VOB = Research Collection of Dr Vitor O. Becker, Camacan, Bahia, Brazil
YPM = Peabody Museum of Natural History, New Haven, CT, USA

The primary types for all relevant North American species of *Stamnodes* and their synonyms were externally examined for this study. When available, genitalic dissections and DNA (COI) barcodes were also reviewed from type material. The author examined the CNIN holdings in January, 2020, and August, 2022 and 2023. All genitalic slides, DNA extracts, and DNA sequences prepared or examined during these visits remain the property of the CNIN and were obtained under the supervision of curator Ivonne Garzón-Orduña. Specimens deposited in the CNIN remain in that institution; and all holotype specimens remain in the collection of original deposition prior to their designation as primary types.

Specimen or sight records for 405 *Stamnodes* from Mexico were databased for this effort (Supp. file 1), and 48 genitalic slides were prepared by the author following the methods described in Lafontaine (2004). When possible, male vesicae were everted with a microsyringe prior to fixation. Preparations were stained with Eosin-Y or Chlorazol Black and slide-mounted in Euparal. Collection data for all genitalic preparations illustrated or examined for this study can be found in Supp. file 1 using their respective genitalic voucher numbers. Adult images were taken using a Visionary Digital imaging system and images processed (background removed) with Adobe Photoshop (Adobe Systems, Mountain View, CA). SimpleMappr (Shorthouse 2010) was used to generate the geographic distribution point maps. GPS coordinates used to generate point maps (Figs 74–89) were taken verbatim from coordinates on specimen labels or estimated from label localities for specimens without coordinates. All estimated coordinates in the Type material sections or in Supp. file 1 are given between square brackets.

North American host records were extracted from relevant primary literature (McFarland 1965; Furniss *et al.* 1988; Powell & Opler 2009; Matson & Wagner 2020). Host records for *S. formosata* (Strecker, 1878), *S. lampra* Rindge, 1958, *S. franckata* (Pearsall, 1909), *S. costimacula* (Grossbeck, 1912), *S. cassinoi* Swett, 1917 and *S. recksecker*i Pearsall, 1910 are presented here as original data; however, additional unpublished life history details and larval illustrations are forthcoming in greater detail in Matson & Wagner (in prep.).

DNA extraction, PCR amplification, and COI barcode sequencing for publicly available sequences were performed at the Canadian Centre for DNA Barcoding (Centre for Biodiversity Genomics–University of Guelph) using their standard Sanger sequencing protocols (Wilson 2012). The COI barcodes of *Stamnodes ferropulvisa* sp. nov. (TAM0053, GenBank: OP898471), *S. patamon* (Druce, 1893) (TAM0054, GenBank: OP898468), *S. favilla* sp. nov. (TAM0055, GenBank: OP898431), *S. splendorata* Pearsall, 1909 (TAM0073, GenBank: OP898434), and *S. fuego* sp. nov. (TAM0075, GenBank: OP898448) were sequenced by the author using the LCO and HCO primers of Wahlberg and Wheat (2008). *Stamnodes aumatlapalli* sp. nov. (TAM0057) and *S. ceniza* sp. nov. (TAM0058) failed to sequence. Extractions were performed using the protocol and material from Macherey Nagel's NucleoSpin Tissue 250 kit. PCR products were sent to Eurofin Genomics (Louisville, KY, USA) for sequencing. Sequence chromatograms were visually inspected for base call errors in Geneious ver. 2021.0 (Kearse *et al.* 2012) and then exported to FASTA files and visually aligned to reference lepidopteran sequences using AliView ver. 1.28 (Larsson 2014). The holotype COI barcode sequence of *S. ceniza* (TAM0325, GenBank: OQ507471) was included at the last minute following peer-review of this manuscript. Only this sequence data was generated separately in the lab of John Gruber (Friends' Central School, Pennsylvania). DNA was extracted using the Qiagen DNeasy DNA extraction and purification kit and amplified using the common LepF/LepR primers of Barcode of Life Project (BOLD). Clean-up and Sanger sequencing of PCR products was performed by GeneWiz (South Plainfield, NJ, USA).

Seventy COI barcode submissions (BOLD Dataset – DS-STAMMEXI) were accessed via BOLD, including sequences generated by the author, to build a neighbour-joining tree representing approximately 28 species-level taxa using the default Kimura-2P model in BOLD (Ratnasingham & Hebert 2007). Sequence data available for all species of *Stamnodes* found in Mexico were chosen to illustrate closest neighbour relationships, and show genetic vouchers by which species concepts, associated data, and new species described herein could be referenced. For species with significant USA phylogeographic structure, i.e., *S. annellata* (Hulst, 1887), *S. costimacula*, etc., chosen sequences represented collections geographically proximal to the USA–Mexican border. BOLD *Stamnodes* sequences currently include many misidentifications and sequences with only generic identification; the sequences used in Fig. 94 are correctly identified and can be backreferenced to BOLD using the BOLD Process ID number next to each taxon. Sequences described here are accessible via GenBank with the following accession numbers: OP898428 to OP898491, OQ507471, and HQ543795 to HQ543799).

A brief section titled 'Molecular characterization' is included in each species account. These data draw largely from information available in the 'BIN Details' of BOLD's public data portal BIN page. Where possible, metrics of mean and maximum pairwise distances of intraspecific variation, and minimum pairwise distance to the nearest interspecific neighbour are given. These statistics are based only on sequences with a minimum length of 500 base pairs and <1% ambiguous bases, and they almost invariably change with the addition of new sequence data, which is an ongoing process. It should be noted that for species represented by more than one BIN, metrics of distance and nearest interspecific neighbour are not available owing to the assumption that BINs usually approximate 'species'. In such cases, statistics presented in the Remarks are drawn from nearest neighbour relationships and nearest neighbour distances from the neighbour-joining tree in Fig. 94 and not from the BIN page. Also warranting explanation are details of the interpretation of nearest neighbour relationships gleaned from BOLD BIN pages. Nearest neighbour relationships in BOLD are derived from the taxonomy of the nearest BIN by way of the minimum pairwise distance. However, in many instances, the nearest neighbour is not the closest adjacent taxon as shown in neighbour-joining trees. Though it is widely understood that neighbour-joining trees are not a substitute for multiple-gene phylogenetic trees, it is also widely recognized that neighbour-joining trees provide useful signals of potential relatedness, especially at the species level. Accordingly, in cases where BOLD's nearest neighbour details disagree with the closest adjacent taxon of neighbour-joining trees, i.e., in Fig. 94, only details of the latter are given as they more likely approximate a greater signal of relatedness.

Results

Taxonomy

Class Insecta Linnaeus, 1758
Order Lepidoptera Linnaeus, 1758
Superfamily Geometroidea Leach, 1815
Family Geometridae Leach, 1815
Subfamily Larentiinae Duponchel, 1845
Tribe Stamnodini Forbes, 1948

Genus ***Stamnodes*** Guenée, [1858]

Stamnodes Guenée, [1858]: 515; type species: *Fidonia pauperaria* Eversmann, 1848, by original designation.

Lissopsis Warren, 1894: 398; type species: *Siona columba* [junior homonym of *Lissopsis* Fritsch, 1887 (Crustacea)], by original designation.

Marmopteryx Packard, 1874: 552; type species: *Marmopteryx tessellata* Packard, 1874, by subsequent designation (Kirby, 1878).
Tora Walker, 1867: 182, 184, 199; type species: *Tora unilinea* Walker, 1867, by monotypy.

Stamnodes aumatlapalli sp. nov.
urn:lsid:zoobank.org:act:44DDB9C4-9466-4B90-8E80-1D4AF7F0F1F1
Figs 1, 41, 61, 74, 94–95

Diagnosis

Specimens of *S. aumatlapalli* sp. nov. examined from the CNIN were found intermixed with *S. favilla* sp. nov. and *S. penguinifera* (Dyar, 1910). The absence of a dark red outlining around the white patterning of the forewing apex and hindwing underside separates this species from *S. favilla*; additional more subtle differences of the hindwing underside also separate the two: notably, the longitudinal, medial white band is continuous in *S. aumatlapalli* (see right arrow, Fig. 1b), but interrupted at the postmedian in *S. favilla* (see right arrow, Fig. 7b).

Stamnodes aumatlapalli sp. nov. is more strongly marked above and bears a slightly darker orange-yellow ground colour than *S. penguinifera*. The hindwing underside is markedly different from that of *S. penguinifera* and can be easily identified by the curved, transverse, medial white band near the posterior inner margin of the hindwing underside that angles distad toward the tornus (see left arrow, Fig. 1b). The same band is straight, thicker, and angles basad in *S. penguinifera* (see left arrow, Fig. 3b). When viewed in conjunction with the longitudinal, medial white band, *S. penguinifera* appears to have a large Y-shaped mark in the center of the hindwing underside; such is absent in *S. aumatlapalli*.

The number, shape, and orientation of cornuti on the vesica immediately separates *S. aumatlapalli* sp. nov. from *S. penguinifera* and *S. favilla* sp. nov. The vesica of *S. aumatlapalli* bears an echinate field of several dozen small cornuti over much of its surface (Fig. 41b), while *S. favilla* has a dense spinose cluster of approximately nine cornuti of varying size that are much larger and more heavily sclerotized than *S. aumatlapalli* (Fig. 46b), and *S. penguinifera* has dozens of cornuti in a dense cluster (Fig. 43b). Female genitalia of *S. aumatlapalli* are similar to those of *S. penguinifera* and *S. favilla* in size, shape, and signum attributes. While *S. aumatlapalli* and *S. favilla* appear to consistently have a laterally sclerotized area of the corpus bursae; such appears to be absent in studied preparations of *S. penguinifera*.

Stamnodes aumatlapalli sp. nov. appears to be most closely related to *S. cannonaria* (Schaus, 1927). The latter is known only from the Guatemalan volcanic highlands. The Isthmus of Tehuantepec represents a significant biogeographic boundary, dividing the Trans-Mexican Volcanic Belt, Northern Oaxacan Highlands, and Sierra Madre del Sur from the volcanic highlands of Guatemala. *Stamnodes aumatlapalli* can be separated from *S. cannonaria* by the presence of an oblique patch of ground colour within the black apical area of the forewing (this may be variable), and subtle differences of the hindwing underside that include a fine, dark grey outline around the white patterning and a lighter grey patch colour. *Stamnodes cannonaria* has a darker, nearly black, patch colour. Although the male genitalia of both species are similar, there are notable differences. The acuminate lateral processes of the juxta in *S. aumatlapalli* appear to be thinner and more widely separated, spanning the width of the vinculum, whereas those of *S. cannonaria* are roughly twice as thick, about one-quarter longer, and not as wide as the vinculum. In addition, the small cornuti on the vesica of *S. aumatlapalli* appear to be about one-half to one-third the size of those of *S. cannonaria*; however, only one male specimen (TAM-2021-104) of *S. cannonaria* was available for genitalic study.

Etymology

The specific epithet *aumatlapalli* is derived from the Latin word for gold, '*aurum*', represented by the double vowel 'au', and the Aztecan Nahuatl root '*mātlapalli*', meaning 'wings'. When these two parts

are combined, they form the name 'golden wings'. The name is a noun in apposition. See Remarks section for further explanation of this name.

Material examined

Holotype

MEXICO • ♂; Hidalgo, nr Jacala; [21.01° N, 99.19° W]; 3 Jul. 1965; Flint & Ortiz leg.; BOLD Process ID: LNAUY170-19; GenBank: OP898429; USNMENT01523813.

Paratypes (20 ♂♂, 13 ♀♀)

MEXICO – **Hidalgo** • 2 ♂♂, 3 ♀♀; same collection data as for holotype; BOLD Process ID: LNAUY169-19; GenBank: OP898466; USNMENT01523812, USNMENT01771265 to USNMENT01771268 • 5 ♂♂; Santiago de Anaya; 20°24′07.61″ N, 98°53′17.97″ W; 26 Sep. 2017; A. Ibarra Vázquez leg.; genetic voucher: TAM0057; genitalia: TAM-2020-043, TAM-2021-063; CNIN • 1 ♀; 4 km carr. Tlanchinol San Cristóbal; 20°57′19″ N, 98°39′42″ W; elev. 1450 m; 18 Feb. 1999; A. Ibarra leg.; CNIN LEP 067444 • 1 ♀; Pachuca de Solo; 20.08273° N, 98.78725° W; elev. 2369 m; Aug.–Oct. 2021; Elsi B. Pérez-Jarillo leg.; CNIN LEP190415 • 1 ♀; Pachuca de Solo; 20.12195° N, 98.73589° W; elev. 2399 m; Aug.–Oct. 2021; Elsi B. Pérez-Jarillo leg.; LEP190393CNIN. – **Querétaro** • 2 ♀♀; Chuvejé; 21°10′41″ N, 99°33′38″ W; elev. 1300 m; 20 Oct. 1998; A. Ibarra leg.; genitalia: TAM-2020-04; CNIN LEP 068224 • 1 ♂, 2 ♀♀; desviación a Misión de Bucareli; 21°6′36″ N, 99°39′25″ W; elev. 2250 m; 25 Jun. 1998; Vences and Ibarra leg.; CNIN LEP 064591, CNIN LEP 0645931 • 1 ♂; Km 4 carretera La Lagunita–Tilaco; [21.20° N, 99.22° W]; elev. 1116 m; 20 Oct. 1998, A. Ibarra leg.; CNIN. – **Guerrero** • 1 ♂, 2 ♀♀; [I]guala, Cerro Tuxpan; [18.41° N, 99.42° W]; elev. 1700 m; 25 Jun. 1987; CNIN • 1 ♂, 1 ♀; 32 km W of Iguala; [18.36° N, 99.80° W]; elev. 1350 m; 15 Sep. 1982; J.A. Powell and J.A. Chemsak leg.; EMEC1748441, EMEC1748442. – **Morelos** • 3 ♂♂; 2 km S of Ignacio Bastida; [18.91° N, 99.02° W]; 1 Aug. 1981; T.A. Sears leg.; BMEC. – **Aguascalientes** • 4 ♂♂, 1 ♀; ridge NW of Jocoque Dam; [22.12° N, 102.36° W]; 19 Aug. 1960; P.H. Arnaud Jr., E.S. Ross, D.C. Rentz leg.; CASENT8539091 to CASENT8539095. – **Tamaulipas** • 1 ♂; 12 mi. SW of Cd. Victoria; [23.60° N, 99.21° W]; elev. 4000 ft; 18 Sep. 1976; J.A. Chemsak and J. Powell leg.; EMEC1748443.

Description

Male

Forewing length. 15–16 mm (n = 21).

Head. Antenna filiform, fuscous. Vertex mostly scarlet, but with some white and fuscous scales; frons white and pink dorsally, fuscous medially, and white ventrally. Labial palpus short, slightly porrect, subequal to diameter of eye, fuscous and white. Cephalic collar mostly pink, but with some white and fuscous scales.

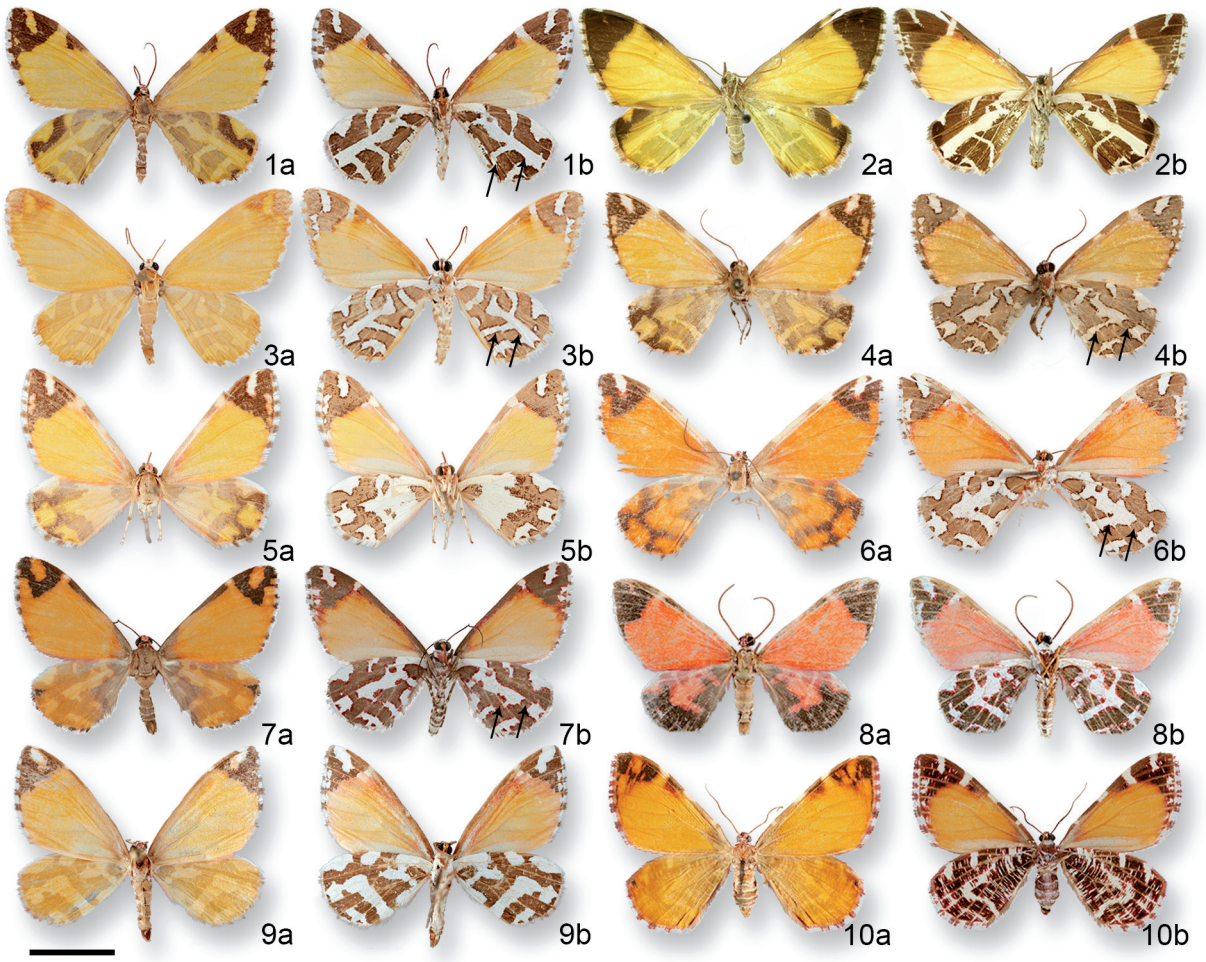
Thorax. Patagium mostly fuscous; tegula fuscous above, white below. Mesoscutum mostly fuscous with faint midsagittal stripe. Legs banded in fuscous and white; tibial spur formula 0–2–4; epiphysis well developed.

Forewing. Ground colour orange-yellow, patterned similar to *S. cannonaria*. Costal area light grey at base and with darker grey crescent patch at costal median. Apical area black with oblique patch of orange-yellow ground colour; ground colour sometimes extending into apical area at subterminus of outer margin but often faint. Underside like upperside but with several white patches along dark grey apical area: (1) small patch along costa near postmedian, (2) larger patch at costa just before apex extending posteriobasad at oblique angle toward body, and (3) small, serrate to irregular patches at subterminus of outer margin below apex. Faint, small, white costomedial spot also present. Fringe starkly checkered with black and white.

Hindwing. Concolourous with forewing, apical area with small black patch (sometimes reduced); pattern elements of underside visible when viewed from above. Underside much different than upperside, predominantly dark grey, with broadly reticulate, large, irregular white patches outlined finely in dark grey to black. Largest white patch extending longitudinally through center of hindwing with thin arms angling toward inner margin and tornus. Smaller white patches at median of costa, apex, and median of inner margin (see Fig. 1b). Fringe as in forewing.

Abdomen. Fuscous above, paler below, some pink lateral scales, and with subtle banding from pale scales at posterior of segments.

Genitalia (Fig. 41). Uncus long, slender, and tapering toward apex. Subscaphium well developed. Juxta wide and broadly U-shaped, with posterolateral, long, curved, acuminate-conical processes. Inner



Figs 1–10. Adult *Stamnodes* Guenée, [1858], dorsal (a) and ventral (b) views. **1**. *S. aumatlapalli* sp. nov., holotype, ♂ (USNMENT01523813). **2**. *S. cannonaria* (Schaus, 1927), holotype, ♂ (USNMENT01771251), photo credit NMNH type search (https://collections.nmnh.si.edu/search/ento/). **3**. *S. penguinifera* (Dyar, 1910) (USNMENT01521263). **4**. *S. clara* sp. nov., holotype, ♂ (AMNH_IZC 00353930). **5**. *S.* ?*clara* aberration (EMEC1748437). **6**. *S. carota* sp. nov., holotype, ♀ (BMEC). **7**. *S. favilla* sp. nov., holotype, ♂ (USNMENT00868520). **8**. *S. fuego* sp. nov., holotype, ♂ (USNMENT01771229). **9**. *S. matrona* sp. nov., holotype, ♂ (EMEC1748430). **10**. *S. splendorata* Pearsall, 1909 (DLW). Scale bar = 1 cm.

surface of valva with two hair tufts: smaller tuft arising basally from digitate tubercle; second, larger more laterally widened tuft residing in slight depression and extending to subapical area of valva. Costal sclerite swollen in basal third, then gradually narrowing toward apex. Vesica bearing echinate field of several dozen small cornuti.

Female

Outwardly undifferentiated from male.

Forewing length. 15–16 mm (n = 13).

Genitalia (Fig. 61). Ovipositor short. Anterior apophysis two-thirds length of posterior apophysis. Ductus bursae short and narrow with prominent sclerite flattened on ventral surface and dorsolaterally rolled toward median. Corpus bursae ovoid; surface with lightly sclerotized patch in posterior half, and with circular depressed signum bearing minute papillae; signum situated at anterior third.

Distribution (Fig. 74)

Mexico: *Stamnodes aumatlapalli* sp. nov. is primarily an inhabitant of the pine-oak woodlands of the Sierra Madre Oriental and Trans-Mexican Volcanic Belt; its distribution in the Sierra Madre Oriental appears to be primarily southern, corresponding to the Hidalgoan subprovince (Morrone 2020). An unusual observation was recorded from Zacatecas on iNaturalist (Observation: 1804430); this moth may be misrecorded. The arid region where this individual was observed is far removed from the typical habitat of *S. aumatlapalli* and until a second observation can be confirmed, this record will be considered suspect and omitted from range maps and discussion.

Biology

Stamnodes aumatlapalli sp. nov. was collected with *S. ferropulvisa* sp. nov. in Santiago de Anaya, Hidalgo. The immature stages remain unknown, but from knowledge of visually similar *Stamnodes*, it is predicted this species will likely be hosted by local mints (Lamiaceae). Adults are likely bi- or multivoltine as adult collections span much of the year: February, June, July, September, and October.

Molecular characterization

This species is represented in BOLD as BIN: BOLD:ADZ0046 (n = 2). At present, the average pairwise intraspecific distance is 0.4%. The nearest adjacent interspecific neighbour to *Stamnodes aumatlapalli* sp. nov. is a single barcode of *S. penguinifera* (LNAUX434-18) (Fig. 94). The sequence of the latter has not been given a BIN number, nor is it incorporated into BOLD's nearest neighbour details as the sequence is a partial read of 325 base pairs.

Remarks

This species was described as part of a project undertaken by Mr Isaac Russell's 2019–2020 eighth-grade science class from Topeka, Kansas. With COVID-19 disrupting educational classrooms, Mr Russell contacted me to assist with a proposed adaptation to his curriculum that would keep his students engaged and learning while they were isolated in their homes. A working group of interested students received lectures on topics such as evolutionary biology, systematics, biodiversity, Mexican biogeography, and the process of describing new species. Students were then given the opportunity to select the name for this new taxon as long as it alluded to the morphology of this species or was related to its country of origin, Mexico. Mr Russell's eighth-grade science class enthusiastically proposed the new species name, *Stamnodes aumatlapalli* sp. nov.; its etymology speaks to both morphology and native language and culture.

Stamnodes penguinifera (Dyar, 1910)
Figs 3, 43, 62, 94–95

Coenocalpe penguinifera Dyar, 1910: 261. Type locality: Zacualpan; Cuernavaca, Mexico. [USNM].

Stamnodes penguinifera – Scoble 1999: 902 (catalogue). — Scoble & Hausmann 2007 (online catalogue). — Rajaei *et al.* 2022 (online catalogue).

Diagnostic remarks

Stamnodes penguinifera is less strongly marked and with a lighter orange ground colour than *S. favilla* sp. nov. and *S. aumatlapalli* sp. nov. The hindwing underside is markedly different from that of aforementioned taxa and can be easily identified by the straight, thick, transverse, medial, white band that angles basad toward the inner margin (see left arrow, Fig. 3b). *Stamnodes penguinifera* appears to have a large Y-shaped mark in the center of the hindwing underside (Fig. 3b) that is absent in *S. aumatlapalli* (Fig. 1b) and *S. favilla* (Fig. 7b). This species also lacks the dark red perimeter that surrounds the white patterning of the forewing underside apex and hindwing underside of *S. favilla*.

The number, shape, and orientation of cornuti on the vesica may also separate *S. penguinifera* from visually similar *Stamnodes*. The vesica of *S. penguinifera* has dozens of cornuti in a dense cluster (Fig. 43b), while *S. aumatlapalli* sp. nov. bears an echinate field of several dozen small cornuti (Fig. 41b), and *S. favilla* sp. nov. (Fig. 46b) has a dense cluster of approximately nine cornuti of varying size that are much larger and more heavily sclerotized than those of *S. aumatlapalli*. The female genitalia of *S. favilla* and *S. aumatlapalli* are very much like *S. penguinifera* in size, shape, and signum attributes; however, examined material of *S. penguinifera* lacks an asymmetric lateral sclerotization of the corpus bursae found in the other two species.

Redescription

Dyar's original description of *S. penguinifera* did not describe genitalic morphology. To his description, the following genitalic redescription and associated images are supplemented:

Male genitalia (Fig. 43). Uncus long, slender, and tapering. Subscaphium well developed. Juxta wide and broadly U-shaped with posterolateral, long, curved, acuminate-conical processes. Inner surface of valva with two hair tufts: smaller tuft arising basally from digitate tubercle; second, larger, more laterally widened tuft residing in slight depression and extending to subapical area of valva. Costal sclerite terminating just short of apex. Vesica bearing dozens of spinose cornuti in dense cluster.

Female genitalia (Fig. 62). Ovipositor short. Anterior apophysis two-thirds length of posterior apophysis. Ductus bursae short and narrow with prominent sclerite flattened on ventral surface and dorsolaterally rolled toward median. Corpus bursae ovoid (very much like that of *S. favilla* sp. nov. and *S. aumatlapalli* sp. nov. but without the posterolateral sclerotization of corpus bursae) with circular and depressed signum bearing minute papillae; signum situated at anterior third of corpus bursae.

Distribution

Mexico: *Stamnodes penguinifera* is known from the type locality in Morelos, the Sierra Madre del Sur pine-oak forests in Guerrero, and the highlands of Chiapas where it is the only *Stamnodes* known to range across the Isthmus of Tehuantepec.

Biology

Adult *S. penguinifera* may be bi- or multivoltine as adult collections span May through September. The immature stages remain unknown but are predicted to be hosted by mints (Lamiaceae).

Molecular characterization

The only COI sequence of *S. penguinifera* is a partial read of 325 bp. It has not been given a BOLD BIN number, nor is it incorporated into BOLD's nearest neighbour details. However, in my analysis (Fig. 94), its nearest adjacent interspecific neighbour is *S. aumatlapalli* sp. nov.

Stamnodes clara sp. nov.
urn:lsid:zoobank.org:act:A1FA2F8C-B6EA-492D-BCEC-01078CF404B8
Figs 4, 44, 75, 94

Diagnosis

Stamnodes clara sp. nov. is phenotypically most similar to *S. carota* sp. nov. and *S. favilla* sp. nov.; however, the latter species inhabits the Sierra Madre Oriental and is believed to be allopatric. Additionally, the white patterning of the forewing underside apex and hindwing underside are outlined with dark red scales in *S. favilla*, while in *S. clara*, the white patterning of the same areas are outlined in dark grey. The ground colour of *S. clara* also appears to be given more toward orange-yellow than the deeper orange ground colour of both *S. favilla* and *S. carota*.

In *S. carota* sp. nov. the transverse medial white band of the hindwing underside is larger and more complete than in *S. clara* sp. nov. (see left arrows, Figs 4b, 6b). However, the number and arrangement of cornuti on the vesica appears to be especially diagnostic: *S. clara* has a tight cluster of approximately four large cornuti (Fig. 44b), while *S. carota* contains a patch of 16–20 cornuti of greatly varying size (Fig. 45b).

Etymology

The specific name *clara*, a noun in the nominative case, is derived from the name of the village of Nuevo Santa Clara, where the holotype specimen was taken; and in honour of my niece, Clara Naomi, whose curiosity, and endless wonder shine bright.

Material examined

Holotype

MEXICO • ♂; Chihuahua, [Nuevo] Santa Clara; [29.28° N, 107.01° W]; 30 Jun. 1947; genitalia: TAM-2022-130; AMNH_IZC 00353930.

Description

Male

Forewing length. 16 mm (n = 1).

Head. Antenna filiform, fuscous. Vertex mostly pink; frons pink in dorsal third, fuscous medially, and white in ventral third and thinly around margin of eye. Labial palpus short, slightly porrect, subequal to diameter of eye, fuscous and white. Cephalic collar mostly fuscous.

Thorax. Patagium and tegula mixture of fuscous and white scales. Mesothorax lightly fuscous above, white below. Legs mixture of pale fuscous and white; tibial spur formula 0–2–4; epiphysis well developed.

Forewing. Ground colour orange-yellow. Costa grey at base and gradually darkening towards apex with lighter patches at antemedian, median, and postmedian of costa. Apical area black with oblique white patch just below costa and smaller yellow patch along subterminal area of outer margin. Underside like upperside but greyer in apical area, patches outlined in dark grey, and smaller yellow patch along subterminal area of outer margin replaced by two, small, white chevron patches. Fringe starkly checkered with grey to black, and white.

Hindwing. Concolourous with forewing above. Distal third of wing along outer margin with darkened black reticulate pattern. Underside much different than upperside: predominantly grey with large, irregular, white patches outlined in dark grey. Largest patch, irregular, extending from base medially and longitudinally to postmedian of wing. Smaller patches at costal median, apex, outer margin median, tornus, and median of inner margin (see Fig. 4b). Fringe as in forewing.

Abdomen. Fuscous.

Genitalia (Fig. 44). Uncus long, slender, and tapering. Subscaphium well developed. Juxta wide and U-shaped with posterolateral, long, conical processes. Inner face of valva with two hair tufts: smaller tuft arising basally from digitate tubercle; second, larger hair tuft more laterally widened, positioned in slight depression, and extending to subapical area of valva. Costal sclerite terminating just short of apex. Vesica with tight cluster of ca four spinose cornuti; these thicker at base than those of most congeners.

Female

Not known.

Distribution (Fig. 75)

Mexico: *Stamnodes clara* sp. nov. is known only from the type locality in Chihuahua.

Biology

The immature stages remain unknown but are likely hosted by mints (Lamiaceae). The holotype was collected in June.

Molecular characterization

This species has not been sequenced.

Remarks

I have identified a possible second individual whose wing pattern deviates from the holotype of *S. clara* sp. nov. that I cautiously consider a conspecific. This specimen is currently housed at the EMEC (voucher: EMEC1748437) and its illustration can be found in Fig. 5. The most significant difference can be found in the white areas of the hindwing underside, which are notably more pronounced in the basal area. Further, the male juxta appears to be larger and the uncus more swollen at the base. Nevertheless, when considering other characteristics, this individual closely aligns with my understanding of *S. clara*. However, due to the limited availability of additional specimens of *S. clara*, defining meaningful species variation remains intractable.

Stamnodes carota sp. nov.
urn:lsid:zoobank.org:act:876B5DB8-7030-4F28-86D6-15B83A6F4CE2
Figs 6, 45, 63, 76, 95

Diagnosis

The diagnosis of *Stamnodes carota* sp. nov. should be considered provisional due to limited records of its visually similar – and likely sympatric – congener, *S. clara* sp. nov. The ground colour of *S. carota* appears to be darker orange than *S. clara*, and the transverse medial white band of the hindwing underside is larger and more complete. However, it appears the most diagnostic feature can be found in the male genitalia. The vesica of *S. carota* contains a patch of 16–20 cornuti of varying size, whereas *S. clara* has a tight cluster of approximately four spinose cornuti.

Stamnodes carota sp. nov. is also phenotypically similar to *S. favilla* sp. nov.; however, the two species appear to be allopatric, with *S. carota* inhabiting the Sierra Madre Occidental and *S. favilla* inhabiting the Sierra Madre Oriental. The white patterning of the forewing underside apex and hindwing underside are outlined with dark red scales in *S. favilla*, while in *S. carota*, the white patterning of the same areas are outlined in dark grey.

Etymology

The species name *carota* is derived from the Latin word '*carota*', which means 'carrot'. It alludes to the orange carrot-like ground colour of this species.

Material examined

Holotype

MEXICO • ♀; Chihuahua, 3 mi. W of Santa Barbara; [26.81° N, 105.89° W]; 22 Jul. 1967; R.C. Gardner, C.R. Kovacic, K. Lorenzen leg.; genitalia: TAM-2022-263; BMEC.

Paratypes (22 ♂♂, 3 ♀♀)

MEXICO – **Chihuahua** • 1 ♂; 3 mi. W of Santa Barbara; [26.81° N, 105.89° W]; 1 [Aug.] 1967; R.C. Gardner, C.R. Kovacic, K. Lorenzen leg.; genitalia: TAM-2022-262 (USNM 154208); USNMENT01771248 • 2 ♂♂; 25 mi. W of Hidalgo del Parral; [26.84° N, 106.03° W]; elev. 6800 ft; 14 Jul. 1964; black and white lights; J.A. Chemsak and J. Powell leg.; USNMENT01771240, USNMENT01771241 • 2 ♂♂; same collection data as for preceding; AMNH_IZC 00353007, AMNH_IZC 00352996 • 2 ♂♂; same collection data as for preceding; CNIN • 1 ♂, 1 ♀; same collection data as for preceding; CMNH • 13 ♂♂, 1 ♀; same collection data as for preceding; EMEC1748467 to EMEC1748480 • 1 ♂, 1 ♀; 12 mi. W of Hidalgo del Parral; [26.92° N, 105.88° W]; elev. 6200 ft; 14 Jul. 1964; J.A. Chemsak leg.; EMEC1748435, EMEC1748436.

Description

Male

Forewing length. 18 mm (n = 22).

Head. Antenna filiform, fuscous. Vertex mostly pink; frons often pink in dorsal third, fuscous medially, and white in ventral third and thinly around margin of eye. Labial palpus short, slightly porrect, subequal to diameter of eye, fuscous and white. Cephalic collar mostly fuscous.

Thorax. Patagium and tegula mixture of fuscous and white scales. Mesothorax lightly fuscous above, white below. Legs mixture of pale fuscous and white; tibial spur formula 0–2–4; epiphysis well developed.

Forewing. Ground colour orange (similar to *S. favilla* sp. nov.). Costa grey at base and alternating between grey and white prior to darkened apex. Blackened apical area with oblique white patch. Underside like upperside but greyer in apical area. White patches in apical area and along subterminus of outer margin thinly outlined in dark grey. Margin of darkened costal and apical areas lightly suffused with redder scales. Fringe starkly checkered with grey to black, and white.

Hindwing. Concolourous with forewing above. Distal third of wing along outer margin with darkened black reticulate pattern. Underside much different than upperside: predominantly grey with large, irregular, white patches outlined in dark grey. Largest patch, irregular, extending from base medially and longitudinally to postmedian of wing. Smaller patches at costal median, apex, outer margin median, tornus, and median of inner margin (see Fig. 6b). Fringe as in forewing.

Abdomen. Fuscous.

Genitalia (Fig. 45). Uncus long, slender, and tapering. Subscaphium well developed. Juxta wide and U-shaped with posterolateral, long, conical processes. Inner face of valva with two hair tufts: smaller tuft arising basally from digitate tubercle; second, larger hair tuft more laterally widened, positioned in slight depression, and extending to subapical area of valva. Costal sclerite terminating just short of apex. Vesica with patch of 16–20 spinose cornuti of varying size.

Female

Outwardly undifferentiated from male.

Forewing length. 19 mm (n = 4).

Genitalia (Fig. 63). Ovipositor short. Anterior apophysis two-thirds length of posterior apophysis. Ductus bursae with prominent sclerite flattened on ventral surface and dorsolaterally rolled toward median; more widened anteriorly than most congeners. Corpus bursae ovoid, lightly sclerotized medially, and with circular signum bearing numerous minute papillae.

Distribution (Fig. 76)

Mexico: *Stamnodes carota* sp. nov. is only known from the type material localities in Chihuahua.

Biology

Stamnodes carota sp. nov. is known to fly in July and presumably August (see Remarks). The immature stages remain unknown but are likely hosted by mints (Lamiaceae).

Molecular characterization

This species has not been sequenced.

Remarks

The collection date of a male paratype specimen (voucher: USNMENT01771248) is ambiguous, as it contains a non-existent roman numeral "IIX" to indicate the month of collection. However, it is probable that the intended month was August, given that this paratype specimen shares the same collectors, locality, and year as the expedition that garnered the holotype specimen in late July.

Stamnodes favilla sp. nov.
urn:lsid:zoobank.org:act:83B71C9F-6AD4-461F-BC04-063140501D7B
Figs 7, 46, 64, 77, 94–95

Diagnosis

Individuals of *S. favilla* sp. nov. may be confused with *S. carota* sp. nov., *S. clara* sp. nov., *S. aumatlapalli* sp. nov., and *S. penguinifera*. The dark red outlining of the white patterning of the forewing underside apex and hindwing underside distinguish *S. favilla* from the previous species. While *Stamnodes favilla* is phenotypically most similar to *S. carota* and *S. clara*, these species are allopatric – *S. carota* and *S. clara* inhabit the Sierra Madre Occidental while *S. favilla* inhabits the Sierra Madre Oriental.

The number, shape, and orientation of cornuti on the vesica are diagnostic. The vesica of *S. aumatlapalli* sp. nov. bears an echinate field of several dozen small cornuti (Fig. 41b); while *S. favilla* sp. nov. (Fig. 46b) has a dense cluster of approximately nine spinose cornuti of varying size that are much larger and more heavily sclerotized than those of *S. aumatlapalli*; and *S. penguinifera* has dozens of spinose cornuti in a dense cluster (Fig. 43b).

The female genitalia of *S. favilla* sp. nov. are very much like *S. penguinifera* in size, shape, and signum attributes; however, *S. favilla* has a posterior, asymmetric lateral sclerotization of the corpus bursae not

found in examined material of *S. penguinifera*. The female genitalia cannot easily be distinguished from those of *S. aumatlapalli* sp. nov.

Etymology

The specific epithet *favilla* is Latin for 'glowing ashes, embers, or sparks', and was inspired by the burnt orange ground colour and dark red perimeter around the reticulate white patterning of the forewing underside apex and hindwing underside.

Material examined

Holotype

MEXICO • ♂; Querétaro, 35 mi. W of Xilitla; [21.37° N, 99.53° W]; elev. 1585 m; 31 Jul. 1992; P.J. Landolt leg.; BOLD Process ID: LNAUS1668-13; GenBank: OP898461; USNMENT00868520.

Paratypes (8 ♂♂, 5 ♀♀)

MEXICO – **México** • 1 ♂, 2 ♀♀; México, Ixtapalapa, San Juan Joya, Vicente Dávila; 19°20′56.69″ N, 98°53′17.97″ W; 20 Jul. 2017; A. Ibarra Vázquez leg.; genitalia: TAM-2020-037; CNIN. – **Hidalgo** • 1 ♂; Santiago de Anaya; 20°24′07.61″ N, 98°53′17.97″ W; 22 Jun. 2018; A. Ibarra Vázquez leg.; genitalia: TAM-2020-042, genetic voucher: TAM0055, Bold Process ID: WAGL2450-20; GenBank: OP898431; CNIN. – **Coahuila** • 1 ♂; Saltillo, Lomas de Lourdes; 25.36366° N, 100.9774° W; 13 Jun. 2020; Emily Estefanía Espinosa Villarreal leg.; CNIN. – **Nuevo León** • 4 ♂♂, 3 ♀♀; Santiago; 25°21′ N, 100°18′ W; elev. 1760 m; 25–30 May 2000; V.O. Becker leg.; Becker 120894; VOB • 1 ♂; 4 mi. W of Iturbide; [24.74° N, 99.97° W]; elev. 5500 ft; 22 Sep. 1975; J. Powell, J. Chemsak, and T. Friedlander leg.; EMEC1748444.

Description

Male

Forewing length. 16 mm (n = 9).

Head. Antenna filiform, fuscous to black. Vertex pink; frons mostly fuscous, pink dorsolaterally and white along ventral margin. Labial palpus short, slightly porrect, subequal to diameter of eye, fuscous and white, tipped with pink. Cephalic collar mostly pink, but with some white, especially laterally.

Thorax. Patagium mostly pink; tegula fuscous above, white below. Mesothorax fuscous above, white and pink below. Legs mixture of pink (mostly on coxa), fuscous, and white; tibial spur formula 0–2–4; epiphysis well developed.

Forewing. Ground colour burnt orange (similar to *S. carota* sp. nov.). Costa grey at base and gradually darkening towards apex. Apical area black with patch of burnt orange ground colour just below costa; ground colour also extending into apical area at subterminus of outer margin. Underside like upperside but with several white patches outlined in dark red at dark grey apical area: (1) small patch along costa near postmedian, (2) larger patch at costa just before apex extending posteriobasad at oblique angle toward the body, and (3) side-by-side chevron patches near outer margin below apex. Fringe starkly checkered with black and white.

Hindwing. Concolourous with forewing above, apical area with small black patch (sometimes reduced); pattern elements of underside clearly visible when viewed from above. Underside much different than upperside, predominantly dark grey, blotted with large irregular white patches outlined in dark red. Largest patch, irregular, extending medially and longitudinally from base to postmedian of wing. Smaller patches at costal median, apex, outer margin median, tornus, and median of inner margin (see Fig. 7b). Fringe as in forewing.

Abdomen. Fuscous above, paler below, with a few lateral pink scales; subtle banding from pale scales at posterior of segments.

Genitalia (Fig. 46). Uncus long, slender, and tapering. Subscaphium well developed. Juxta wide and U-shaped with posterolateral, long, acuminate-conical processes (processes more inset, straight, and blunted at the apex than in *S. fuego* sp. nov.). Inner face of valva with two hair tufts: smaller tuft arising basally from digitate tubercle; second, larger more laterally widened tuft residing in slight depression and extending to subapical area of valva. Costal sclerite terminating just short of apex. Vesica with nine or more clustered cornuti of varying size, smallest about one-third length of largest.

Female

Outwardly undifferentiated from male.

Forewing length. 17 mm (n = 5).

Genitalia (Fig. 64). Ovipositor short. Anterior apophysis two-thirds length of posterior apophysis. Ductus bursae short and narrow with prominent sclerite flattened on ventral surface and dorsolaterally rolled toward median; more widened anteriorly than most congeners. Corpus bursae ovoid, laterally sclerotized near posterior base, and with circular and depressed signum bearing minute papillae; signum situated at anterior third of corpus bursae.

Distribution (Fig. 77)

Mexico: the distribution of *Stamnodes favilla* sp. nov. is not well circumscribed, but generally, this species is found throughout the Sierra Madre Oriental pine-oak forests. To the south, *S. favilla* has been collected in the states of Mexico and Hidalgo. To the north, this species extends to Coahuila, in the vicinity of Saltillo, and eastward to at least Santiago, Nuevo León.

Biology

Stamnodes favilla sp. nov. is known to fly from May through September across its range. The immature stages remain unknown but are likely hosted by mints (Lamiaceae).

Molecular characterization

This species is represented in BOLD by two BINs: BOLD:ACG0444 (n = 1, Querétaro) and BOLD:AEH2871 (n = 1, Hidalgo). The pairwise distance between these two BINs is 2.32%. The distance to the nearest adjacent interspecific neighbour, *Stamnodes fuego* sp. nov. (n = 1), is around 5% (Fig. 94).

Remarks

Much of the type material from CNIN had missing parts, mostly legs, but at least one paratype appears to have been decapitated and the head reapplied upside down.

Stamnodes fuego sp. nov.
urn:lsid:zoobank.org:act:02C87385-7562-42ED-9622-59B53B323687
Figs 8, 47, 65, 78, 94–95

Diagnosis

So far as known, this species, with its dark orange-red ground colour and mostly charcoal hindwings, cannot be confused with others. Unpublished preliminary phylogenetic analyses (Matson & Wagner in prep.) show a close relationship with *Stamnodes favilla* sp. nov.; however, the dark orange-red ground colour immediately sets this species apart from the latter, as well as from *S. carota* sp. nov. and *S. clara* sp. nov. – two other species that also appear to be closely related.

Etymology

The specific epithet *fuego*, meaning 'fire' in Spanish, was inspired by the orange-red ground colour and charcoal-coloured patches that adorn the wings. The name is a noun in apposition.

Material examined

Holotype

MEXICO • ♂; Sonora, Municipio de Bacadehuachi, Rincón de Guadalupe, 14.9 km (air) ENE of Bacadehuachi, Arroyo Campo Los Padres (Río Riito drainage), Sierra de Bacadehuachi; 29°50′53″ N, 108°59′39″ W; elev. 1814 m; 2 Sep. 2011; J. Palting leg.; genetic voucher: TAM0075; BOLD Process ID: WAGL2449-20; GenBank: OP898448; USNMENT01771229.

Paratypes (13 ♂♂, 3 ♀♀)

MEXICO – **Chihuahua** • 1 ♂; 3 mi. south of Témoris; [27.23° N, 108.27° W]; 28 Aug. 1969; T.A. Sears, R.C. Gardner, C.S. Glaser leg.; AMNH_IZC 00352927 • 1 ♂; same collection data as for preceding; elev. 4700 ft; 2 Sep. 1969; AMNH_IZC 00352929 • 1 ♂; same collection data as for preceding; 18 Aug. 1969; genitalia: TAM-2020-024 (USNM 154201); USNM01771231 • 1 ♀; same collection data as for preceding; genitalia: TAM-2020-025 (USNM 154200); USNM01771230 • 1 ♀; same collection data as for preceding; 16 Aug. 1969; USNM01771234 • 1 ♂; same collection data as for preceding; 1 Aug. 1969; genitalia: TAM-2020-027 (USNM 154202); USNM01771232 • 1 ♂; same collection data as for preceding; 2 Sep. 1969; USNM01771233 • 1 ♂; same collection data as for preceding; CNIN • 1 ♂; same collection data as for preceding; BMEC • 1 ♂; same collection data as for preceding; 2 Aug. 1969; BMEC • 1 ♂; 4 mi. SW of Témoris; [27.23° N, 108.32° W]; 7 Sep. 1969; T.A. Sears, R.C. Gardner, C.S. Glaser leg.; AMNH_IZC 00352928 • 1 ♂; same collection data as for preceding; elev. 4700 ft; 28 Aug. 1968; USNM01771239 • 1 ♀; same collection data as for preceding; 22 Aug. 1968; BMEC • 2 ♂♂; same collection data as for preceding; 7 Sep. 1969; BMEC • 1 ♂; same collection data as for preceding; 22 Aug. 1968; BMEC.

Description

Male

Forewing length. 15–17 mm (n = 14).

Head. Antenna filiform, fuscous. Vertex mostly pink; frons white at ventral margin, white and pink at dorsal margin, and broadly fuscous between. Labial palpus short, slightly porrect, subequal to diameter of eye, fuscous medially and white at apex and base.

Thorax. Patagium mostly pink; tegula fuscous. Mesothorax fuscous above, white beneath. Legs banded with fuscous and white; tibial spur formula 0–2–4; epiphysis well developed.

Forewing. Deep orange-red; costa charcoal, with three, small white patches. Apical area charcoal, rarely with small patch of ground colour. Underside concolourous with forewing except for wavy white patch bordered by red within charcoal apical area; white costal markings more pronounced. Fringe checkered.

Hindwing. Mostly charcoal, but strongly blotched with orange-red in medial and costal areas. Underside also mostly charcoal, but with bright white reticulate patches outlined in red (see Fig. 8b), and veins faintly outlined with white. Fringe checkered.

Abdomen. Charcoal to fuscous above, paler below, and with subtle banding from pale scales at posterior of segments.

Genitalia (Fig. 47). Uncus long, slender, and tapering. Subscaphium well developed. Juxta large, nearly as wide as vinculum, and U-shaped with posterolateral, long, curved, acuminate-conical processes (processes may be more curved and acuminate than in *S. favilla* sp. nov.). Inner face of valva with two hair tufts: smaller tuft arising basally from digitate tubercle; second, larger, more laterally widened tuft residing in slight depression and extending to subapical area of valva. Costal sclerite terminating just short of apex. Vesica with eight or more clustered cornuti of varying size, smallest cornutus about one-third length of largest.

Female

Outwardly undifferentiated from male.

Forewing length. 17–19 mm (n = 3).

Genitalia (Fig. 65). Anterior apophysis two-thirds length of posterior apophysis. Ductus bursae short and narrow with prominent sclerite flattened on ventral surface and dorsolaterally rolled toward median; longer than that of most congeners. Corpus bursae ovoid, laterally sclerotized near posterior base, and with circular and depressed signum bearing numerous minute papillae; signum situated at anterior of corpus bursae.

Distribution (Fig. 78)

Mexico: *Stamnodes fuego* sp. nov. is known from the northeastern Sierra Madre Occidental pine-oak forests. The only known collections of this species are from the type material in Sonora and Chihuahua.

Biology

Stamnodes fuego sp. nov. is known to fly from August into September. The immature stages remain unknown, but from knowledge of visually similar *Stamnodes*, it is predicted this species will be hosted by local mints (Lamiaceae).

Molecular characterization

This species is represented in BOLD as BIN: BOLD:AEH2873 (n = 1). The distance to the nearest adjacent interspecific neighbour, *Stamnodes favilla* sp. nov. (n = 2), is around 5% (Fig. 94).

Remarks

All but one paratype were obtained from the same U.S. led expeditions to Mexico in the late 1960's and held in the Bohart Museum of Entomology at the University of California, Davis. The holotype, collected by John Palting in 2011, is the only recent collection that I have examined.

Stamnodes matrona sp. nov.
urn:lsid:zoobank.org:act:3C7D2A28-E94B-4E2B-9914-3CFDB1570B2B
Figs 9, 48, 66, 79, 95

Diagnosis

Stamnodes matrona sp. nov. is not easily confused with other *Stamnodes*, but as this species is likely sympatric with *S. favilla* sp. nov., a brief diagnosis with respect to the latter is warranted. While *S. favilla* has a dark red outlining of the white patterning of the forewing underside apex and hindwing underside, such is absent in *S. matrona*. Furthermore, the male phallus altogether lacks cornuti, which should separate this species from *S. favilla* and all other similar species.

Etymology

The specific name *matrona*, a noun in the nominative case, is derived from the Latin '*matrona*', meaning 'lady, married woman, wife'.

Material examined

Holotype

MEXICO • ♂; Nuevo León, 4 mi. W of Iturbide; [24.73° N, 99.97° W]; elev. 5500 ft; 22 Sep. 1975; J. Powell, J. Chemsak and T. Friedlander leg.; at light; EMEC1748430.

Paratypes (6 ♂♂, 1 ♀)

MEXICO – **Nuevo León** • 3 ♂♂; same collection data as for holotype; EMEC1748430 to EMEC1748432 • 1 ♂; 4 mi W Iturbide; [24.74° N, 99.97° W]; elev. 5500 ft; 13–14 Sep. 1976; J. Powell and J. Chemsak leg.; black light; EMEC1748433 • 1 ♂; same collection data as for preceding; 22 Sep. 1975; J. Powell, J. Chemsak, T. Friedlander leg.; at light; AMNH_IZC 00353019 • 1 ♂; same collection data as for preceding; 22 Sep. 1975; J. Powell, J. Chemsak, T. Friedlander leg.; at light; AMNH_IZC 00353019 • 1 ♀; same collection data as for preceding; 22 Sep. 1975; J. Powell, J. Chemsak, T. Friedlander leg.; at light; genitalia: TAM-2023-284 (USNM 154214); USNMENT01771226 • 1 ♂; highway 60, 4 mi. E of Galeana Jct.; [24.83° N, 100.15° W]; elev. 6000 ft; 23 Sep. 1975; J. Powell, T. Friedlander leg.; at light; genitalia: TAM-2023-280 (USNM 154215); USNMENT01771225.

Description

Male

Forewing length. 15–16 mm (n = 7).

Head. Antenna filiform, fuscous. Vertex mostly pink. Frons mostly black, but white and pink dorsally, and thinly white along lateral and ventral margins. Labial palpus short, slightly porrect, subequal to diameter of eye, mostly fuscous. Cephalic collar pink and white.

Thorax. Patagium pink and white; tegula fuscous. Mesothorax fuscous above, whitish below. Legs mostly fuscous, though coxa and proximal half of femur given more toward white; tibial spur formula 0–2–4; epiphysis well developed.

Forewing. Ground colour yellow-orange. Costa faintly grey; apical area black with yellow-orange and white patch below costa. Underside like upperside but apical patch white, costa darker grey, and costal area with scarlet suffusion. Fringe starkly checkered along outer margin and given toward pink along inner margin.

Hindwing. Concolourous with forewing above. Underside much different than upperside, predominantly dark grey, blotted with large irregular white patches. White patches as follows: irregular patches at base; subovate patches at costal median and apex; large, angled patch extending from median of outer margin to median of inner margin; and small irregular patch about the tornus (see Fig. 9b). Patches not finely outlined as in other *Stamnodes*. Fringe pink.

Abdomen. Fuscous above, white below.

Genitalia (Fig. 48). Uncus long, slender, and tapering. Subscaphium well developed. Juxta wide and U-shaped with posterolateral, long, conical processes. Inner face of valva with two hair tufts: smaller tuft arising basally from digitate tubercle; second, larger hair tuft more laterally widened, positioned in slight depression, and extending to subapical area of valva. Costal sclerite with medial swelling and terminating just short of apex. Vesica without cornuti.

Female

Outwardly undifferentiated from male.

Forewing length. 17 mm (n = 1).

Genitalia (Fig. 66). Anterior apophysis two-thirds length of posterior apophysis. Ductus bursae with prominent sclerite flattened on ventral surface and dorsolaterally rolled toward median. Corpus bursae ovoid with inwardly, depressed circular signum bearing numerous minute papillae.

Distribution (Fig. 79)

Mexico: *Stamnodes matrona* sp. nov. is known from the Sierra Madre Oriental pine-oak forests of Nuevo León.

Biology

Stamnodes matrona sp. nov. flies in September. The immature stages remain unknown but are likely hosted by mints (Lamiaceae).

Molecular characterization

This species has not been sequenced.

Stamnodes splendorata Pearsall, 1909
Figs 10, 94–95

Stamnodes splendorata Pearsall, 1909b: 367. Type locality: Palmerlee, Cochise County, Arizona, USA. [AMNH].

Stamnodes splendorata – McDunnough 1938: 151 (checklist). — Ferguson 1983: 103 (checklist). — Furniss *et al.* 1988: 9. — Poole & Gentili 1996: 686 (checklist). — Scoble 1999: 903 (catalogue). — Knudson & Bordelon 2002: 7–8. — Scoble & Hausmann 2007 (online catalogue). — Pohl *et al.* 2016: 448 (checklist). — Rajaei *et al.* 2022 (online catalogue).

Distribution

Mexico: *Stamnodes splendorata* inhabits the pine-oak forests of the Sierra Madre Occidental, with records also spanning the Trans-Mexican Volcanic Belt to at least the state of Hidalgo. USA: this species can also be found in the Madrean sky islands of southeast Arizona eastward to the Davis Mountains of West Texas.

Biology

The life history of *S. splendorata* is unpublished, but the host plant is likely an herbaceous mint (Lamiaceae). The host is hypothesized from phylogeny (Matson & Wagner in prep.) as this species sits squarely among many mint-feeding *Stamnodes*. Adult collections are centered around a single late July-August flight.

Molecular characterization

The USNM houses a single aberrant specimen from 5 miles east of Tulancingo, Hidalgo (BOLD Process ID: LNAUX434-18; GenBank: OP898486). This individual is lighter in colour and its barcode differs from that of Arizona (USA) specimens by two percent; however, only 307 of the 658 barcode nucleotides were successfully sequenced. The Hidalgo population warrants future study, but until then, the sequenced individual and its parent population will be considered conspecific with those to the north.

This species is represented in BOLD as BIN: BOLD:AAV8865 (n = 2, partial sequences excluded). At present, the average pairwise intraspecific distance is 0.71%.

Stamnodes fergusoni Matson & Wagner, 2020
Figs 11, 93–95

Stamnodes fergusoni Matson & Wagner, 2020: 79–90. Type locality: Ranch Road 189 (30.1823° N, 100.06° W), Val Verde County, Texas, USA. [USNM].

Stamnodes fergusoni – Rajaei *et al.* 2022 (online catalogue).
Stamnodes sp. (undescribed) – Knudson & Bordelon 2002: 7–8.

Distribution

Mexico: *Stamnodes fergusoni* is found in the grassland, steppe, thorn scrub, and foothill habitats of the Chihuahuan Desert of northern Mexico where its host plant is abundant. The Mexican distribution remains largely unclarified, with only a few collections from the Tamaulipan mezquital ecoregion of north Coahuila near Ciudad Acuña, and one record as far south as Sierra Mojada. So far as known, *S. fergusoni* is the only *Stamnodes* with a principally Chihuahuan Desert distribution. USA: *Stamnodes fergusoni* is primarily found in West Texas but extending westward to southeastern Arizona.

Biology

Stamnodes fergusoni is univoltine with a peak autumn flight from September through October and a single generation with mature caterpillars from October into November. Over most of this species' range, the pupa is believed to overwinter and remain in diapause until the following fall. Larvae (Fig. 93) are hosted by *Salvia* L. (Lamiaceae) and were reared to maturity on rock sage (*Salvia pinguifolia* (Fernald) Wooton & Standl.) in Arizona and New Mexico (Matson & Wagner 2020). Matson & Wagner (2020) also suggested this species may feed on shrubby blue sage (*Salvia ballotiflora* Benth.) in south Texas and Coahuila where *S. pinguifolia* is absent. This potential *Salvia ballotiflora* host plant association has not been confirmed.

Molecular characterization

This species is represented in BOLD as BIN: BOLD:ACO1632 (n = 6). At present, the average pairwise intraspecific distance is 0.76%, the maximum pairwise intraspecific distance is 1.59%, and the distance to the nearest neighbour, *Stamnodes aumatlapalli* sp. nov. (n = 2), is 4.19%.

Remarks

See Matson & Wagner (2020) for description, genitalic images, and other life history information.

Stamnodes deceptiva Barnes & McDunnough, 1918
Figs 12, 94–95

Stamnodes deceptiva Barnes & McDunnough, 1918: 136, pl. 23 fig. 1. Type locality: Paradise, Cochise County, Arizona, USA. [USNM].

Stamnodes deceptiva – McDunnough 1938: 151 (checklist). — Ferguson 1983: 103 (checklist). — Poole & Gentili 1996: 686 (checklist). — Scoble 1999: 901 (catalogue). — Knudson & Bordelon 2002: 7. — Scoble & Hausmann 2007 (online catalogue). — Pohl *et al.* 2016: 449 (checklist). — Matson & Wagner 2020: 79–90. — Rajaei *et al.* 2022 (online catalogue).

Diagnostic remarks

Stamnodes deceptiva is sometimes confused with *S. fervefactaria*. It is most easily set apart from the latter by its two, bright orange, transverse medial patches on the hindwing underside that sit inside a cream, transverse medial band.

Distribution

Mexico: *Stamnodes deceptiva* is primarily a mid-elevation northern Sierra Madre Occidental sky island endemic found in Sonora and Chihuahua. USA: this species is locally common in a few mountainous areas of southeastern Arizona and western New Mexico.

Biology

The life history of this species is unpublished, but caterpillars can be predicted to feed on herbaceous mints from knowledge of related taxa. Adults fly from July to August.

Molecular characterization

This species is represented in BOLD as BIN: BOLD:AAH4920 (n = 16). At present, the average pairwise intraspecific distance is 0.1%, the maximum pairwise intraspecific distance is 0.32%, and the distance to the nearest neighbour, *Stamnodes fergusoni* (n = 6), is 6.6%.

Stamnodes fervefactaria (Grote, 1881)
Figs 13, 94–95

Emplocia fervefactaria Grote, 1881: 177. Type locality: New Mexico, USA. [NHMUK].

Coenocalpe fervifactaria – Hulst 1896: 287. — Dyar 1902: 285 (cat.). — Pearsall 1906: 204.
Stamnodes fervifactaria – Pearsall 1909b: 366. — Powell & Opler 2009: 226; pl. 32 figs 33–34. — Lee 2014: e86 (inventory).
Stamnodes fervefactaria – Bonniwell 1920: 120. — McDunnough 1938: 151 (checklist). — Ferguson 1983: 103 (checklist). — Furniss *et al.* 1988: 9. — Poole & Gentili 1996: 686 (checklist). — Scoble 1999: 902 (catalogue). — Knudson & Bordelon 2002: 7–8. — Scoble & Hausmann 2007 (online catalogue). — Pohl *et al.* 2016: 449 (checklist). — Matson & Wagner 2020: 79–90. — Rajaei *et al.* 2022 (online catalogue).

Diagnostic remarks

Stamnodes fervefactaria lacks the two, bright orange, transverse, medial patches on the hindwing underside found in *S. deceptiva* and is cream coloured between the large grey patches of the hindwing underside that stands in contrast to the similar but stark-white patterning of visually similar *S. fergusoni*, *S. disrupta* sp. nov., *S. mariachi* sp. nov., and *S. erupta* sp. nov. Matson & Wagner (2020) provide detailed diagnostic comments about this species as it relates to its visually similar USA-distributed congeners.

Distribution

Mexico: while *Stamnodes fervefactaria* has not been recorded in Mexico, records of this species along the USA-Mexico border in the USA suggest this species is likely to occur in Mexico. USA: *S. fervefactaria* is found in the states of Arizona, New Mexico, Colorado, and Texas where its distribution is spotty and tied to mid- to high-elevation mountain habitats.

Biology

The life history of *S. fervefactaria* is unpublished, but caterpillars can be predicted to feed on herbaceous mints from knowledge of related taxa. Adults fly from July through September.

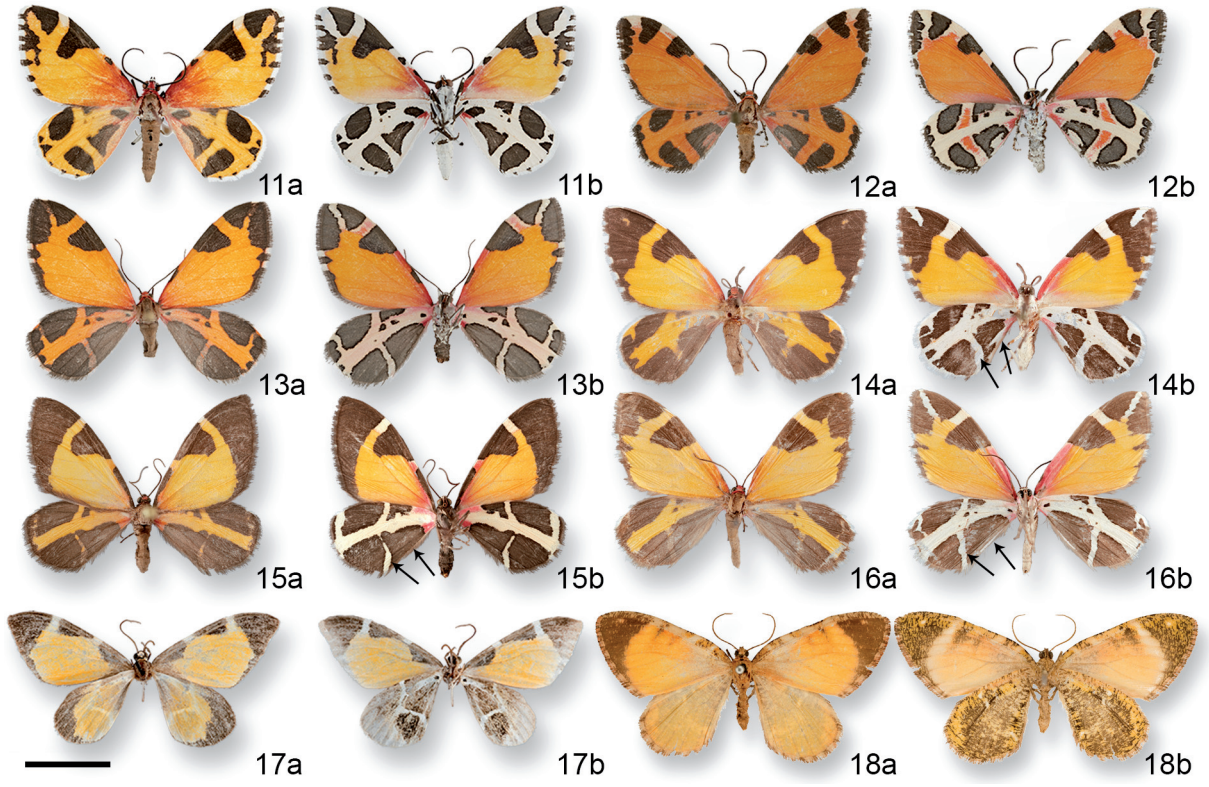
Molecular characterization

This species is represented in BOLD by a single BIN: BOLD:AAL5992 (n = 9, USA: Colorado, New Mexico). The distance to the nearest adjacent interspecific neighbour, *Stamnodes disrupta* sp. nov. (n = 5, Mexico: Sonora), is presently around 2.9% (Fig. 94).

Stamnodes disrupta sp. nov.
urn:lsid:zoobank.org:act:4F9AC763-7709-4260-877B-63C784314A85
Figs 14, 49, 67, 80, 94–95

Diagnosis

Stamnodes disrupta sp. nov. may be confused with *S. fervefactaria*, *S. fergusoni*, *S. mariachi* sp. nov. and *S. erupta* sp. nov. The bright, white reticulate pattern of the underside of the hindwing and apex of the forewing stand in contrast to the more off-white to cream colour of the same areas in *S. fervefactaria*. Additionally, the lead grey patches on the hindwing underside are finely bounded by a thin dark grey



Figs 11–18. Adult *Stamnodes* Guenée, [1858], dorsal (a) and ventral (b) views. **11**. *S. fergusoni* Matson & Wagner, 2020, holotype, ♂ (USNMENT01771260). **12**. *S. deceptiva* Barnes & McDunnough, 1918 (USNMENT01771261). **13**. *S. fervefactaria* (Grote, 1881) (USNMENT01771262). **14**. *S. disrupta* sp. nov., holotype (BMEC). **15**. *S. mariachi* sp. nov., holotype, ♀ (EMEC174828). **16**. *S. erupta* sp. nov., holotype, ♂ (USNMENT01771245). **17**. *S. ceniza* sp. nov., holotype, ♂ (LEP190410CNIN). **18**. *S. proana* (Druce, 1893), holotype (NHMUK). Scale bar = 1 cm.

edge in *S. fervefactaria* and *S. fergusoni* that is mostly absent in *S. disrupta*. *Stamnodes disrupta* is known from the northern Sierra Madre Occidental in the states of Sonora and Chihuahua, while visually similar sister species *S. erupta* is known from the vicinity of Mexico City. While the hindwing underside of *S. disrupta* bears a white, transverse medial band that gradually curves toward the tornus (see left arrow, Fig. 14b), the same band in *S. erupta* is straighter as it angles toward the tornus (see left arrow, Fig. 16b). The angle of this band affects the shape of the large lead-coloured patch near the tornus; in *S. disrupta*, this patch is more subovate, while in *S. erupta*, it is more triangulate. The basal inner margin of *S. disrupta* also appears to have more white scales along the inner edge of the large grey basal patch of the same area in *S. mariachi* and *S. erupta* (see right arrows, Figs 14b, 15b, 16b). *Stamnodes disrupta* may also be separated from *S. mariachi* by the presence of a checkered forewing fringe and oblique white patch in apical area of forewing underside.

Male genitalia readily separate *S. disrupta* sp. nov. (Fig. 49) from *S. fergusoni* (Matson & Wagner 2020: fig. 7). *Stamnodes fergusoni* has a juxta that bears posterolateral conical processes and its vesica has a large echinate patch of cornuti; these characters are absent in *S. disrupta*. However, the male genitalia of *S. disrupta*, *S. fervefactaria*, *S. mariachi* sp. nov., and *S. erupta* sp. nov. are exceedingly similar with only subtle differences. While the uncus of *S. disrupta* (Fig. 49a) and *S. fervefactaria* is broadly swollen medially, that of *S. mariachi* (Fig. 50a) and *S. erupta* (Fig. 51a) tapers only slightly along its length and lacks an apparent medial swelling. The shield-like juxta of *S. disrupta* is larger, and more pronounced on its distal surface than in *S. mariachi*.

Etymology

The species name *disrupta* is derived from the Latin word '*disrumpere*', meaning 'to shatter' or 'to break apart'. It alludes to the broken, white, hindwing underside pattern of this moth. The phonetic similarity with visually similar *S. erupta* sp. nov. is intentional to reinforce the close relationship between these two species.

Material examined

Holotype

MEXICO • ♂; Chihuahua, 3 mi. S of Temoris; [27.23° N, 108.25° W]; 5 Sep. 1969; T.A. Sears, R.C. Gardner, C.S. Glaser leg.; BMEC.

Paratypes (9 ♂♂, 2 ♀♀)

MEXICO – **Chihuahua** • 1 ♂; 3 mi. S of Temoris; [27.23° N, 108.25° W]; 9 Sep. 1969; T.A. Sears, R.C. Gardner, C.S. Glaser leg. genitalia: TAM-2023-260 (USNM 154211); USNMENT01771237. – **Sonora** • 2 ♂♂, 1 ♀; highway 16 K260 in prominent canyon; [28.37° N, 109.05° W]; 10–12 Sep. 1992; R. Wells leg.; genitalia: TAM-2023-261; BMEC • 1 ♂; same collection data as for preceding; AMNH_IZC 00353029 • 1 ♂; Rte. 16 Río Maycoba, 17 mi. E of Yécora; [28.43° N, 109.19° W]; 29 Sep. 1991; Jim P. Brock leg.; genitalia: TAM-2023-256; MGCL Accession #2016-49; E.C. Knudson Knudson/Bordelon leg.; MGCL • 4 ♂♂, 1 ♀; 20 mi. W of Yécora, Mesa Companera, Mex Hwy 16; [28.46° N, 109.26° W]; 12 Sep. 2004; P. Opler leg.; Bold Process IDs: ABLCX271-10 to ABLCX275-10; GenBank: HQ543795 to HQ543799; CSU.

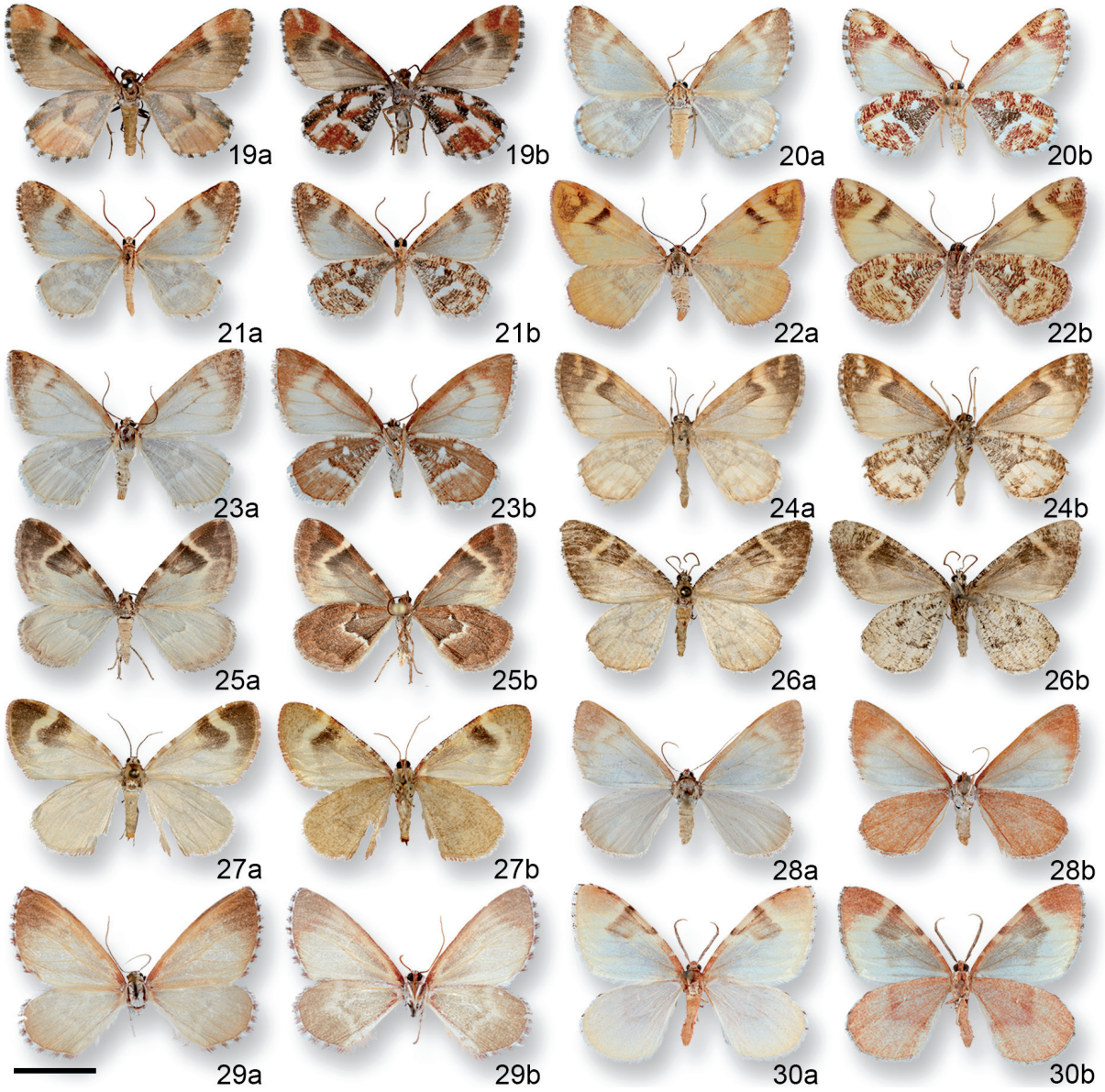
Description

Male

Forewing length. 17–18 mm (n = 10).

Head. Antenna filiform, fuscous to black. Vertex scarlet; frons mostly fuscous, with a few midsaggital white scales and white along ventral and lateral margins. Labial palpus short, slightly porrect, subequal to diameter of eye, fuscous and white. Cephalic collar mostly scarlet.

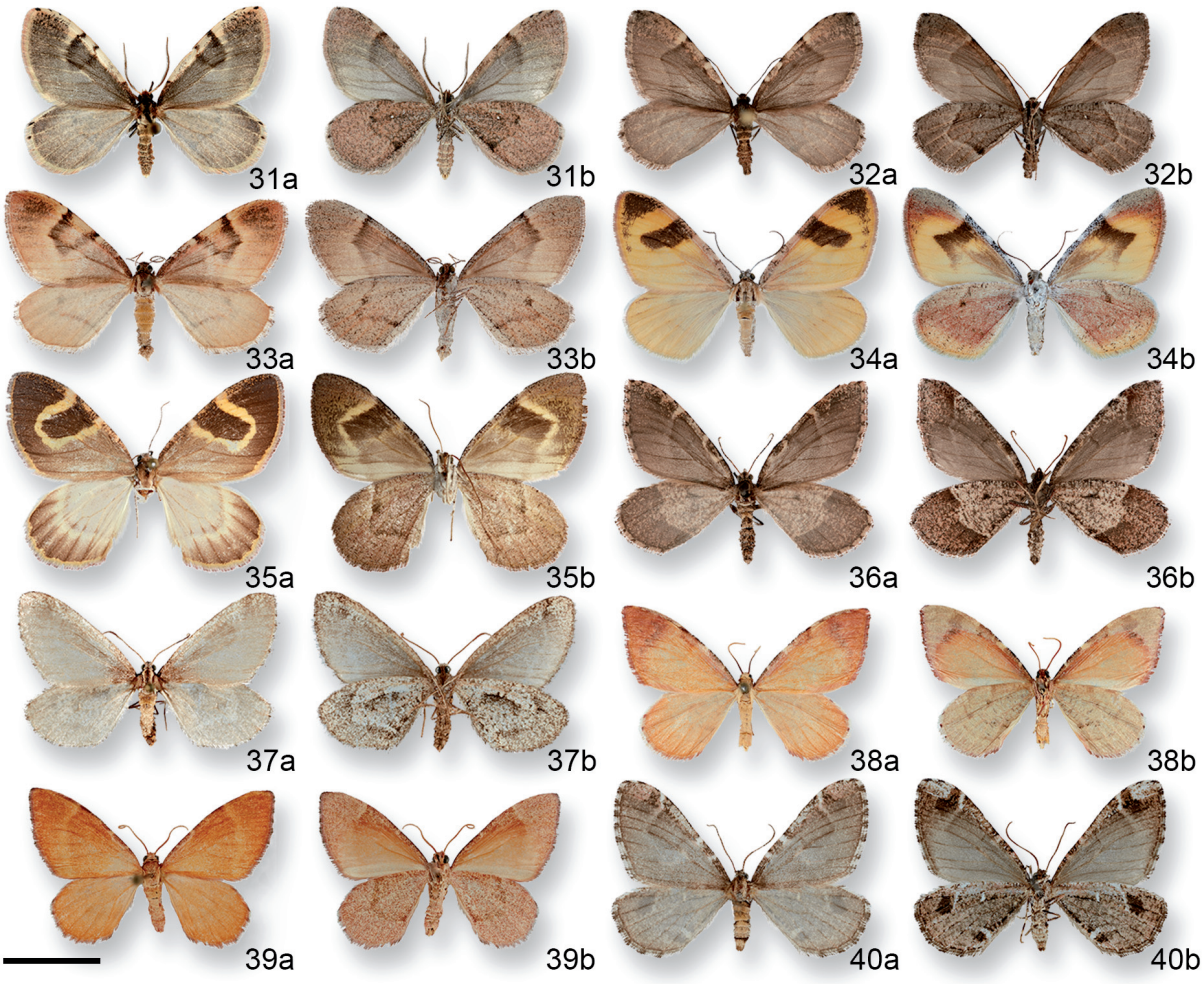
Thorax. Patagium mostly scarlet; tegula scarlet at base but otherwise mostly fuscous transitioning to lighter grey distally. Mesothorax fuscous above, white and pink below. Legs mixture of white and fuscous; tibial spur formula 0–2–4; epiphysis well developed.



Figs 19–30. Adult *Stamnodes* Guenée, [1858], dorsal (a) and ventral (b) views. **19**. *S. saltillo* sp. nov., holotype, ♂ (CNIN). **20**. *S. formosata* (Strecker, 1878) (USNMENT01771263). **21**. *S. lampra* Rindge, 1878, paratype (USNMENT01771264). **22**. *S. franckata* (Pearsall, 1909) (USNMENT01771255). **23**. *Stamnodes* sp. (?undescribed; Mexico: Nuevo León) (USNMENT01523823). **24**. *S. patamon* (Druce, 1893) (CNIN). **25**. *S. coenonymphata* (Hulst, 1900) (TAM). **26**. *S. catarina* sp. nov., holotype, ♂ (AMNH_IZC 00352926). **27**. *S. churro* sp. nov., holotype, ♀ (AMNH_IZC 00352920). **28**. *S. ferropulvisa* sp. nov., holotype, ♀ (USNMENT01523824). **29**. *S. calcarea* sp. nov., holotype, ♂ (CMNH). **30**. *S. ululata* Pearsall, 1912 (USNMENT01771256). Scale bar = 1 cm.

Forewing. Scarlet near base, diffusing to light orange-yellow ground colour. Costa with small antemedial lead-black patch and much larger, trigonate to subquadrangular, costomedial, lead-black patch. Apical area broadly lead-black. Underside similar to upperside, but scarlet base more intense in costal area, and costal area given toward white between lead-black costomedial patch and apical area; apical area also with thin, oblique white patch. Fringe lightly checkered.

Hindwing. Concolourous with forewing above, but ground colour mostly reduced to medial, longitudinal ray and branches between large, ill-defined, lead-black coloured patches (Fig. 14a). Underside sharing similar pattern elements, but much more starkly contrasted with white rays between large, lead-black coloured patches; patches along costal antemedian and postmedian, thinly along outer margin, along basal half of inner margin, and at tornus (Fig. 14b). Tornal patch subovate. Fringe as in forewing.



Figs 31–40. Adult *Stamnodes* Guenée, [1858], dorsal (a) and ventral (b) views. **31**. *S. costimacula* (Grossbeck, 1912) (DLW). **32**. *S. cassinoi* Swett, 1917 (DLW). **33**. *S. annellata* (Hulst, 1887) (USNMENT01771252). **34**. *S. seiferti* (Neumoegen, 1882) (USNMENT01771250). **35**. *S. tenebrosa* sp. nov., holotype, ♂ (AMNH_IZC 00352924). **36**. *S. affiliata* Pearsall, 1911 (DLW). **37**. *S. reckseckeri* Pearsall, 1910 (USNMENT01771257). **38**. *S. apollo* Cassino, 1920 (USNMENT01771258). **39**. *S. agapetica* (Dyar, 1916) (USNMENT01771259). **40**. *S. albiapicata* Grossbeck, 1910 (USNMENT01771253). Scale bar = 1 cm.

Abdomen. Fuscous.

Genitalia (Fig. 49). Uncus long, narrow, and medially swollen. Subscaphium well developed. Inner surface of valve with dense hair tuft arising from basal tubercle. Juxta shield-like, void of stiff setae or posterior processes. Vesica without large cornuti, but with extremely small rugose papillae at base of vesica and along ovoid lateral diverticulum.

Female

Outwardly undifferentiated from male.

Forewing length. 17 mm (n = 2).

Genitalia (Fig. 67). Anterior apophysis two-thirds length of posterior apophysis. Ostium large, lamella antevaginalis strongly sclerotized and subcircular. Short and narrow ductus bursae with prominent anterior sclerite flattened on ventral surface and dorsolaterally rolled toward median. Corpus bursae spherical; bearing two signa, each with inward directed process; one signum situated near posterior base of corpus bursae (near ductus bursae) and one near anterior third, each covered with minute papillae.

Distribution (Fig. 80)

Mexico: *Stamnodes disrupta* sp. nov. is known from the Sierra Madre Occidental pine-oak forests of Sonora and Chihuahua.

Biology

Stamnodes disrupta sp. nov. flies in September. The immature stages remain unknown but are likely hosted by mints (Lamiaceae).

Molecular characterization

This species is represented in BOLD as BOLD:AAM2600 (n = 5, Mexico: Sonora) At present, the average pairwise intraspecific distance is 0.22%, the maximum pairwise intraspecific distance is 0.48%, and the distance to the nearest neighbour, *Stamnodes fervefactaria* (n = 9), is 2.86%.

Stamnodes mariachi sp. nov.
urn:lsid:zoobank.org:act:5C4231A3-88F6-4B1B-B48D-93B1E5ED6C61
Figs 15, 50, 68, 81, 95

Diagnosis

Stamnodes mariachi sp. nov. may be confused with *S. disrupta* sp. nov., *S. fervefactaria*, *S. fergusoni*, and *S. erupta* sp. nov. The bright, white reticulate pattern of the underside of the hindwing and apex of the forewing stand in contrast to the more off-white to cream colour of the same areas in *S. fervefactaria*. *Stamnodes mariachi* can be separated from all aforementioned species by the absence of a checkered forewing fringe and absence of an oblique white patch in the apical area of the forewing underside. Additionally, the black apical area of the forewing that broadly extends all the way down the outer margin to the tornus appears to be diagnostic.

Male genitalia readily separate *S. mariachi* sp. nov. (Fig. 50) from *S. fergusoni* (Matson & Wagner 2020: fig. 7). *Stamnodes fergusoni* has a juxta that bears posterolateral conical processes and its vesica has a large echinate patch of cornuti; these characters are absent in *S. mariachi*. However, the male genitalia of *S. mariachi*, *S. disrupta* sp. nov., *S. fervefactaria*, and *S. erupta* sp. nov. are exceedingly similar with only subtle differences. While the uncus of *S. disrupta* (Fig. 49a) and *S. fervefactaria* is broadly swollen

medially, that of *S. mariachi* (Fig. 50a) and *S. erupta* (Fig. 51a) tapers slightly along its length and lacks an apparent medial swelling.

Etymology

The species name *mariachi* refers to the style of traditional Mexican music that has its roots in rural Western Mexico where this species may be found. The name is a noun in apposition.

Material examined

Holotype

MEXICO • ♀; Durango, 3 mi. S of El Salto; [23.73° N, 105.35° W]; elev. 8000 ft; 10 Aug. 1986; J. Brown leg.; black light trap; EMEC174828.

Paratypes (3 ♂♂, 1 ♀)

MEXICO – **Durango** • 1 ♂; same collection data as for holotype; genitalia: TAM-2023-282; CNIN. – **Sinaloa** • 1 ♂; 8 mi. W of El Palmito; elev. 6400 ft; 8–12 Aug. 1972; J. Powell, D. Veirs, C.D. MacNeill leg.; black & white lights; EMEC1748429 • 1 ♀; same collection data as for preceding; genitalia: TAM-2023-283; AMNH_IZC 00353020 • 1 ♂; same collection data as for preceding; genitalia: TAM-2023-285 (USNM 154213); USNMENT01771227.

Description

Male

Forewing length. 15 mm (n = 3).

Head. Antenna filiform, fuscous to black. Vertex scarlet and fuscous; frons mostly fuscous, with a few midsaggital white scales and white along lateral margins. Labial palpus short, slightly porrect, subequal to diameter of eye, mostly fuscous. Cephalic collar mostly fuscous.

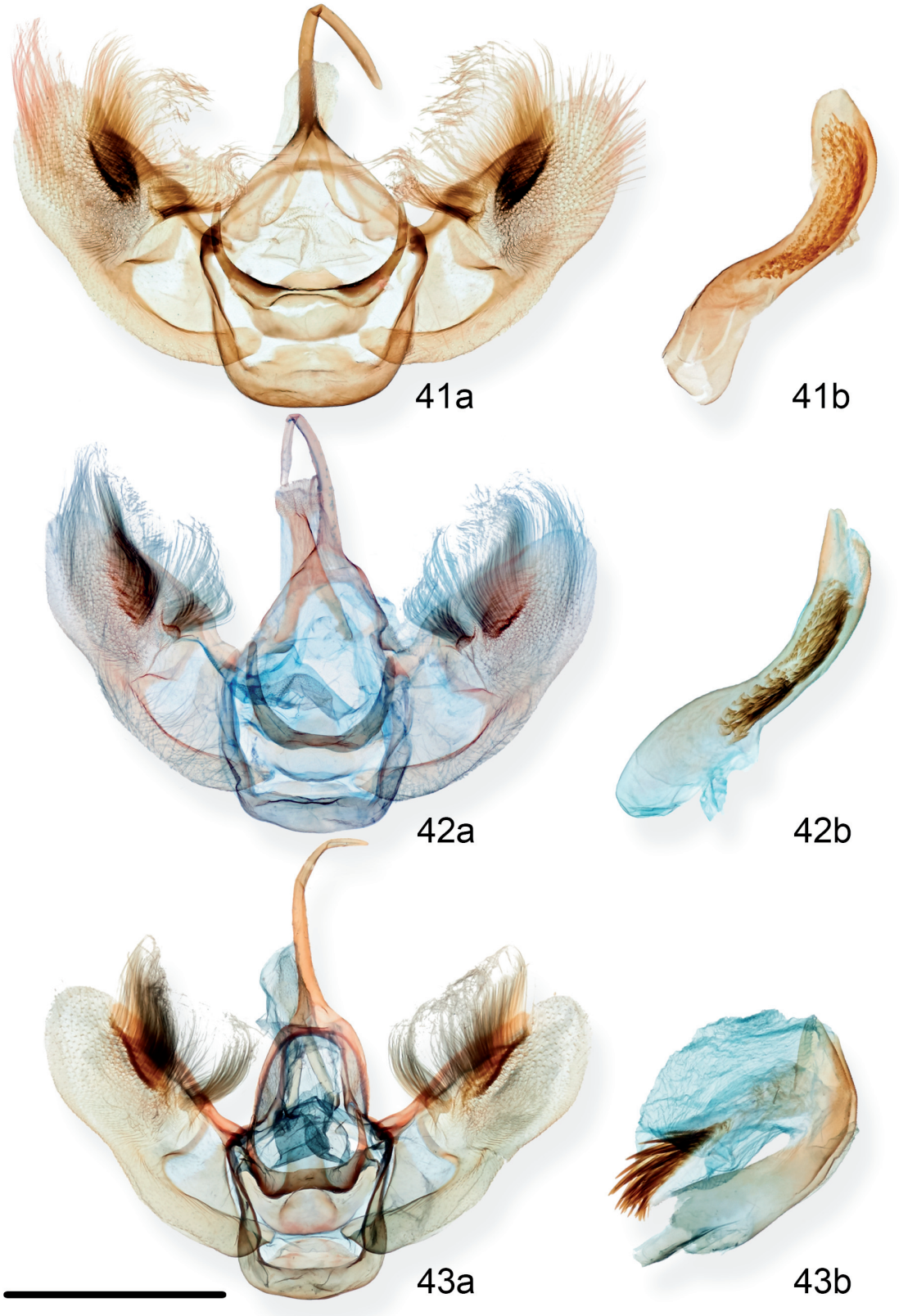
Thorax. Patagium mixture of scarlet and fuscous; tegula mostly fuscous. Mesothorax fuscous. Legs mixture of white and fuscous; tibial spur formula 0–2–4; epiphysis well developed.

Forewing. Faintly scarlet near base, diffusing to light orange-yellow ground colour. Costa with basal lead-black patch and much larger, trigonate, costomedial, lead-black patch. Apical area and broadly along outer margin lead-black. Underside similar to upperside, but scarlet base more apparent in costal area, and costal area given toward white between lead-black costomedial patch and apical area. Fringe fuscous.

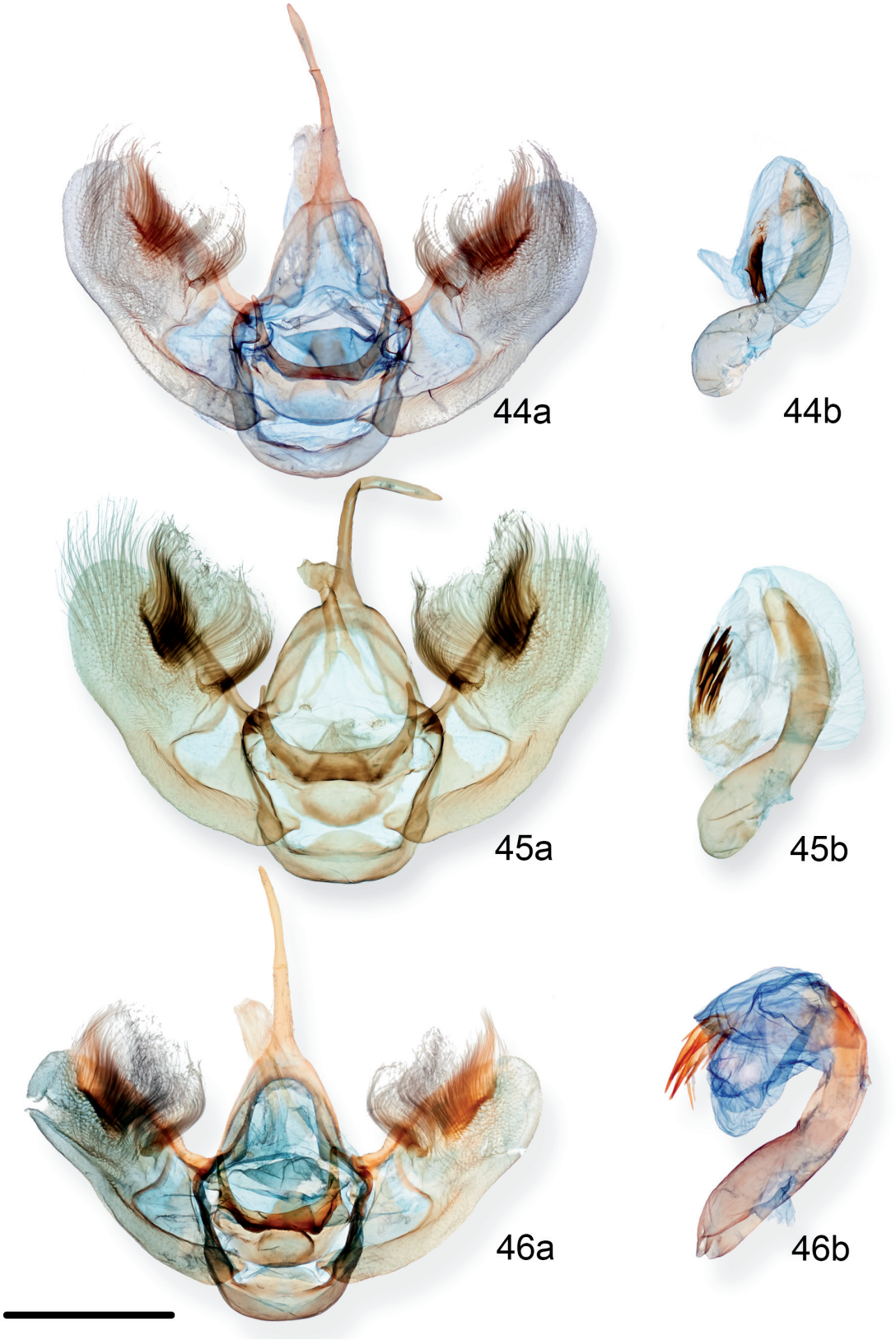
Hindwing. Concolourous with forewing above, but ground colour mostly reduced to medial, longitudinal ray and branches between large, ill-defined, lead-black coloured patches (Fig. 15a). Underside sharing similar pattern elements, but much more starkly contrasted with white rays between large, lead-black coloured patches; patches along costal antemedian and postmedian, thinly along outer margin, along basal half of inner margin, and at tornus (Fig. 15b). Basal area along costa and inner margin also more broadly highlighted with scarlet. Fringe as in forewing.

Abdomen. Fuscous.

Genitalia (Fig. 50). Uncus long, narrow, and tapering. Subscaphium well developed. Inner surface of valve with dense hair tuft arising from basal tubercle. Juxta shield-like, void of stiff setae or posterior processes. Vesica without large cornuti, but with extremely small rugose papillae at base of vesica and along ovoid lateral diverticulum.



Figs 41–43. Male genitalia: genital capsules (a) and phalli (b). **41**. *S. aumatlapalli* sp. nov., paratype (TAM-2021-063, CNIN). **42**. *S. cannonaria* (Schaus, 1927) (TAM-2022-104, USNM 154246). **43**. *S. penguinifera* (Dyar, 1910) (TAM-2020-044, CNIN). Scale bar = 1 mm.



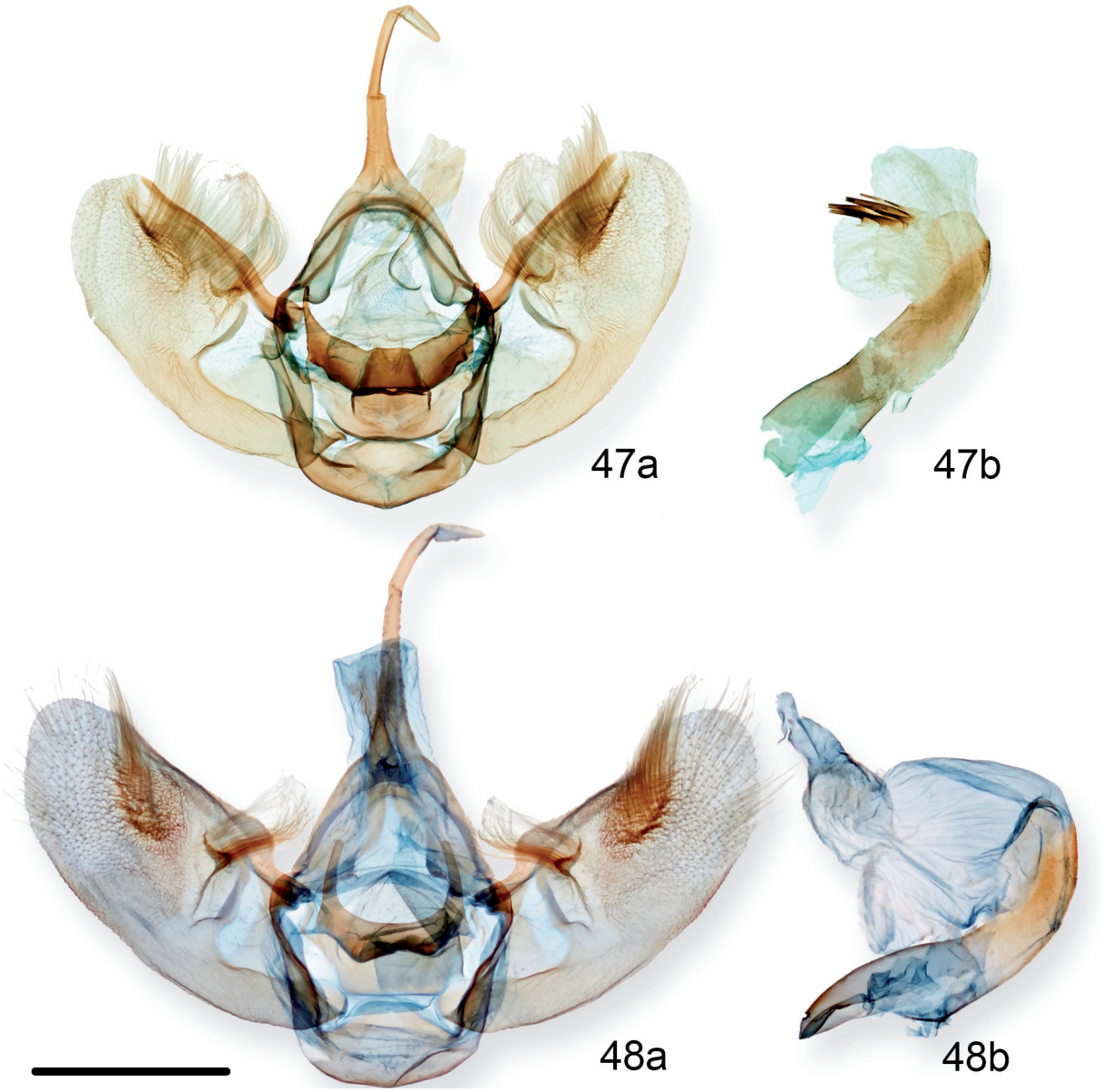
Figs 44–46. Male genitalia: genital capsules (a) and phalli (b). **44**. *S. clara* sp. nov., holotype (TAM-2022-130, AMNH). **45**. *S. carota* sp. nov., paratype (TAM-2023-262, USNM 154208). **46**. *S. favilla* sp. nov., paratype (TAM-2020-042, CNIN). Scale bar = 1 mm.

Female

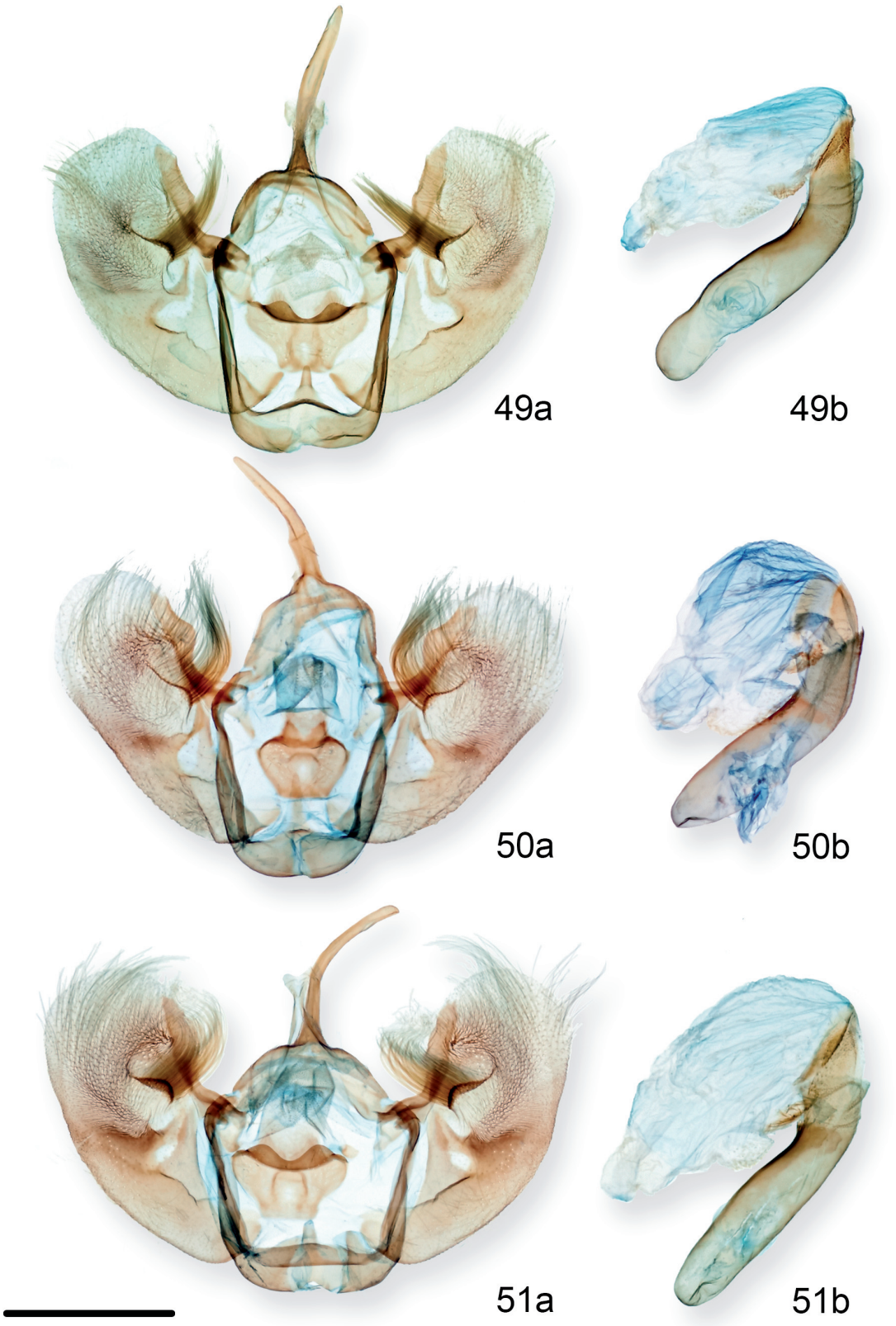
Outwardly undifferentiated from male.

Forewing length. 16–17 mm (n = 2).

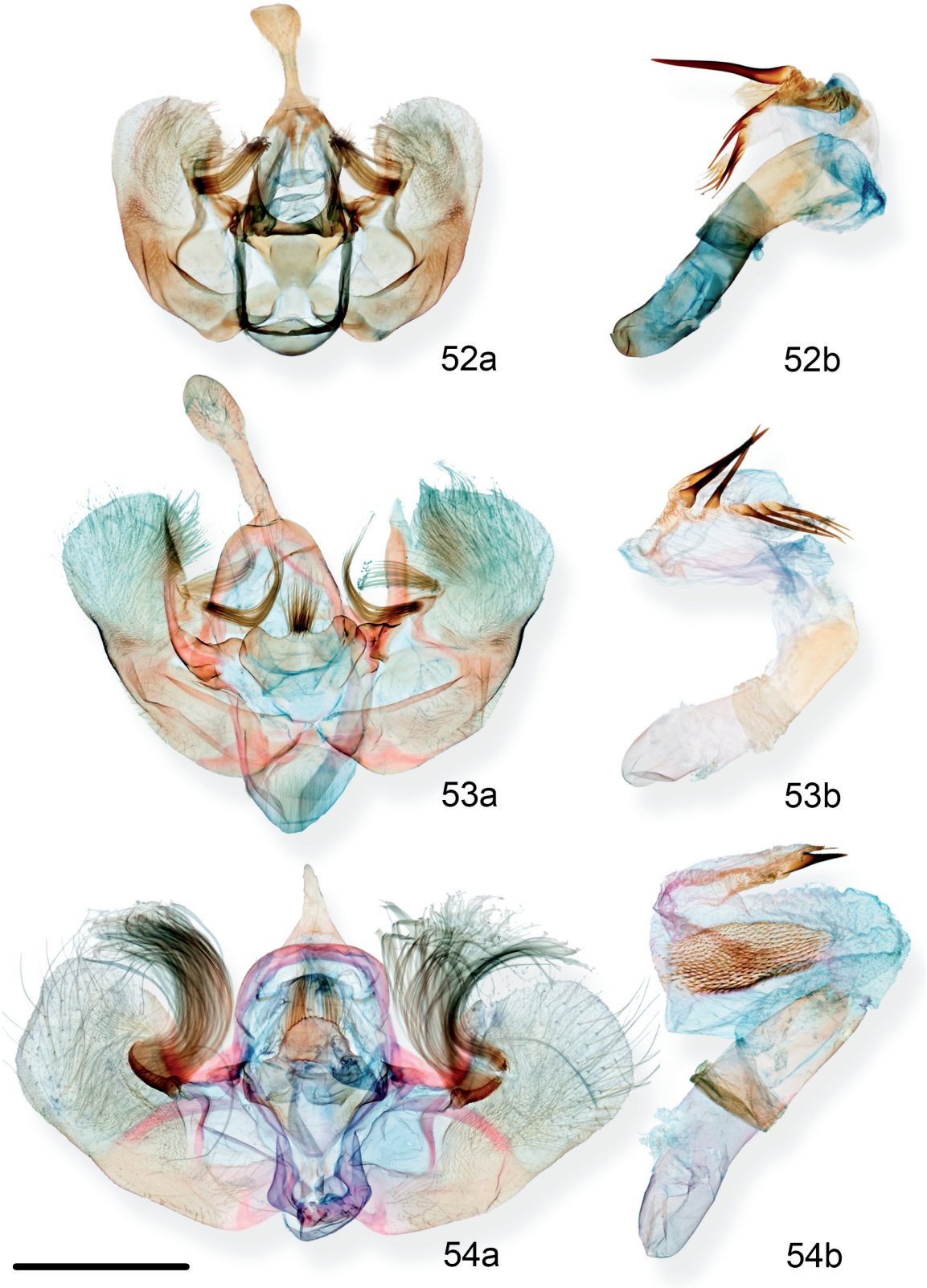
Genitalia (Fig. 68). Anterior apophysis two-thirds length of posterior apophysis. Ostium large, lamella antevaginalis subcircular. Short and narrow ductus bursae with prominent anterior sclerite flattened on ventral surface and dorsolaterally rolled toward median. Corpus bursae spherical, bearing two signa; tiny signum situated near posterior base of corpus bursae (near ductus bursae) and second signum, situated at anterior third, with inward directed process and rugose areole of minute papillae.



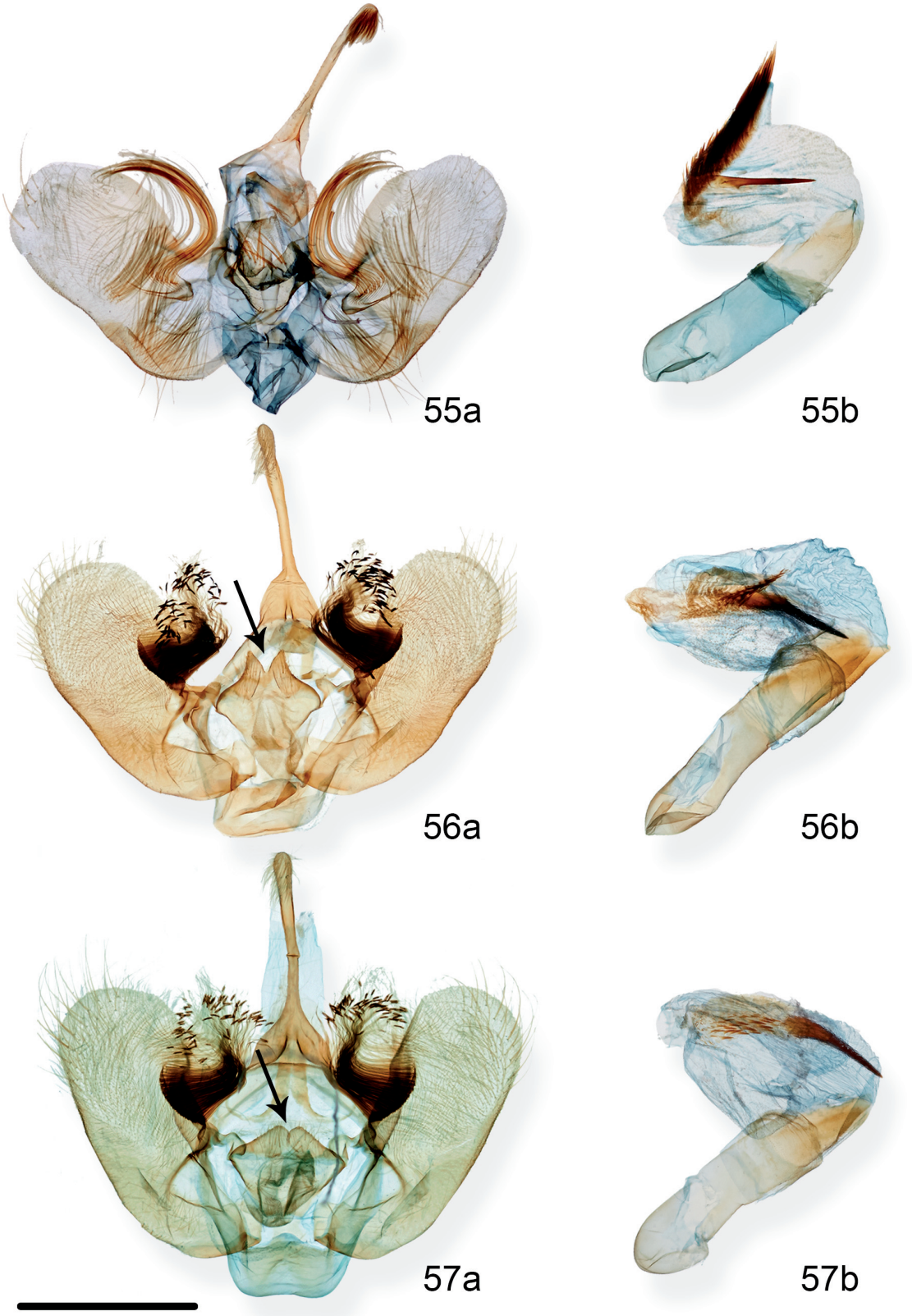
Figs 47–48. Male genitalia: genital capsules (a) and phalli (b). **47**. *S. fuego* sp. nov., paratype (TAM-2020-027, USNM 154202). **48**. *S. matrona* sp. nov., paratype (TAM-2023-280, USNM 154215). Scale bar = 1 mm,



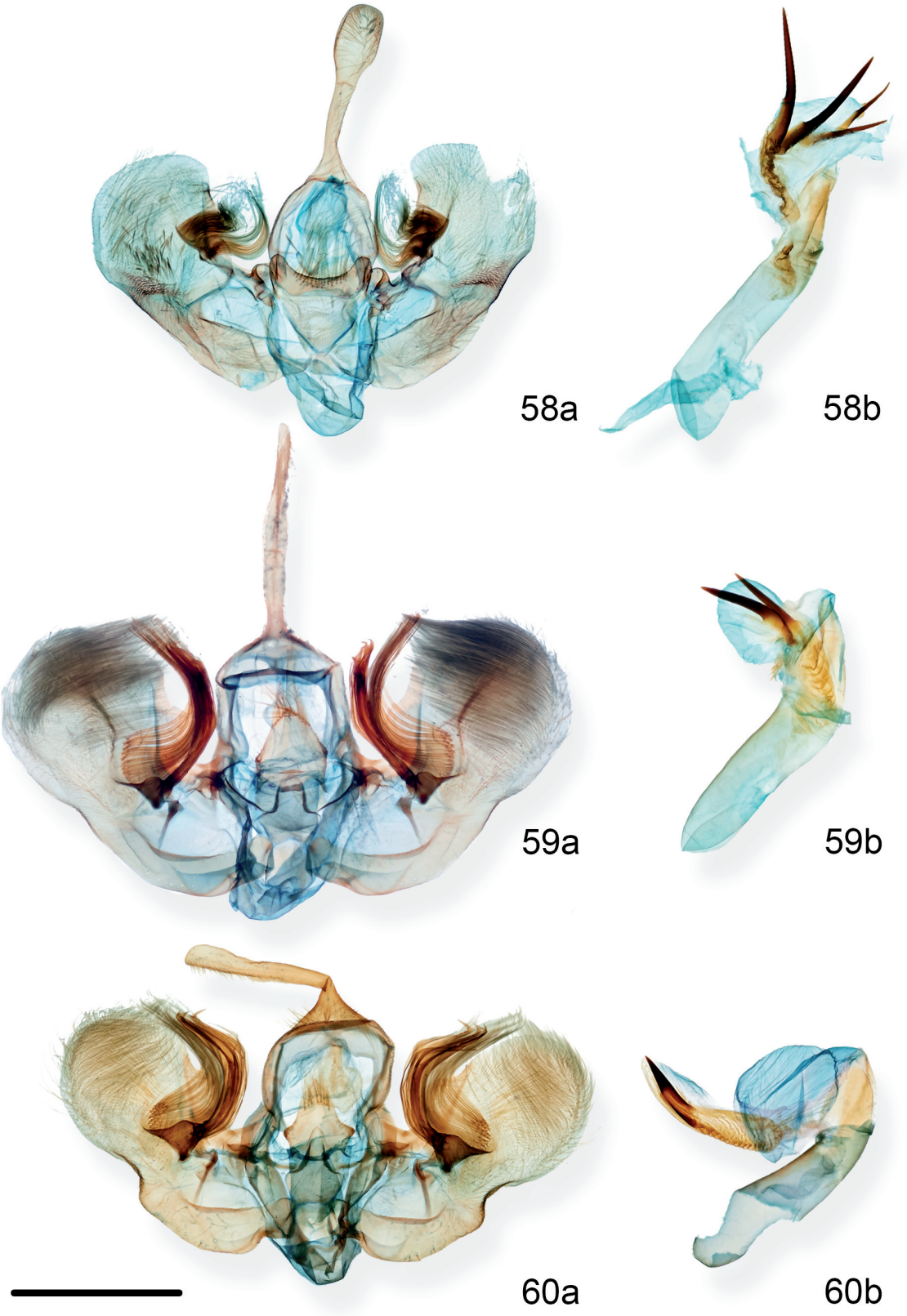
Figs 49–51. Male genitalia: genital capsules (a) and phalli (b). **49**. *S. disrupta* sp. nov., paratype (TAM-2023-260, USNM 154211). **50**. *S. mariachi* sp. nov., paratype (TAM-2023-285, USNM 154213). **51**. *S. erupta* sp. nov., paratype (TAM-2023-257, USNM 154210). Scale bar = 1 mm.



Figs 52–54. Male genitalia: genital capsules (a) and phalli (b). **52**. *S. saltillo* sp. nov., paratype (TAM-2020-059, CNIN). **53**. *S. catarina* sp. nov., paratype (TAM-2022-107, USNM 154205). **54**. *S. churro* sp. nov., paratype (TAM-2022-105, USNM 154206). Scale bar = 1 mm.



Figs 55–57. Male genitalia: genital capsules (a) and phalli (b). **55**. *S. patamon* (Druce, 1893) (TAM-2022-139, CNIN). **56**. *S. ferropulvisa* sp. nov., paratype (TAM-2023-219, CNIN). **57**. *S. calcarea* sp. nov., holotype (TAM-2023-194, CMNH). Scale bar = 1 mm.



Figs 58–60. Male genitalia: genital capsules (a) and phalli (b). **58**. *S. tenebrosa* sp. nov., holotype (TAM-2021-097, AMNH). **59**. *S. apollo* Cassino, 1920 (TAM-2020-046, CNIN). **60**. *S. agapetica* (Dyar, 1916) (TAM-2023-205, CMNH). Scale bar = 1 mm.

Distribution (Fig. 81)

Mexico: *Stamnodes mariachi* sp. nov. is known from the Sierra Madre Occidental pine-oak forests of Durango and possibly Sinaloa (see Remarks).

Biology

Stamnodes mariachi sp. nov. flies in August. The immature stages remain unknown but are likely hosted by mints (Lamiaceae).

Molecular characterization

This species has not been sequenced.

Remarks

Three of the four paratypes were collected from "Sin. [Sinaloa], 8 mi. W of El Palmito, 6400 [ft]". However, there is a discrepancy in the elevation as the actual elevation 8 miles west of El Palmito, Sinaloa is around 1500–2000 ft. Eight miles west of a different village – El Palmito, Durango – matches the mentioned elevation of 6400 ft, suggesting confusion in either the recorded elevation or the precise locality due to villages with identical names. Because of this uncertainty, inferred GPS coordinates are omitted, and these three individuals are excluded from the range map.

Stamnodes erupta sp. nov.
urn:lsid:zoobank.org:act:461F7E96-F1B3-4BEC-A0BF-9BF90C74F602
Figs 16, 51, 69, 82, 95

Diagnosis

Stamnodes erupta sp. nov. may be confused with *S. fervefactaria*, *S. fergusoni*, *S. disrupta* sp. nov. and *S. mariachi* sp. nov. The bright, white reticulate pattern of the underside of the hindwing and apex of the forewing stand in contrast to the more off-white to cream colour of the same areas in *S. fervefactaria*. Additionally, the lead grey patches on the hindwing underside are finely bounded by a thin dark grey edge in *S. fervefactaria* and *S. fergusoni* that is absent in *S. erupta*. *Stamnodes erupta* is known from the vicinity of Mexico City, while *Stamnodes disrupta* is so far only known from the northern Sierra Madre Occidental in the states of Sonora and Chihuahua. While the hindwing underside of *S. erupta* bears a straight, white, transverse medial band that angles toward the tornus (see left arrow, Fig. 16b), the same band in *S. disrupta* gradually curves toward the tornus (see left arrow, Fig. 14b). The angle of this band affects the shape of the large lead-coloured patch near the tornus; in *S. erupta*, it is more triangulate, while in *S. disrupta*, it is more subovate. Additionally, the basal inner margin of *S. erupta* lacks the white scaling along the inner edge of the large grey patch of the same area found in *S. disrupta* (see right arrows, Figs 14b, 16b). *Stamnodes erupta* can be separated from *S. mariachi* by the presence of a checkered forewing fringe and oblique white patch in apical area of forewing underside.

Male genitalia readily separate *S. erupta* sp. nov. (Fig. 51) from *S. fergusoni* (Matson & Wagner 2020: fig. 7). *Stamnodes fergusoni* has a juxta that bears posterolateral conical processes and its vesica has a large echinate patch of cornuti; these characters are absent in *S. erupta*. However, the male genitalia of *S. disrupta* sp. nov., *S. fervefactaria*, *S. erupta*, and *S. mariachi* sp. nov. are exceedingly similar with only subtle differences. While the uncus of *S. disrupta* (Fig. 49a) and *S. fervefactaria* is broadly swollen medially, that of *S. mariachi* (Fig. 50a) and *S. erupta* (Fig. 51a) tapers only slightly along its length and is not noticeably swollen medially.

Etymology

The species name *erupta* was inspired by the moth's striking colouration, which to an imaginative eye, may resemble the explosive eruption of a volcano. It is derived from the Latin verb '*erumpere*', meaning 'to break out' or 'to burst forth'.

Material examined

Holotype

MEXICO • ♂; [Mexico City], nr City Mex.; [19.6° N, 99.1° W]; August; R. Muller leg.; 8664; genitalia: TAM-2023-258 (USNM 154209); USNMENT01771245.

Paratypes (6 ♂♂, 2 ♀♀)

MEXICO • 2 ♂♂; [illegible pencil writing]; Draudt 1924; Dognin Collection; genitalia: TAM-2023-257 (USNM 154210); USNMENT01771246, USNMENT01771247. – **México** • 1 ♀; 7 air km WSW of Juchitepec; [19.16° N, 98.90° W]; 24 Aug. 1987; J. Brown and J. Powell leg.; genitalia: TAM-2023-286 (USNM 154212); USNMENT01771228 • 1 ♂; same collection data as for preceding; 25 Aug. 1987; J. Brown and J. Powell leg.; AMNH_IZC 00353018 • 1 ♂; same collection data as for preceding; CNIN • 2 ♂♂, 1 ♀; 7 air km WSW of Juchitepec; [19.16° N, 98.90° W]; 24 Aug. 1987; J. Brown and J. Powell leg.; EMEC1748445 to EMEC1748447.

Description

Male

Forewing length. 17–18 mm (n = 7).

Head. Antenna filiform, fuscous to black. Vertex scarlet; frons mostly fuscous, with a few white scales and white along ventral and lateral margins. Labial palpus short, slightly porrect, subequal to diameter of eye, fuscous and white. Cephalic collar mostly scarlet.

Thorax. Patagium mostly scarlet; tegula scarlet at base but otherwise mostly fuscous transitioning to lighter grey distally. Mesothorax fuscous above, white and pink below. Legs mixture of white and fuscous; tibial spur formula 0–2–4; epiphysis well developed.

Forewing. Scarlet near base, diffusing to light orange-yellow ground colour. Costa with large, trigonate to subquadrangular, costomedial, lead-black patch. Apical area broadly lead-black; sometimes with subtle oblique, patch of ground colour. Underside similar to upperside, but scarlet base more intense in costal area, and costal area given toward white between lead-black costomedial patch and apical area; apical area also with thin, oblique white patch. Fringe lightly checkered.

Hindwing. Concolourous with forewing above, but ground colour mostly reduced to medial, longitudinal ray between large, ill-defined, lead-black coloured patches (Fig. 16a). Underside sharing similar pattern elements, but much more starkly contrasted with white rays between large, lead-black coloured patches; patches along costal antemedian and postmedian, basal half of inner margin, and at tornus (see Fig. 16b). Tornal patch trigonate. Fringe as in forewing.

Abdomen. Fuscous.

Genitalia (Fig. 51). Uncus long, narrow, and tapering toward apex. Subscaphium well developed. Inner surface of valva with dense hair tuft arising from basal tubercle. Juxta shield-like with posterior surface medially depressed; void of stiff setae. Vesica without large cornuti, but with extremely small rugose papillae and needle-like cornuti at base of vesica; rugose papillae also along ovoid lateral diverticulum.

Female

Outwardly undifferentiated from male.

Forewing length. 18–19 mm (n = 2).

Genitalia (Fig. 69). Apophyses girthy; anterior apophysis two-thirds length of posterior apophysis. Ostium large, lamella antevaginalis strongly sclerotized. Short and narrow ductus bursae with prominent anterior sclerite flattened on ventral surface and dorsolaterally rolled toward median. Corpus bursae spherical; bearing two signa, each with inward directed process; one signum situated near posterior base of corpus bursae (near ductus bursae) and second near anterior third, each covered with minute papillae.

Distribution (Fig. 82)

Mexico: So far as known, *Stamnodes erupta* sp. nov. is a denizen of the pine-oak woodlands of the Trans-Mexican Volcanic Belt.

Biology

Stamnodes erupta sp. nov. is known to fly in August. The immature stages remain unknown but are likely hosted by mints (Lamiaceae).

Molecular characterization

This species has not been sequenced.

Stamnodes ceniza sp. nov.
urn:lsid:zoobank.org:act:6174E8AF-DF9C-49EF-8D27-6B312E01E7A3
Figs 17, 70, 83, 94–95

Diagnosis

This taxon is unmistakable and cannot be confused with other known *Stamnodes*; the grey predominance of the hindwing underside is especially diagnostic (see Fig. 17b).

Etymology

The specific epithet, '*ceniza*', Spanish for ash, follows a theme with two other species described in this work: *S. favilla* sp. nov. (ember or spark) and *S. fuego* sp. nov. (fire). This name was inspired by the ashen, dark grey apices and grey hindwing underside.

Material examined

Holotype

MEXICO • ♂; Hidalgo, San Agustín Tlaxiaca; 20.13622° N, 98.81453° W; elev. 2434 msnm; Aug.–Oct. 2021; Elsi B. Pérez-Jarillo leg.; genetic voucher: TAM0325; BOLD Process ID: MXGEO096-23; GenBank: OQ507471; LEP190410CNIN.

Paratype

MEXICO • 1 ♀; Querétaro, Chuvejé; 21°10′41″ N, 99°33′38″ W; 28 Jan. 1998; Balcázar and Ibarra leg.; genetic voucher: TAM0058; genitalia: TAM-2020-035; CNIN LEP 063243.

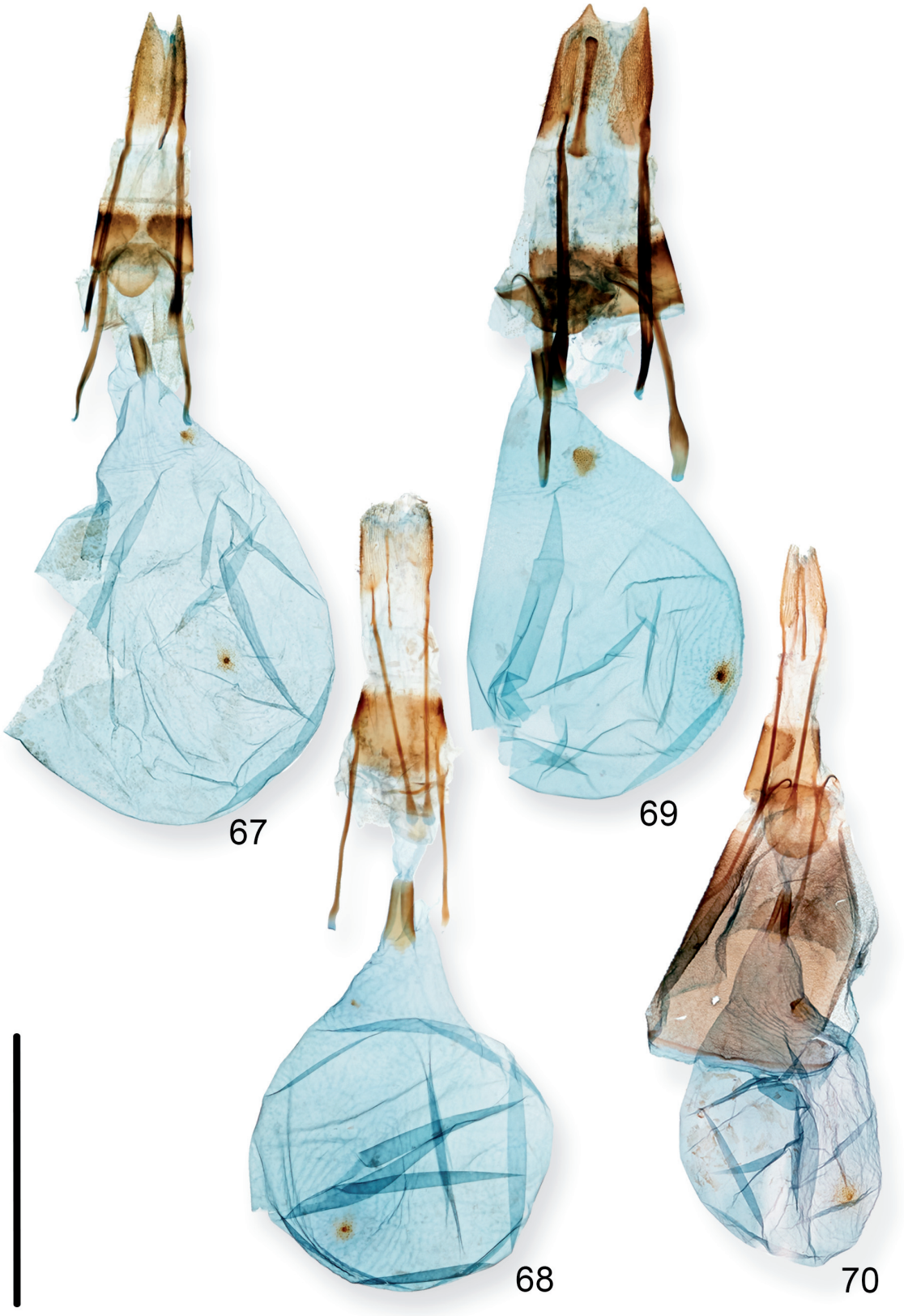
Description

Male

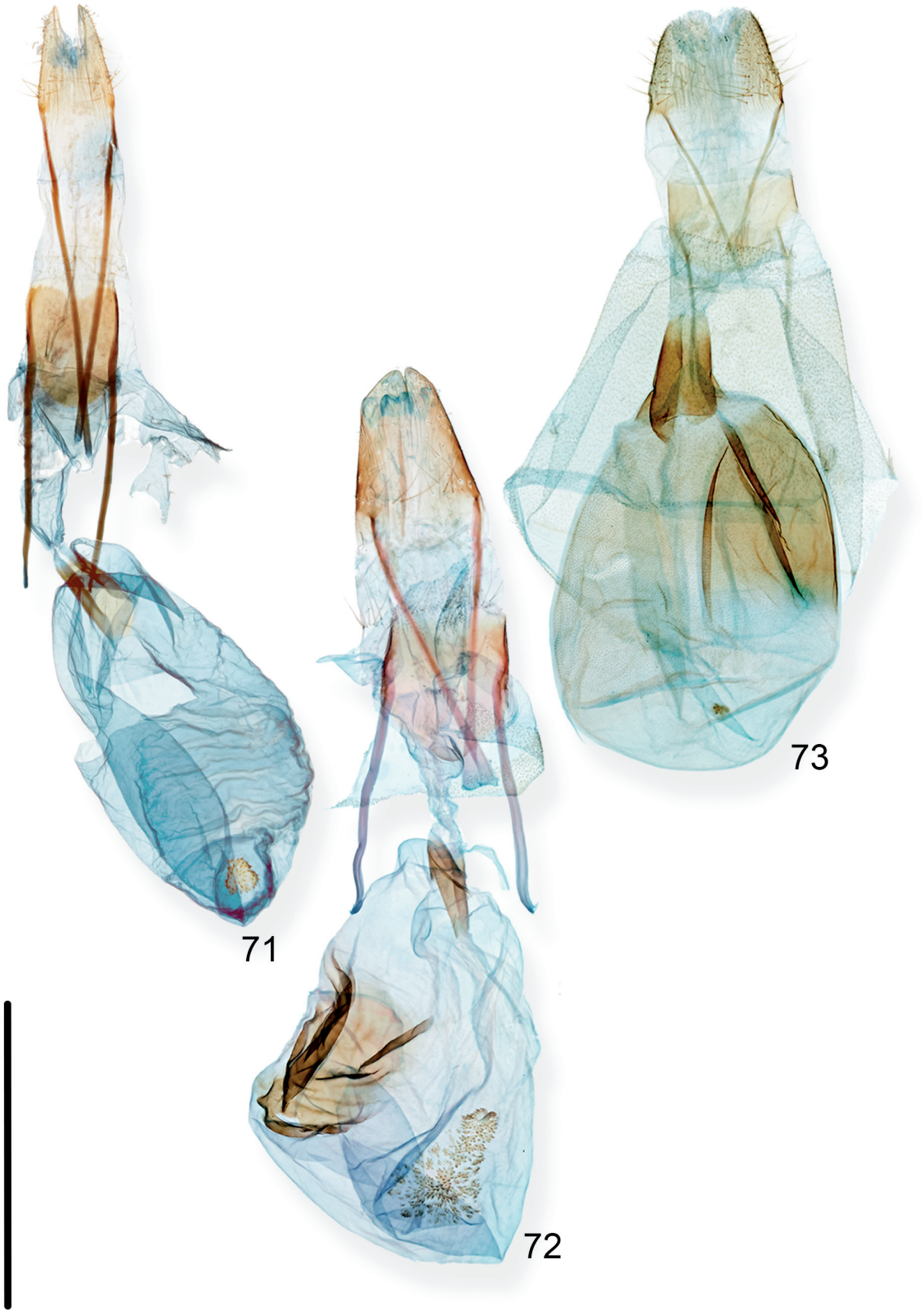
Forewing length. 15 mm (n = 1).

Figs 61–63. Female genitalia. **61**. *S. aumatlapalli* sp. nov., paratype (TAM-2020-041, CNIN). **62**. *S. penguinifera* (Dyar, 1910) (TAM-2023-249, CMNH). **63**. *S. carota* sp. nov., holotype (TAM-2023-263, BMEC). Scale bar = 2 mm.

Figs 64–66. Female genitalia. **64**. *S. favilla* sp. nov., paratype (TAM-2020-037, CNIN). **65**. *S. fuego* sp. nov., paratype (TAM-2020-024, USNM 154201). **66**. *S. matrona* sp. nov., paratype (TAM-2023-284, USNM 154214). Scale bar = 2 mm.



Figs 67–70. Female genitalia. **67**. *S. disrupta* sp. nov., paratype (TAM-2023-261, BMEC). **68**. *S. mariachi* sp. nov., paratype (TAM-2023-283, AMNH). **69**. *S. erupta* sp. nov., paratype (TAM-2023-286, USNM 154212). **70**. *S. ceniza* sp. nov., paratype (TAM-2020-035, CNIN). Scale bar = 2 mm.



Figs 71–73. Female genitalia. **71**. *S. saltillo* sp. nov., paratype (TAM-2020-060, CNIN). **72**. *S. churro* sp. nov., holotype (TAM-2022-106, AMNH). **73**. *S. ferropulvisa* sp. nov., paratype (TAM-2023-200, USNM 154207). Scale bar = 2 mm.

Head. Antenna filiform and black. Frons dark grey; vertex cream to light orange. Labial palpus short, slightly porrect, subequal to diameter of eye, dark grey and white. Cephalic collar mostly dark grey.

Thorax. Patagium mostly white; tegula mostly light grey. Legs predominantly light grey.

Forewing. Light orange; costal area dark grey in basal third and with medial trigonate patch; apical area dark grey, this colour extending thinly down outer margin to tornus. Underside more or less concolourous with upperside, perhaps slightly darker, and areas between dark grey patches of costa whiter than above.

Hindwing. Light orange, with large area of dark grey along costa and apical area. Underside predominantly dark grey with subtle off-white patchwork and lacking orange ground colour of above. Darker grey to black ovate patch bordered by off-white scales at tornal area, diameter of patch about half width of hindwing.

Abdomen. Grey.

Genitalia. Abdomen lost from only male specimen.

Female

Outwardly undifferentiated from male.

Forewing length. 17 mm (n = 1).

Genitalia (Fig. 70). Anterior apophysis two-thirds length of posterior apophysis. Ostium large, lamella antevaginalis strongly sclerotized and subcircular. Short and narrow ductus bursae with prominent sclerite flattened on ventral surface and dorso-laterally rolled toward median area. Corpus bursae spherical; bearing two signa, each with inward directed process; one signum situated near posterior base of corpus bursae (near ductus bursae) and second near anterior third, each covered with minute papillae.

Distribution (Fig. 83)

Mexico: *Stamnodes ceniza* sp. nov. is only known from the southern Sierra Madre Oriental localities of the type material.

Biology

The immature stages are unknown. The holotype was collected between August and October 2021, and the paratype from January.

Molecular characterization

Only the holotype of this species has been successfully sequenced. It is represented in BOLD by the BIN: BOLD:AFB2888 (n = 1). The distance to the nearest neighbour, *S. disrupta* sp. nov. (n = 5), is 4.8%.

Remarks

The abdomen of the male holotype has been lost rendering the description of the male genitalia of this species impossible at this time. Otherwise, the holotype is in decent shape. However, the paratype is not in great shape; the right hindwing, broken and previously pinned underneath the individual, has since been glued back into place, and only a foreleg and midleg remain of its six legs.

Stamnodes saltillo sp. nov.
urn:lsid:zoobank.org:act:5BEED936-6AF6-4A9B-8BED-3D44D09B64A9
Figs 19, 52, 71, 84, 94–95

Diagnosis

Stamnodes saltillo sp. nov. is outwardly unmistakable from congeners. This species may resemble *S. marmorata* of the USA, as both share a striking checkered fringe and a hindwing underside heavily patched and striated with white upon a mostly black and red-brown base colouring. Whereas much of the brown scaling radiates over the veins in *S. marmorata*, it is only subtly so in *S. saltillo*. Though I only had access to a few *S. saltillo* individuals, the intraspecific colour variation of *S. marmorata* appears to be much greater than the relatively consistent colouring of *S. saltillo*. These two species do not overlap in distribution.

Etymology

This species derives its name from the historic city of Saltillo, and furthermore honours the contribution of resident Emily Estefanía Espinosa Villarreal, whose invaluable collections advanced this work and constitute much of this species' type series. The name is a noun in apposition.

Material examined

Holotype
MEXICO • ♂; Coahuila, Saltillo, Lomas de Lourdes; 25.36366° N, 100.9774° W; 12 Sep. 2020; Emily Estefanía Espinosa Villarreal leg.; genetic voucher: TAM0091; BOLD Process ID: WAGL2551-21; GenBank: OP898482; CNIN.

Paratypes (16 ♂♂, 6♀)
MEXICO – **Coahuila** • 1 ♂; same locality data as for holotype; 10 Apr. 2020; Emily Estefanía Espinosa Villarreal leg.; CNIN • 1 ♂; same locality data as for holotype; 25 May. 2020; Emily Estefanía Espinosa Villarreal leg.; CNIN • 3 ♂♂, 1 ♀; same locality data as for holotype; 13 Jun. 2020; Emily Estefanía Espinosa Villarreal leg.; CNIN • 3 ♂♂, 1 ♀; same locality data as for holotype; 15 Jun. 2020; Emily Estefanía Espinosa Villarreal leg.; genitalia: TAM-2020-060; CNIN • 3 ♂♂; same locality data as for holotype; 13 Sep. 2020; Emily Estefanía Espinosa Villarreal leg.; genitalia: TAM-2020-059; CNIN • 1 ♂; same locality data as for holotype; 2 Oct. 2020; Emily Estefanía Espinosa Villarreal leg.; CNIN. – **Nuevo León** • 1 ♂; 11 km ESE of Galeana; [24.76° N, 99.99° W]; elev. 1680 m; 22 Jun. 1982; J. Rawlins and O. Sholes leg.; CMNH. • 1 ♀; San Luis Potosí [Nuevo León], Cerro Potosí; [24.88° N, 100.21° W]; elev. 3400 m; 18 Aug. 1975; E. van den Berghe leg.; USNMENT01771222 • 2 ♀♀; Cerro Potosí; [24.88° N, 100.21° W]; elev. 2800 m; 26 Jun. 1997; V.O. Becker leg.; VOB • 1 ♀; Santiago; 25°21′ N, 100°18′ W; 25–30 May 2000; elev. 1760 m; V.O. Becker leg.; VOB • 2 ♂♂; highway 60, 4 mi. E of Galeana Jct.; [24.74° N, 99.98° W]; elev. 6000 ft; 23 Sep. 1975; J.A. Powell and T. Friedlander leg.; EMEC1748438, EMEC1748439 • 1 ♂; 4 mi. W of Iturbide; [24.74° N, 99.97° W]; elev. 5500 ft; 22 Sep. 1975; J. Powell, J. Chemsak and T. Friedlander leg.; EMEC1748440.

Description

Male
Forewing length. 14–16 mm (n = 17).

Head. Antenna filiform, fuscous to black, sometimes with white scales above. Vertex with intermixed white and dark red scales; frons mostly dark red, with sprinkling of white scales bordering eye and vertex, and slightly suffused with fuscous medially. Labial palpus porrect, slightly larger than diameter

of eye, mostly dark red, with fuscous apically. Cephalic collar mostly ochreous except for lateral, dark red scales.

Thorax. Patagium basally ochreous and distally dark red; tegula mostly ochreous, slightly dark red at base. Mesothorax ochreous above; white and deep red below. Coxa mostly white, sprinkled with red on internal face; femur fuscous and speckled with white above, ochreous below; tibia and tarsus mostly ochreous; tibial spur formula 0–2–4; epiphysis well developed.

Forewing. Ground colour ochreous to tan. Costal margin deep red at base, gradually lightening towards apex, but overall darker than rest of wing with exception of light-tan patches at ante- and postmedian; postmedial patch extending about half-way down wing toward the inner margin. Light grey beneath the costal area, especially pronounced at median, transitioning to tan at inner margin. Underside like upperside but much darker red across costal margin and apical area. Apical area also with strong oblique white dash directed toward base. Fringe starkly checkered with black and white.

Hindwing. Concolourous with forewing, pattern elements of underside clearly visible when viewed from above. Underside much different than upperside, blotched with black and dark red around stark-white patches; black and dark red areas scattered sparingly with white scales. Small, white patches at base, median, and apex of costal margin with much more pronounced longitudinally extended patch at antemedian; largest patch widely C-shaped, arcing from median of inner margin to center of wing and then turning distally, terminating near median of outer margin. Fringe as in forewing.

Abdomen. Fuscous above, cream below, patches of red lateral scales around spiracles.

Genitalia (Fig. 52). Uncus large and spatulate. Subscaphium well developed. Inner face of valva with large hair tuft bearing ribbon-like setae arising from low tubercle on medial subcostal depression. Juxta large and U-shaped with posterolateral, long, acuminate-conical processes. Vesica with large, stand-alone, spinose cornutus, and adjacent series of approximately eight spinose cornuti that descend in size; largest cornutus of this series about one-third size of stand-alone cornutus.

Female

Outwardly undifferentiated from male.

Forewing length. 14–16 mm (n = 6).

Genitalia (Fig. 71). Papillae anales pointed; apophyses subequal in length. Ductus bursae with triangular sclerite dorsolaterally rolled toward median in anterior third; corpus bursae ovoid with externally depressed circular signum bearing numerous minute papillae located in anterior third.

Distribution (Fig. 84)

Mexico: *Stamnodes saltillo* sp. nov. is a denizen of northern Sierra Madre Oriental pine-oak forests with the majority of records coming from the mountains around Saltillo, Coahuila. The range of this moth presumably extends southward to other regions of the Sierra Madre Oriental.

Biology

Stamnodes saltillo sp. nov. appears to be bivoltine, flying from April to mid-June and again from September to October at the type locality. The immature stages remain unknown but are likely hosted by a rosaceous shrub.

Molecular characterization

This species is represented in BOLD as BIN: BOLD:AEI6540 (n = 1). The distance to the nearest neighbour, *Stamnodes marmorata* (n = 26), is 6.81%.

Remarks

Preliminary phylogenetic analyses place *S. saltillo* sp. nov. sister to the *Purshia*-feeding *S. marmorata* (Matson & Wagner in prep.); however, both are nested among many *Cercocarpus*-feeding species and thus *Cercocarpus* Kunth (Rosaceae) should also be considered a potential host.

A single paratype (USNMENT01771222) from Cerro Potosí was labeled as from the state of San Luis Potosí, despite Cerro Potosí most often referring to a high mountain in Nuevo León. The high elevation given on the specimen label also suggests this individual was collected from Cerro Potosí in Nuevo León and not the state of San Luis Potosí. As such, Nuevo León is given in the Type material section in brackets and the estimated GPS coordinates are also based on a Nuevo León locality.

Stamnodes formosata (Strecker, 1878)
Figs 20, 92, 94–95

Marmopteryx formosata Strecker, 1878: 1864. Type locality: Rio Florida, [Colorado], [USA]. [FMNH].
Marmopteryx dryadata Hulst, 1880: 43. Type locality: Colorado, USA. [AMNH].
Marmopteryx sponsata Grote, 1882: 215. Type locality: near Hot Springs, Las Vegas, New Mexico, USA. [USNM].

Coenocalpe formosata – Hulst 1896: 287. — Dyar 1902: 286 (cat.). — Pearsall 1906: 204.
Stamnodes formosata – Pearsall 1909b: 366. — McDunnough 1938: 151 (checklist). — Ferguson 1983: 103 (checklist). — Poole & Gentili 1996: 686 (checklist). — Scoble 1999: 902 (catalogue). — Knudson & Bordelon 2002: 7–8. — Scoble & Hausmann 2007 (online catalogue). — Powell & Opler 2009: 226; pl. 32 fig. 32. — Lee 2014: e86 (inventory). — Pohl *et al.* 2016: 448 (checklist). — Rajaei *et al.* 2022 (online catalogue).

Diagnostic remarks

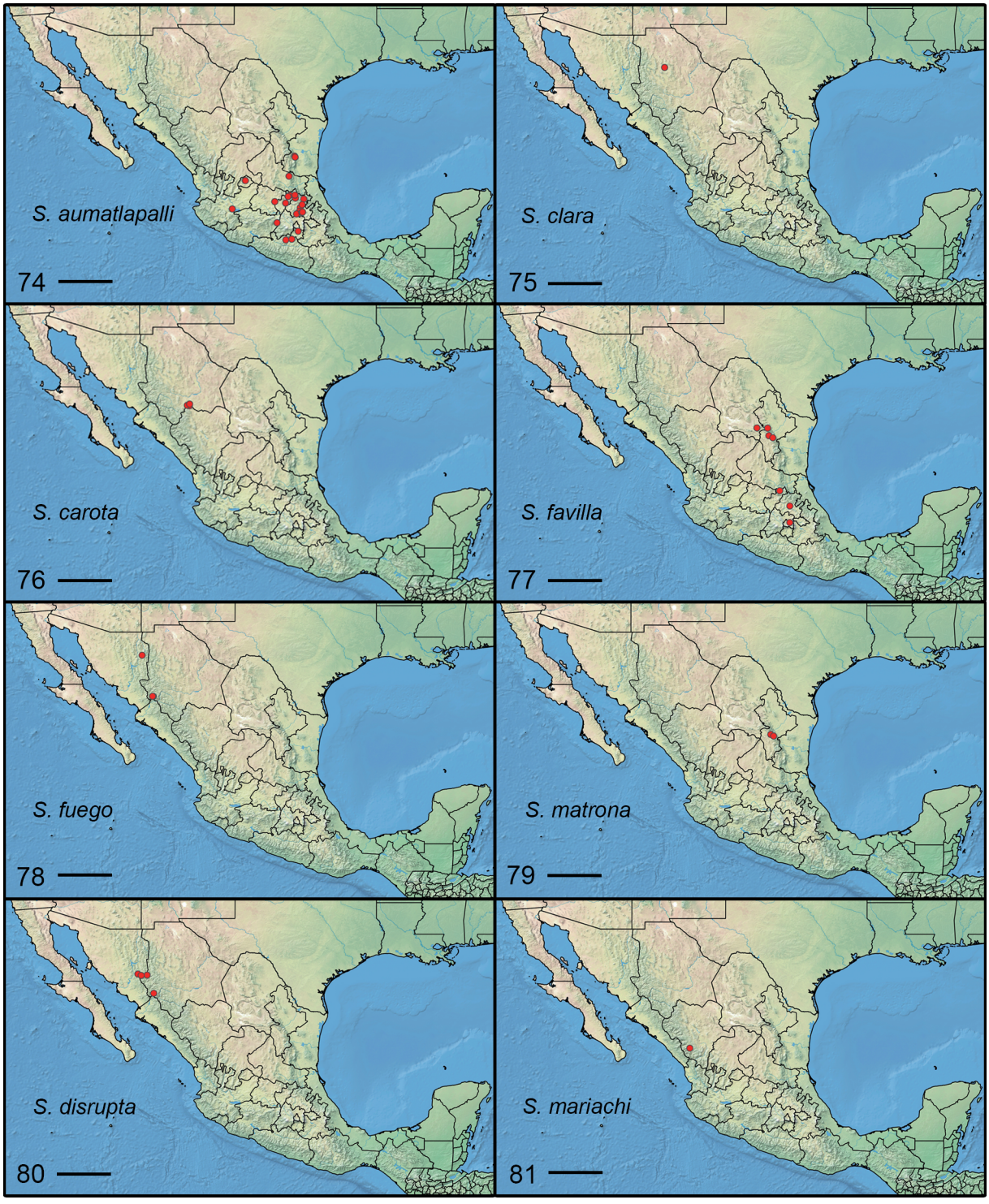
Stamnodes formosata is easily confused with sympatric *S. lampra*. *Stamnodes formosata* is larger than *S. lampra*, has lighter brown scaling at the forewing apex and costomedial patch above, and the forewing apical area and hindwing are striated with bright red scales beneath that stand in opposition to the often rust to light brown scales of the same areas in *S. lampra*.

Distribution

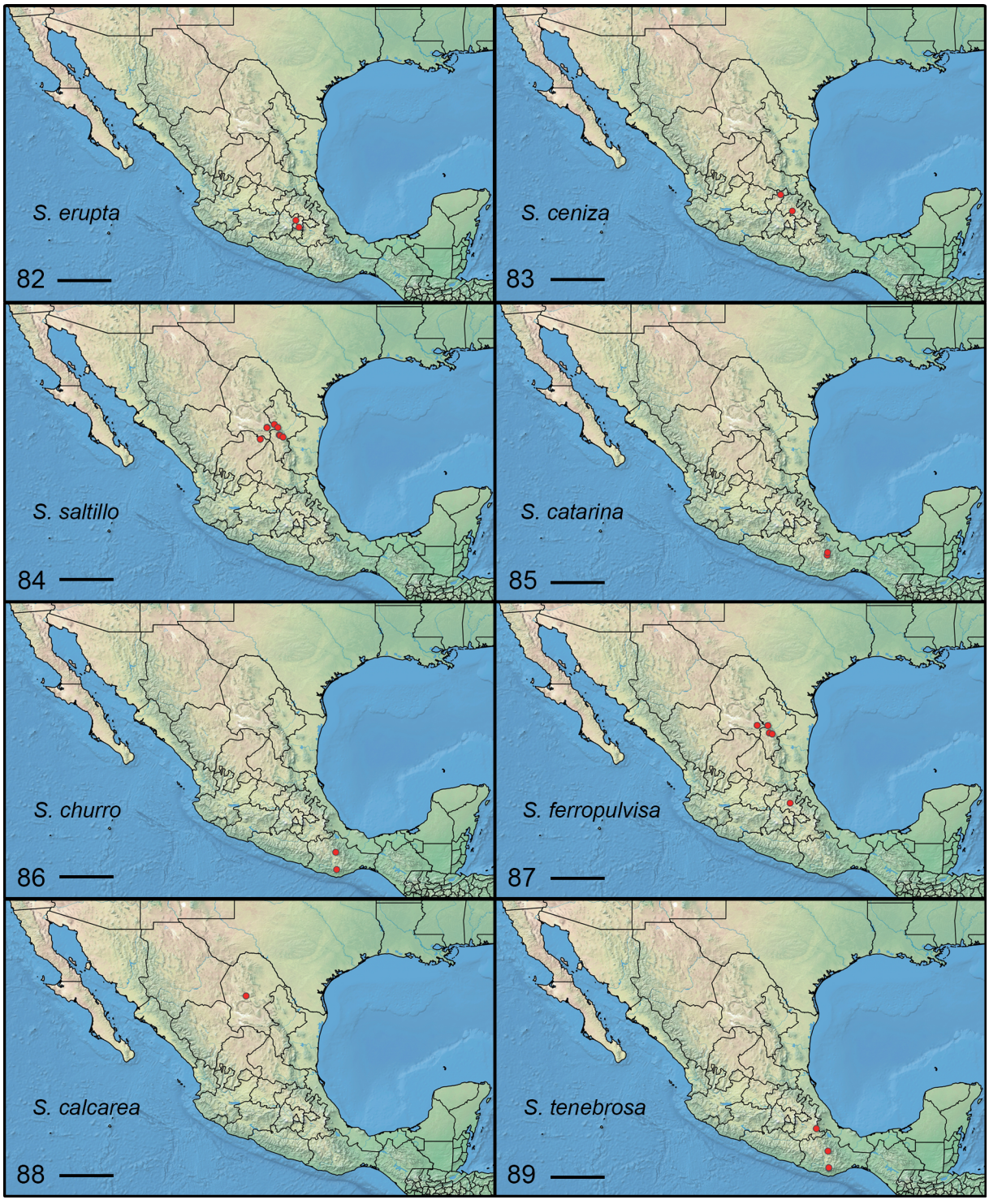
Mexico: *Stamnodes formosata* inhabits the rocky hillsides, open woodlands, and chaparral communities of the northern Sierra Madre Occidental. USA: this species ranges from the Madrean sky islands of southeastern Arizona and West Texas, north into the Rocky Mountains of Colorado. *Stamnodes formosata* appears to have a larger USA distribution than visually similar and closely related *S. lampra*.

Biology

Stamnodes formosata flies mainly in July and August with mature caterpillars centered from September to early November. Larvae are hosted by alder leaf mountain mahogany (*Cercocarpus montanus* Raf.). The caterpillar (Fig. 92) and host plant were discovered by David L. Wagner in October 2014 in southeast Arizona. Additional unpublished life history details and larval illustrations are forthcoming (Matson & Wagner in prep.).



Figs 74–81. Distributions of newly described *Stamnodes* Guenée, [1858]. **74**. *S. aumatlapalli* sp. nov. **75**. *S. clara* sp. nov. **76**. *S. carota* sp. nov. **77**. *S. favilla* sp. nov. **78**. *S. fuego* sp. nov. **79**. *S. matrona* sp. nov. **80**. *S. disrupta* sp. nov. **81**. *S. mariachi* sp. nov. Single dots may represent > 1 individual. Scale bars = 400 km.



Figs 82–89. Distributions of newly described *Stamnodes* Guenée, [1858]. **82**. *S. erupta* sp. nov. **83**. *S. ceniza* sp. nov. **84**. *S. saltillo* sp. nov. **85**. *S. catarina* sp. nov. **86**. *S. churro* sp. nov. **87**. *S. ferropulvisa* sp. nov. **88**. *S. calcarea* sp. nov. **89**. *S. tenebrosa* sp. nov. Single dots may represent > 1 individual. Scale bars = 400 km.

Molecular characterization

This species is represented in BOLD by two BINs: BOLD: AAF2597 (n = 11, USA: Colorado, New Mexico) and BOLD:ACE7212 (n = 9, USA: southeast Arizona). The pairwise distance between these two BINs is 1.39%. The distance to their nearest adjacent interspecific neighbour, *Stamnodes ferropulvisa* sp. nov. (n = 3), is around 5% (Fig. 94).

Stamnodes lampra Rindge, 1958
Figs 21, 94, 95

Stamnodes lampra Rindge, 1958: 3–4, figs 3–4, 11–12. Type locality: Madera Canyon, Santa Rita Mountains, Pima County, Arizona, USA. [AMNH].

Stamnodes lampra – Ferguson 1983: 103 (checklist). — Poole & Gentili 1996: 686 (checklist). — Scoble 1999: 902 (catalogue). — Scoble & Hausmann 2007 (online catalogue). — Pohl *et al.* 2016: 449 (checklist). — Rajaei *et al.* 2022 (online catalogue).

Diagnostic remarks

This species is easily confused with sympatric *S. formosata*, but *Stamnodes lampra* is smaller than *S. formosata*, has darker brown scaling at the forewing apex and darkened costomedial area, and beneath, the forewing apical area and hindwing are typically striated with rust and light brown scales that stand in opposition to *S. formosata*'s bright red scales of the same areas.

Distribution

Mexico: *Stamnodes lampra* inhabits the rocky hillsides, open woodlands, and chaparral communities of the northern Sierra Madre Occidental. USA: *Stamnodes lampra* is relatively uncommon in the Madrean Sky Islands of southeast Arizona.

Biology

The peak adult flight occurs in July and August with larvae to follow. Larvae are hosted by alder leaf mountain mahogany (*Cercocarpus montanus*). The caterpillar and host plant were discovered by David L. Wagner and the author in September 2018 in southeast Arizona. Additional unpublished life history details and larval illustrations are forthcoming (Matson & Wagner in prep.).

Molecular characterization

This species is represented in BOLD as BIN: BOLD:AAM3494 (n = 4). At present, the average pairwise intraspecific distance is 0.08%, the maximum pairwise intraspecific distance is 1.93%, and the distance to the nearest neighbour, *Stamnodes coenonymphata* (n = 26), is 4.33%.

Stamnodes franckata (Pearsall, 1909)
Figs 22, 94–95

Coenocalpe franckata Pearsall, 1909a: 130. Type locality: Chiricahua Mts, near Douglas, Arizona, USA. [AMNH].

Stamnodes franckata – Pearsall 1909b: 366. — McDunnough 1938: 151 (checklist). — Ferguson 1983: 103 (checklist). — Poole & Gentili 1996: 686 (checklist). — Scoble 1999: 902 (catalogue). — Knudson & Bordelon 2002: 7–8. — Scoble & Hausmann 2007 (online catalogue). — Pohl *et al.* 2016: 449 (checklist). — Rajaei *et al.* 2022 (online catalogue).

Diagnostic remarks

Stamnodes franckata is easily confused with sympatric *S. formosata*. *Stamnodes franckata* is typically larger than *S. formosata*, has darker brown scaling at the forewing apex and costomedial patch above, and the forewing apical area and hindwing are striated with brown scales beneath that stand in opposition to *S. formosata*'s vibrant red scales of the same areas. The ground colour of *S. franckata* is also given more toward ochreous than the cream colour of *S. formosata*, and the fringe of *S. franckata* is sometimes pink.

Distribution

Mexico: *Stamnodes franckata* is mostly a Sierra Madre Occidental entity with most records from Sonora. However, it is also likely that *S. franckata* will be found in the states of Chihuahua and Coahuila as the moth is abundant in the Chisos Mountains of Texas. USA: *Stamnodes franckata* ranges from central Arizona to the Big Bend region of Texas.

Biology

Adults fly from August to October with mature caterpillars following from September to early November. Larvae are hosted by alder leaf mountain mahogany (*Cercocarpus montanus*). The caterpillar and host plant were discovered by David L. Wagner in November 2017 in southeast Arizona. Additional unpublished life history details and larval illustrations are forthcoming (Matson & Wagner in prep.).

Molecular characterization

This species is represented in BOLD by two BINs: BOLD: AAM3493 (n = 7, USA: Arizona, New Mexico) and BOLD:ACE7212 (n = 2, USA: west Texas). The pairwise distance between these two BINs is 1.31%. The distance to their nearest interspecific neighbour, *Stamnodes coenonymphata* (n = 3), is around 5.8%.

Stamnodes patamon (Druce, 1893)
Figs 24, 55, 94–95

Marmopteryx patamon Druce, 1893: 178, ibidem 3: pl. 58 figs 7–8. Type locality: 6000 ft, Amula, Guerrero, Mexico. [NHMUK].

Stamnodes patamon – Scoble 1999: 902 (catalogue). — Scoble & Hausmann 2007 (online catalogue). — Rajaei *et al.* 2022 (online catalogue).

Redescription

Druce's original description of *S. patamon* did not include genitalic morphology. To his description, the following genitalic redescription and associated images are supplemented:

Male genitalia (Fig. 55). Uncus long, narrow, slightly enlarged at apex. Inner face of valva with about five, long, sickle-shaped sclerotized ribbons originating from basal tubercle. Juxta cat-faced with stiff, crossing, submedial setae on posterior surface. Vesica with large spinose cornutus and adjacent patch of several hundred filamentous cornuti.

Female genitalia. No material available for study.

Distribution

Mexico: *Stamnodes patamon* is primarily known to inhabit the pine-oak forests of the Northern Oaxaca Highlands and Sierra Madre del Sur, ranging north and westward into the Sierra Madre Occidental to at least western Durango. Reviewed material was often collected at elevations around 2000 m.

Biology

Stamnodes patamon is bi- or multivoltine, with adult records in March, April, May, and October. The immature stages of this taxon remain unknown, but its phylogenetic kin are mountain mahogany (*Cercocarpus*) feeders (Matson & Wagner in prep.).

Molecular characterization

Stamnodes patamon is represented in BOLD as BIN: BOLD:ABU6207 (n = 3). At present, the average pairwise intraspecific distance is 0.71%, the pairwise maximum intraspecific distance is 1.01%, and the distance to the nearest neighbour, *Stamnodes* sp. (?undescribed) (n = 1, Nuevo León), is 3.53%.

Remarks

During my review of this species, I came across individuals from the Sierra Madre Occidental that were located as far north and west as western Durango, which was surprising as I had previously considered *S. patamon* to be exclusive to the Sierra Madre del Sur. However, after examining the male genitalia of these individuals from Durango, I regard them as the same species.

Figs 90–93. Final instar larval variation of North American species of *Stamnodes* Guenée, [1858]. **90**. *S. albiapicata* Grossbeck, 1910, collected from *Pholistoma membranaceum* (Benth.) Constance; USA: California: San Diego Co. (2017C29); photo credit Moria L. Robinson. **91**. *S. coenonymphata* (Hulst, 1900) collected from *Cercocarpus betuloides* Nutt.; USA: California: Sonoma Co. (2018E171). **92**. *S. formosata* (Strecker, 1878) collected from *Cercocarpus montanus* Raf.; USA: Arizona: Cochise Co. (2014K98), photo credit David L. Wagner. **93**. *S. fergusoni* Matson & Wagner, 2020, collected from *Salvia pinguifolia* (Fernald) Wooton & Standl.; USA: New Mexico: Lincoln Co. (2018J32), photo credit David L. Wagner (Matson & Wagner 2020).

A population that resembles *S. patamon* (*S.* nr *patamon* in Fig. 95) also extends into the northernmost areas of the Sierra Madre Oriental. Vitor Becker collected individuals in Gómez Farías, Tamaulipas, in May of 1997, and in Cerro Potosí, Nuevo León, in June of 1997. Unfortunately, I could only examine photographs of this material sent to me by Becker, as all but one specimen are held in his collection in Brazil, where regulations often prohibit biological material from leaving the country. However, one individual (Fig. 23) from Becker's collection in Cerro Potosí is deposited at the USNM and has been barcoded. This specimen appears somewhat aberrant compared to most of the rest of Becker's series and may represent yet another questionable entity. The COI barcode (BOLD Process ID: LNAUY180-19) was found to be 3.5% (pairwise) different from Oaxacan *S. patamon*. Although *S. patamon* from Durango, Guerrero, Oaxaca, and the putative *S.* nr *patamon* individuals from Nuevo León and Tamaulipas bear a subapical white patch on the forewing, this feature is lacking in the sequenced individual. The sequenced individual also has an overall lighter cream ground colour, and the medial transverse white patch on the hindwing underside appears straighter than the more arcing norm for *S. patamon*. Unfortunately, the sequenced individual is female, so I could not compare its genitalia to the entirely male series of *S. patamon* available for this study, nor to the putative individuals of *S.* nr *patamon* from Nuevo León and Tamaulipas in Becker's collection in Brazil. For now, the sequenced individual will be regarded as the sole representative of a potentially undescribed species that warrants further investigation. In the Discussion and Figs 94 and 95, it is listed as *Stamnodes* sp. (?undescribed).

Stamnodes coenonymphata (Hulst, 1900)
Figs 25, 91, 94–95

Coenocalpe coenonymphata Hulst, 1900: 104. Type locality: Pasadena, California; Yosemite Valley, California, USA. [AMNH].
Stamnodes coenonymhata prunata Wright, 1924: 92–93. Type locality: San Diego, California, USA. [SDNHM, MCZ].
Stamnodes coenonymphata brunneata Wright, 1924: 93. Type locality: San Diego, California, USA. [SDNHM, MCZ].
Stamnodes coenonymphata pallidata Wright, 1924: 93. Type locality: San Diego, California, USA. [SDNHM, MCZ].
Stamnodes coenonymphata wrightii Cassino & Swett, 1925: 38. Type locality: San Diego, California, USA. [Not found in MCZ].

Coenocalpe coenonymphata – Dyar 1902: 285 (cat.).
Stamnodes coenonymphata – Pearsall 1909b: 366. — McDunnough 1938: 151 (checklist). — McFarland 1965: 62. — Ferguson 1983: 103 (checklist). — Furniss *et al.* 1988: 7–9. — Poole & Gentili 1996: 686 (checklist). — Brown & Bash 2000: 73. — Scoble 1999: 901 (catalogue). — Miller & Hammond 2003: 158. — Scoble & Hausmann 2007 (online catalogue). — Pohl *et al.* 2016: 448 (checklist). — Rajaei *et al.* 2022 (online catalogue). — Albu & Albu 2023: 55 (survey).

Diagnostic remarks

Stamnodes coenonymphata is highly variable in colour, especially the hindwing underside. The transverse medial band of the hindwing underside common to many *Cercocarpus*-feeding *Stamnodes* is generally white in *S. coenonymphata* with the scales basad and distad greatly differing in colour. The transverse band is more basally positioned than in congeners and has a more acute angle as it extends basad toward the margins. This species is most often confused with *S. costimacula*, *S. annellata*, and *S. cassinoi*.

Distribution

Mexico: *Stamnodes coenonymphata* is found in the chaparral associations, foothills, canyons, and Pacific coastal scrub communities of northwestern Baja California. USA: the core of this species' range lies in California.

Biology

The peak flight of *S. coenonymphata* is January to March with larvae to follow in the spring and early summer. Larvae (Fig. 91) are hosted by birch leaf mountain mahogany (*Cercocarpus betuloides* Nutt.) (McFarland 1965).

Molecular characterization

This species is represented in BOLD as BIN: BOLD:AAF2593 (n = 26). At present, the average pairwise intraspecific distance is 0.82%, the pairwise maximum intraspecific distance is 1.93%, and the distance to the nearest adjacent interspecific neighbour, *Stamnodes formosata* (n = 20), is about 3%.

Stamnodes catarina sp. nov.
urn:lsid:zoobank.org:act:DAC04EB8-EAB0-461F-9BB5-1D6B32E7A574
Figs 26, 53, 85, 95

Diagnosis

In dorsal view, *S. catarina* sp. nov. could be confused with sympatric *S. patamon* or *S. churro* sp. nov.; however, the hindwing underside pattern and male genitalia unambiguously separate these taxa. The hindwing underside of *S. catarina* is lightly striated with dark brown to black scales and bears an ill-defined black discal spot (Fig. 26b). In *S. patamon*, the hindwing underside is striated with dark brown and burgundy scales surrounding several large, ill-defined, all-white patches (Fig. 24b), and in *S. churro*, the hindwing underside is cream coloured and speckled with light brown scales throughout (scales modestly darker in basal half of wing) (Fig. 27b). The pale ground colour of *S. catarina* has a grey cast, while that of *S. churro* is tanner, and *S. patamon* given more toward yellow-cream.

Stamnodes catarina sp. nov. is immediately distinguished from *S. churro* sp. nov. by its large spatulate uncus (Fig. 53a) – the uncus of *S. churro* is small and triangulate (Fig. 54a). Among numerous other differences, *S. catarina* can be separated from *S. patamon* by its juxta that bears a dense tuft of approximately 100 erect setae on its distal surface (Fig. 53a). *Stamnodes patamon* only has a few spinose setae arising from the surface of the juxta, and bears large, sickle-shaped sclerotized ribbons on the inner face of valva (Fig. 55a) that are absent in *S. catarina*. The vesica of *S. catarina* bears approximately eight large spinose cornuti, linearly decreasing in size (Fig. 53b); while the vesica of *S. churro* has a large, central, echinate patch of several hundred small cornuti opposite of two, large, apical spinose cornuti (Fig. 54b); and the vesica of *S. patamon* bears a single, large, spinose cornutus adjacent to a large patch of several hundred filamentous cornuti (Fig. 55b). With male dissection, these species cannot be confused.

Etymology

The specific epithet, *catarina*, is named after Santa Catarina Ixtepeji, a small town nearest the collection site of several type specimens. It is a noun in the nominative case.

Material examined

Holotype

MEXICO • ♂; Oaxaca, Mpio. Ixlepejl [Ixtepejl], Cerezal; [17.26° N, 96.56° W]; elev. 2300 m; 7 Nov. 1980; E.C. Welling leg.; AMNH_IZC 00352926.

Paratypes (3 ♂♂)

MEXICO – **Oaxaca** • 1 ♂; same collection data as for holotype; genitalia: TAM-2022-107 (USNM 154205); USNMENT01771238 • 1 ♂; same collection data as for holotype; CNIN • 1 ♂; Mpio. San

Juan Atepec, La Cabaña; [17.43° N, 96.54° W]; elev. 2800 m; 6 Nov. 1980; E.C. Welling leg.; AMNH_IZC 00352925.

Description

Male

Forewing length. 15–16 mm (n = 4).

Head. Antenna filiform, mostly white above. Vertex and frons with mixture of white and grey scales; frons entirely white at border with eyes. Labial palpus short, slightly porrect, 1.5 × diameter of eye, grey and white. Cephalic collar mostly white, grey laterally.

Thorax. White to cream. Patagium mixture of grey and white scales; tegula mostly cream. Legs white and blotched with light grey scales; tibial spur formula 0–2–4; epiphysis well developed.

Forewing. Ground colour cream to grey. Costal area dark grey at base with two, small white patches. Costal medial area with subquadrangular, dark grey patch terminating near center of wing and outwardly highlighted by U-shaped band of lighter scales; distal half of wing becoming much darker grey, especially in apical area and along outer margin. Underside patterned as in upperside but darkened apical area bearing subtle maculation of cream scales. Terminal, thin black line of outer margin outlining base of fringe in all wings. Fringe checkered.

Hindwing. Concolourous with forewing above, sometimes with slight darkening of grey at apex. Underside cream to white, lightly striated with dark brown to black scales; dark scales forming ill-defined discal spot and subtle transverse medial band from inner margin to center of wing. Fringe checkered.

Abdomen. Cream to light grey above, white below, sometimes with lateral dark grey scales over spiracles.

Genitalia (Fig. 53). Uncus long, slender, and strongly spatulate at apex. Juxta triangulate with three rounded processes on distal surface; medial process bearing dense tuft of approximately 100 erect setae. Valva ear-shaped with wide costal sclerite; inner face of valva with two hair tufts: tuft bearing ribbon-like setae arising basally from digitate tubercle; second, smaller tuft residing just distal to first tuft. Vesica with eight large spinose cornuti; cornuti linearly decreasing in size; smallest cornutus about half size of largest.

Female

Not known.

Distribution (Fig. 85)

Mexico: the distribution of *Stamnodes catarina* sp. nov. is not well circumscribed. This species is only known from the heavily wooded and mountainous Northern Oaxaca Highlands region of Oaxaca where it has been collected at elevations between 2300–2800 m.

Biology

Adults of *Stamnodes catarina* sp. nov. fly in November. Adult habitus and genitalia suggest affinity to the many *Stamnodes* that feed on *Cercocarpus*. *Stamnodes catarina* is sympatric and synchronic with *S. churro* sp. nov., *S. tenebrosa* sp. nov., and likely *S. patamon* as well.

Molecular characterization

This species has not been sequenced.

Remarks

The male genitalia of *S. catarina* sp. nov. resemble those of *S. seiferti* and *S. tenebrosa* sp. nov., perhaps indicating a close relationship despite an external phenotype that is none too similar.

The large spatulate uncus of *S. catarina* sp. nov. can be used to diagnose this species from *S. churro* sp. nov. without dissection. A brush may be used to remove caudal abdominal scales to reveal the large spatulate uncus. Likewise, the small triangulate uncus of *S. churro* can rarely be seen using this method.

Stamnodes churro sp. nov.
urn:lsid:zoobank.org:act:87100BBD-5B0F-4C07-A932-A16639A16704
Figs 27, 54, 72, 86, 95

Diagnosis

In dorsal view, *S. churro* sp. nov. may be confused with sympatric *S. patamon* or *S. catarina* sp. nov., fortunately, the hindwing underside pattern and male genitalia unambiguously separate these taxa. The hindwing underside of *S. churro* is cream-coloured and speckled with light brown scales throughout (scales modestly darker in basal half of wing) (Fig. 27b). In *S. patamon*, the hindwing underside is striated with dark brown and burgundy scales surrounding several large, ill-defined, all-white patches (Fig. 24b), and in *S. catarina*, the hindwing underside is lightly striated with dark brown to black scales and bears an ill-defined black discal spot (Fig. 26b).

The uncus is small and triangulate in *S. churro* sp. nov. (Fig. 54a) and large and spatulate in *S. catarina* sp. nov. (Fig. 53a) and *S. patamon* (Fig. 55a). Among numerous other differences, the vesica bears a large, central, echinate patch of several hundred small cornuti, and two, large, apical spinose cornuti in *S. churro* (Fig. 54b); about eight large spinose cornuti linearly decreasing in size in *S. catarina* (Fig. 53b); and a single, large, spinose cornutus adjacent to a large patch of several hundred filamentous cornuti in *S. patamon* (Fig. 55b). With dissection, males of these species cannot be confused.

Etymology

The specific epithet, *churro*, is named after the popular, fried dough dessert of Mexico and elsewhere. This name was proposed by a passionate group of fourth-grade students from Mrs Stephanie Ball's 2021–2022 science class in Alexandria, Virginia. The diagnostic cream-coloured hindwing underside, generously speckled with light brown scales, was reminiscent of the colour and texture of the iconic dessert for which this moth is now named. The name is a noun in apposition.

Material examined

Holotype
MEXICO • ♀; Oaxaca, Mpio. Ixlepejl [Ixtepejl], Cerezal; [17.26° N, 96.56° W]; elev. 2300 m; 7 Nov. 1980; E.C. Welling leg.; genitalia: TAM-2022-106; AMNH_IZC 00352920.

Paratype
MEXICO • 1 ♂; Oaxaca, Mpio. Río Hondo, San José Pacífico; [16.16° N, 96.50° W]; elev. 2400 m; 16 Oct. 1971; E.C. Welling leg.; genitalia: TAM-2022-105 (USNM 154206); USNMENT01771235.

Description

Male
Forewing length. 15 mm (n = 1).

Head. Antenna filiform, checkered with alternating black and white scales above. Vertex and frons mostly light pink with scattered white scales. Labial palpus short, slightly porrect, subequal to diameter of eye, light pink and white. Cephalic collar mostly cream, but with some light pink scales, especially laterally.

Thorax. Patagium mostly cream; tegula cream above, light pink laterally, white and light pink below. Mesoscutum cream to ochreous. Legs mixture of pink and white scales; tibial spur formula 0–2–4; epiphysis well developed.

Forewing. Ground colour cream. Costal area pinkish grey at base with two white patches. Costomedial area with darkened grey patch terminating near center of wing; apical area along outer margin also dark grey. Underside patterned as in upperside but darkened apical area and outer margin of upperside replaced by speckling of much lighter brown scales. Fringe not checkered, white basally, light pink distally.

Hindwing. Concolourous with forewing ground colour above and without additional markings. Underside speckled with light brown scales throughout, scales modestly darker in basal half of wing. Fringe matching ground colour.

Abdomen. Ochreous above, white below.

Genitalia (Fig. 54). Uncus smaller than most *Stamnodes*, triangulate, tapering toward apex. Subscaphium well developed. Juxta pentangular, distal surface bearing ca 50 long setae, setae curved inward toward median. Valva ear-shaped, with inward depressed costal margin bearing large, broad, costobasal sclerite; inner surface of valva with large, laterally widened hair tuft arising from subcostal depression, hair tuft about two-thirds length of valva. Vinculum narrow, half as wide as tegumen. Everted vesica S-shaped, narrowing toward apex; bearing large central patch of several hundred, minute, dentate cornuti and two large, apical spinose cornuti.

Female

Outwardly undifferentiated from male.

Forewing length. 17 mm (n = 1).

Genitalia (Fig. 72). Anterior apophysis three-quarters length of posterior apophysis. Ductus bursae about one-third length of corpus bursae; attached to corpus bursae by broad triangulate sclerite flattened on ventral surface and dorsolaterally rolled toward median. Corpus bursae ovoid, bearing pyriform signum with numerous minute papillae in dorsal lower third, and large, subcircular surface sclerotization in ventromedial area.

Distribution (Fig. 86)

Mexico: *Stamnodes churro* sp. nov. is known from the heavily wooded and mountainous Northern Oaxaca Highlands and Oaxaca's Sierra Madre del Sur at elevations around 2300–2400 m.

Biology

Adults of *Stamnodes churro* sp. nov. fly in October and November. Adult habitus and genitalia suggest affinity to the many *Stamnodes* that feed on mountain mahogany (*Cercocarpus*). *Stamnodes churro* was collected flying with *S. catarina* sp. nov. and *S. tenebrosa* sp. nov. in El Cerezal, Oaxaca.

Molecular characterization

This species has not been sequenced.

Stamnodes ferropulvisa sp. nov.
urn:lsid:zoobank.org:act:DDF7C8EB-7E2F-447E-AD2D-4CCCC1D83252
Figs 28, 56, 73, 87, 94–95

Diagnosis

At the CNIN, *Stamnodes ferropulvisa* sp. nov. was sorted with *S. agapetica*, but it can be easily distinguished from the latter by its lighter ground colour which leans more toward a cream shade rather than orange-brown. Moreover, *S. ferropulvisa* lacks a strong transverse medial band on the hindwing underside, which is present in *S. agapetica*. *Stamnodes ferropulvisa* is also visually similar and presumably closely related to *S. calcarea* sp. nov. While both species share a tan to cream ground colour, the forewing underside apical area and hindwing underside of *S. ferropulvisa* is given much more toward rusty-brown than the lighter beige colour found in examined material of *S. calcarea*. Additionally, *S. calcarea* has an apparent pale, medial, transverse band on the hindwing underside that is absent or inconspicuous in *S. ferropulvisa*. Male genitalia of these species are quite similar, but the posterior juxtal processes of *S. calcarea* are more rounded apically and less deeply cleft between (see arrow, Fig. 57a), while the same processes of *S. ferropulvisa* are apically pointed and deeply cleft between (see arrow, Fig. 56a).

Stamnodes ferropulvisa sp. nov. is somewhat reminiscent of *S. ululata* (Fig. 28), a California (USA) endemic. Both share a creamy upperside and a much darker, rust-coloured, forewing-underside, apical area and hindwing underside. *Stamnodes ferropulvisa* is noticeably smaller than *S. ululata* and lacks the bipectinate male antennae, but more importantly these species are allopatric.

Etymology

The specific epithet *ferropulvisa*, loosely translates to ‘rust-powdered’ in Latin and describes the colour and fine maculation of the forewing underside apical area and hindwing underside.

Material examined

Holotype

MEXICO • ♀; Nuevo León, Cerro Potosí; [24.88° N, 100.21° W]; 26 Jun. 1997; elev. 2800 m; V.O. Becker leg.; BOLD Process ID: LNAUY181-19; GenBank: OP898454; genitalia: TAM-2020-200; USNMENT01523824.

Paratypes (17 ♂♂, 7 ♀♀)

MEXICO – **Nuevo León** • 1 ♀; same collection data as for holotype; VOB • 2 ♂♂, 3 ♀♀; Santiago; 25°21′ N, 100°18′ W; elev. 1760 m; 25–30 May 2000; V.O. Becker leg.; Becker 120895; VOB • 1 ♀; 3 mi. E of Galeana; [24.81° N, 100.03° W]; 7–9 Aug. 1963; W.D. Duckworth and D.R. Davis leg.; BOLD Process ID: LNAUY168-19; GenBank: OP898437; genitalia: TAM-2023-200 (USNM 154207); USNMENT01523811 • 2 ♂♂, 1 ♀; 4 mi. W of Iturbide; [24.74° N, 99.97° W]; elev. 5500 ft; 22 Sep. 1975; J. Powell, J. Chemsak and T. Friedlander leg.; at light; EMEC1748418 to EMEC1748420 • 2 ♂♂, 1 ♀; same collection data as for preceding; 13–14 Sep. 1976; J. Chemsak and J. Powell leg.; at blacklight; EMEC1748421 to EMEC1748423 • 2 ♂♂; same collection data as for preceding; 25 Sep. 1975; J. Powell, T. Richlin, and T. Friedlander leg.; at light; EMEC1748426 and EMEC1748427 • 2 ♂♂; highway 60, 4 mi. E of Galeana Jct.; [24.74° N, 99.98° W]; elev. 6000 ft; 23 Sep. 1975; J. Powell and T. Friedlander leg.; at light; EMEC1748424, EMEC1748425. – **Hidalgo** • 4 ♂♂; Santiago de Anaya; 20°24′07.61″ N, 98°53′17.97″ W; 26 Sep. 2017; A. Ibarra Vázquez leg.; genetic voucher: TAM0053; BOLD Process ID: WAGL2453-20; GenBank: OP898471; genitalia: TAM-2020-045, TAM-2023-240; CNIN. – **Coahuila** • 2 ♂♂; Saltillo, Lomas de Lourdes; 25.36366° N, 100.9774° W; 16 Sep. 2020; Emily Estefanía Espinosa Villarreal leg.; CNIN • 1 ♂; same collection data as for preceding; 10 Apr. 2020; genitalia: TAM-2023-219; CNIN.

Description

Male

Forewing length. 15–16 mm (n = 17).

Head. Antenna filiform, fuscous to black. Frons and vertex rosaceous, pale white to cream at margins. Labial palpus short, slightly porrect, subequal to diameter of eye, and mostly rosaceous. Cephalic collar mostly cream.

Thorax. Cream to ochreous. Legs with mostly rosaceous femora, but otherwise cream; tibial spur formula 0–2–4; epiphysis well developed.

Forewing. Cream ground colour; costa ochreous; apical area brown with curved, transverse, cream-coloured postmedial band that fades into ground colour centrally; brown colour of apices extending and fading down outer margin to tornus in some individuals. Underside matching patterning of upperside but with costa, apices, and outer margin replaced with rust. Fringe uncheckered and brown.

Hindwing. Cream-coloured above; below, rosaceous in costobasal area but elsewhere finely maculated with rust-coloured scales. Fringe like forewing.

Abdomen. Cream to ochreous.

Genitalia (Fig. 56). Uncus long and spatulate. Vinculum broadly squared. Juxta nearly pentagonal but with posterior face deeply cleft forming posterolateral points. Inner face of valva with hair tuft arising from medial depression; elongate scales of hair tuft enlarged at tips. Vesica with single, large, spinose cornutus and separate patch of dozens of much smaller spinose cornuti.

Female

Outwardly undifferentiated from male.

Forewing length. 16–17 mm (n = 8).

Genitalia (Fig. 73). Ovipositor short, anterior and posterior apophysis subequal in length. Ductus bursae short and narrow with prominent sclerite flattened on ventral surface and dorsolaterally rolled toward median. Corpus bursae ovoid with circular signum bearing minute papillae; signum situated at anterior third of corpus bursae.

Distribution (Fig. 87)

Mexico: *Stamnodes ferropulvisa* sp. nov. is known from the pine-oak forests of the Sierra Madre Oriental, from southern Coahuila in the vicinity of Saltillo southward to at least Santiago de Anaya, Hidalgo.

Biology

The flight of *Stamnodes ferropulvisa* sp. nov. is at least partially synchronous with *S. aumatlapalli* sp. nov. at the type locality in Hidalgo, and synchronous with *S. saltillo* sp. nov. and *S. favilla* sp. nov. at the type locality in Coahuila. The immature stages of this taxon remain unknown, but with new phylogenetic information and an expanded knowledge of Stamnodini life history (Matson & Wagner in prep.), the discovery of this caterpillar should be relatively easy to auger. A preliminary phylogeny of Stamnodini (Matson & Wagner in prep.) places *S. ferropulvisa* sister to *S. formosata* and deep within a clade of *Cercocarpus* specialists. Local *Cercocarpus* from the collection localities of *S. ferropulvisa* will likely host the larva. Likewise, the larva is likely to be stout, green to brown in colour, with 4–5 deep creases per segment, and abundantly salted with white excrescences. Adults may be bi- or multivoltine as confirmed records are from April through June and September. Presumably, larvae follow the adult flight in the same manner as close relatives.

Molecular characterization

This species is represented in BOLD by two BINs: BOLD:ADY9132 (n = 2, Nuevo León) and BOLD:AEH2872 (n = 1, Hidalgo). The pairwise distance between these two BINs is ~2%. The distance to their nearest adjacent interspecific neighbour, *Stamnodes formosata* (n = 20), is around 5% (Fig. 94), however, the presumed sister species, *S. calcarea* sp. nov., has not been successfully sequenced.

Remarks

The forewing lengths of type individuals from Coahuila and Nuevo León are on average about 1 mm longer than type individuals from Hidalgo.

Stamnodes calcarea sp. nov.
urn:lsid:zoobank.org:act:35564042-253B-4351-B99C-F5CEAFC43DDA
Figs 29, 57, 88, 95

Diagnosis

Stamnodes calcarea sp. nov. is visually similar and presumably closely related to *S. ferropulvisa* sp. nov. While both species share a tan to cream ground colour, the forewing underside apical area and hindwing underside of *S. ferropulvisa* is given much more toward rusty brown than the lighter beige colour found in the four specimens of *S. calcarea* available for examination. Additionally, *S. calcarea* has an apparent pale medial transverse band on the hindwing underside that is absent or inconspicuous in *S. ferropulvisa*. Male genitalia of these species are exceedingly similar; however, the posterior juxtal processes of *S. calcarea* are more rounded apically and less deeply cleft between (see arrow, Fig. 57a), while the same processes of *S. ferropulvisa* are apically pointed and deeply cleft between (see arrow, Fig. 56a). Though both species share a single spinose cornutus and an opposite echinate field of many smaller cornuti, the smaller cornuti of *S. calcarea* are generally half the length of those of *S. ferropulvisa*.

Etymology

The specific epithet, *calcarea*, meaning 'of lime' or 'pertaining to lime', is given for the pale and chalky hindwing underside that is reminiscent of limestone (calcium carbonate). Limestone is also a dominant geological substrate at the type locality.

Material examined

Holotype

MEXICO • ♂; Coahuila, Sierra La Madera, Upper Canada Desiderio; [27.08° N, 102.31° W]; 15–17 Mar. 1983; elev. 1810 m; J. Rawlins and S. Thompson leg.; genitalia: TAM-2023-194; genetic voucher: TAM0323; CMNH.

Paratypes (3 ♂♂)

MEXICO • 1 ♂; same collection data as for holotype; genitalia: TAM-2023-203 (USNM 154204); USNMENT01771236 • 1 ♂; same collection data as for holotype; AMNH_IZC 00352921 • 1 ♂; same collection data as for holotype; CNIN.

Description

Male

Forewing length. 16–17 mm (n = 4).

Head. Antenna filiform, mostly ochreous except for mixture of white, black, and pink scales above. Frons and vertex mostly rosaceous, but vertex scattered with some white scales. Labial palpus short, slightly porrect, subequal to diameter of eye, mostly rosaceous. Cephalic collar white to cream.

Thorax. Cream to ochreous. Tegula slightly rosaceous at base. Legs with mostly rosaceous femora, but otherwise cream; tibial spur formula 0–2–4; epiphysis well developed.

Forewing. Ground colour cream with slightly darker costa and ochreous to light brown apical area; costomedian with pale, barely visible, transverse band. Underside like upperside, perhaps slightly darker. Fringe lightly checkered with brown and white.

Hindwing. Concolourous with forewing above. Underside beige with pale medial transverse band; basal area along inner margin often speckled with pink scales. Fringe like forewing.

Abdomen. Cream to ochreous.

Genitalia (Fig. 57). Uncus long and slightly spatulate. Vinculum broadly squared. Juxta nearly pentagonal, but with cleft posterior face forming rounded posterolateral processes. Inner face of valva with hair tuft arising from medial depression; elongate scales of hair tuft enlarged at tips. Vesica with single, large, spinose cornutus opposite echinate field of nearly two dozen minute cornuti.

Female

Not known.

Distribution (Fig. 88)

Mexico: *Stamnodes calcarea* sp. nov. is so far only known from the type locality in the Sierra La Madera range of central Coahuila but is likely found elsewhere through the oak woodlands and chaparral-ladened arroyos and canyons of the northern Sierra Madre Oriental where its predicted host, mountain mahogany (*Cercocarpus*), is abundant.

Biology

Adult *Stamnodes calcarea* sp. nov. were collected in March at the type locality along with a large series of *S. agapetica*. The immature stages of this taxon remain unknown, but adult habitus and genitalia suggest affinity to the many *Stamnodes* that feed on *Cercocarpus* spp.

Molecular characterization

An attempt to sequence the COI barcode region of the holotype specimen was unsuccessful. This extraction remains ripe for next-generation sequencing.

Remarks

I was unable to find any additional information regarding the location of "Upper Canada Desiderio". Based on the predicted host of this moth, the dry bajada habitat where the GPS coordinates from the type specimens' labels plot does not seem like a suitable location. Additionally, the elevation of 1810 m on the label does not match the elevation of 1140 m where the GPS coordinates on the label plot. Given this incongruence, it is likely that the labeled elevation is correct, and the given GPS coordinates should be considered only as a very rough regional approximation.

Stamnodes ululata Pearsall, 1912
Figs 30, 94–95

Stamnodes ululata Pearsall, 1912: 99. Type locality: La Puerta, California, USA. [AMNH].
Stamnodes similis Wright, 1927: 42, **syn. nov.** Type locality: Pine Valley, San Diego County, California. [SDNHM].

Stamnoctenis similis – McDunnough 1938: 151 (checklist). — Ferguson 1983: 103 (checklist). — Poole & Gentili 1996: 686 (checklist). — Brown 2004: 110.
Stamnoctenis ululata – McDunnough 1938: 151 (checklist). — McFarland 1965: 62. — Ferguson 1983: 103 (checklist). — Furniss *et al.* 1988: 9. — Poole & Gentili 1996: 686 (checklist).
Stamnodes similis – Furniss *et al.* 1988: 9. — Scoble 1999: 901 (catalogue). — Scoble & Hausmann 2007 (online catalogue). — Pohl *et al.* 2016: 448 (checklist). — Rajaei *et al.* 2022 (online catalogue).
Stamnodes ululata – Scoble 1999: 901 (catalogue). — Scoble & Hausmann 2007 (online catalogue). — Pohl *et al.* 2016: 448 (checklist). — Rajaei *et al.* 2022 (online catalogue).

Taxonomic act

Stamnodes similis **syn. nov.** is newly regarded as a synonym of *S. ululata*. In the original description of *S. similis*, Wright describes this taxon as most closely resembling *S. apollo* and makes no mention of *S. ululata*. It is unlikely Wright compared the holotype female of *S. ululata* to his *S. similis* material, for had he done so, at the very least he would have had to mention their uncanny similarity. COI barcodes and genitalic preparations of *S. similis* specimens at the USNM are identical to those of *S. ululata*. Doug Ferguson in Furniss *et al.* (1988) entertained this taxonomic change but did not make an explicit call for synonymy.

Diagnostic remarks

Stamnodes ululata is one of only a few species of *Stamnodes* known to be sexually dimorphic. The male antennae are bipectinate with ciliated rami; those of the female are filiform. In males, the forewing apex, costa, and costomedial subquadrangular patch are darkened with brown-grey scales, while in females, these areas are much lighter and given towards clay. The female hindwing underside is also nearly immaculate, and only occasionally shows a very slight, medial, transverse colour transition.

Distribution

Mexico: *Stamnodes ululata* is found in the chaparral associations, foothills, canyons, and Pacific coastal scrub communities of northwestern Baja California. USA: the core of this species' range lies to the north in California.

Biology

Adults precede larvae in the fall, flying from September to November across most of the range. Males rarely come to light according to McFarland (1965). Larvae are hosted by birch leaf mountain mahogany (*Cercocarpus betuloides*). In Furniss *et al.* (1988), Douglas Ferguson attributed the original host record of this species to reared adults from Chris Henne records in the Los Angeles County Museum (LACM). Additional unpublished life history details and larval illustrations are forthcoming (Matson & Wagner in prep.).

Molecular characterization

This species is represented in BOLD as BIN: BOLD:AAL9317 (n = 21). At present, the average pairwise intraspecific distance is 1.31%, the pairwise maximum intraspecific distance is 2.75%, and the distance to the nearest neighbour, *Stamnodes costimacula* (n = 13), is 7.35%.

Stamnodes costimacula (Grossbeck, 1912)
Figs 31, 94–95

Petrophora costimacula Grossbeck, 1912: 283. Type locality: San Diego, California, USA. [AMNH].
Stamnodes kelseyi Wright, 1927: 41. Type locality: Pine Valley, San Diego County, California, USA. [SDNHM].

Stamnoctenis costimacula pallula McDunnough, 1941: 70. Type locality: The Geysers, Sonoma County, California, USA. [CNC].

Stamnodes costimacula – McDunnough 1938: 151 (checklist). — Furniss *et al.* 1988: 9. — Scoble 1999: 901 (catalogue). — Scoble & Hausmann 2007 (online catalogue). — Lee 2014: e86 (inventory). — Pohl *et al.* 2016: 449 (checklist). — Rajaei *et al.* 2022 (online catalogue).
Stamnoctenis kelseyi – McDunnough 1938: 151 (checklist); 1941: 70.
Stamnoctenis costimacula – McDunnough 1941: 70. — McFarland 1965: 62. — Ferguson 1983: 103 (checklist). — Poole & Gentili 1996: 686 (checklist).
Stamnodes kelseyi – Furniss *et al.* 1988: 9.

Diagnostic remarks

Males can be separated from those of *S. annellata*, *S. coenonymphata*, and *S. cassinoi* by their bipectinate antennae.

Distribution

Mexico: *Stamnodes costimacula* is found in the chaparral associations, foothills, canyons, and Pacific coastal scrub communities of northwestern Baja California. USA: the core of this species' range lies in California.

Biology

The peak adult flight is October to December with mature larvae following into March and April. Larvae are hosted by birch leaf mountain mahogany (*Cercocarpus betuloides*). The caterpillar and host plant were discovered by David L. Wagner and the author in March 2016 in southern California. Additional unpublished life history details and larval illustrations are forthcoming (Matson & Wagner in prep.).

Molecular characterization

This species is presently represented in BOLD by multiple BINs. The BIN that includes topotypic San Diego Co. (USA) individuals is: BOLD:AAN0096 (n = 13). At present, the average pairwise intraspecific distance is 0.63% and the distance to the nearest neighbour, *Stamnodes costimacula pallula* (n = 6), is 2.81%.

Remarks

COI barcode data show significant phylogeographic divergence across the range of *S. costimacula.* Nuclear markers are necessitated to further circumscribe and scale this genetic variation. Without significant isolating barriers, it can be assumed that topotypic individuals barcoded from San Diego Co., California, represent the same population as that in northern Baja California.

Stamnodes cassinoi Swett, 1917
Figs 32, 94–95

Stamnodes cassinoi Swett, 1917: 52. Type locality: Eldridge, California, USA. [MCZ].

Stamnodes cassinoi – McDunnough 1938: 151 (checklist). — Peterson 1968: 86–87. — Ferguson 1983: 103 (checklist). — Furniss *et al.* 1988: 7. — Poole & Gentili 1996: 686 (checklist). — Scoble 1999: 901 (catalogue). — Brown & Bash 2000: 73. — Powell 2005: 369. — Scoble & Hausmann 2007 (online catalogue). — Pohl *et al.* 2016: 449 (checklist). — Rajaei *et al.* 2022 (online catalogue).

Diagnostic remarks

Stamnodes cassinoi is not easy to distinguish from *S. annellata* and *S. costimacula.* Males can be separated from those of *S. costimacula* by their filiform and non-bipectinate antennae. Generally, the basal half of the hindwing underside is darker brown than in *S. annellata* and *S. costimacula*, and the costal margin at the antemedian often has a noticeable semicircular ochreous patch. Genitalic dissection

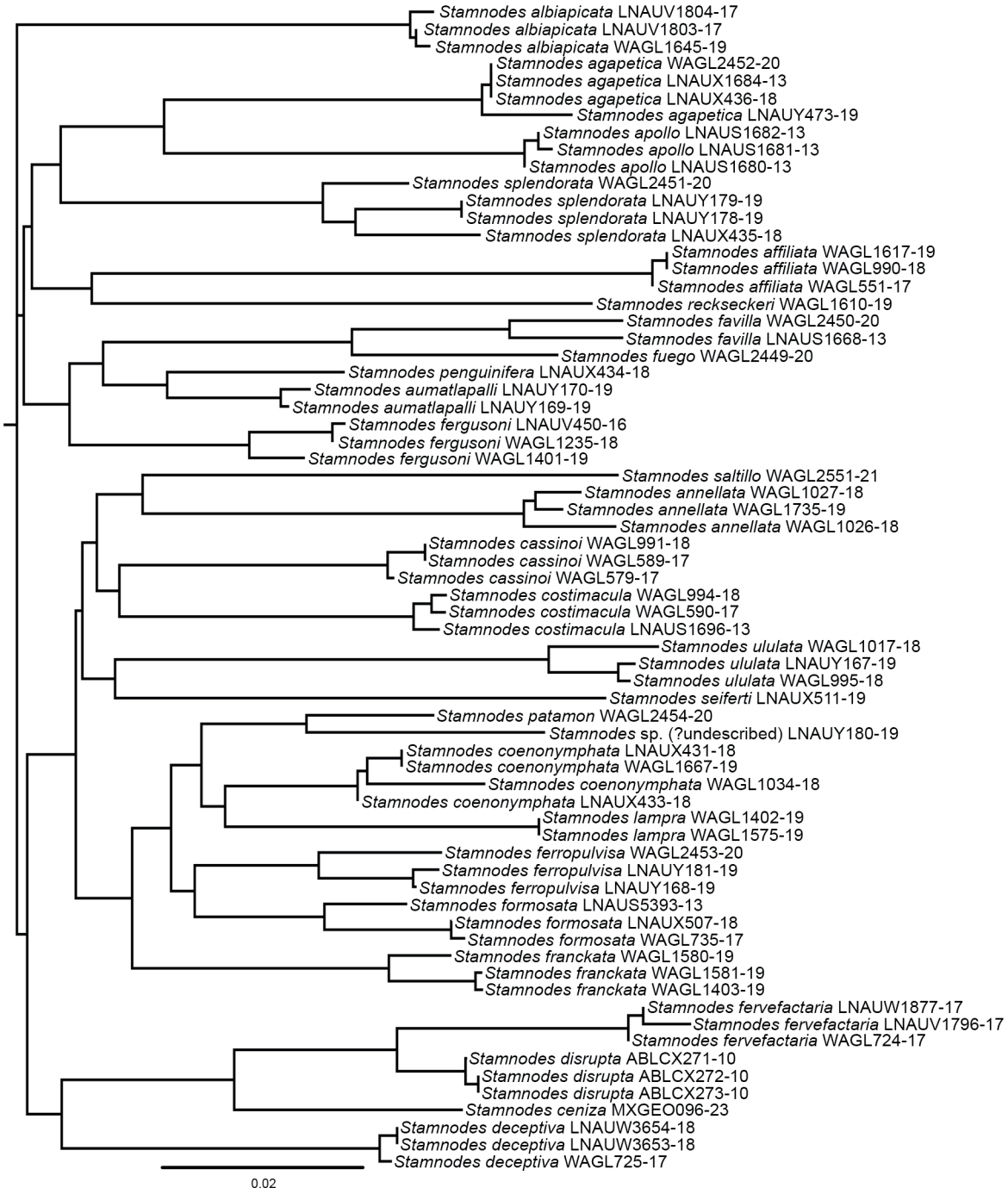


Fig. 94. COI neighbour-joining tree for Mexican *Stamnodes* Guenée, [1858] using default Kimura-2P model in the Barcode of Life Project (BOLD). Taxon names followed by BOLD Process ID.

(Matson & Wagner in prep.) and genetic analysis are sometimes necessary to distinguish this taxon from others.

Distribution

Mexico: *Stamnodes cassinoi* is found in the chaparral associations, foothills, canyons, and Pacific coastal scrub communities of northwestern Baja California. USA: the core of this species' range lies in California. *Stamnodes cassinoi* appears to prefer more coastal habitat than congeners and rarely ranges inland.

Biology

Stamnodes cassinoi feeds on *Cercocarpus betuloides* in southern California and likely Mexico. There is a single flight, from early December through January, with mature caterpillars following into March. The caterpillar and host plant were discovered by David L. Wagner and the author in March 2016 in southern California. Additional unpublished life history details and larval illustrations are forthcoming (Matson & Wagner in prep.).

Molecular characterization

This species is represented in BOLD as BIN: BOLD:AAF9456 (n = 10). At present, the average pairwise intraspecific distance is 0.59%, the pairwise maximum intraspecific distance is 1.12%, and the distance to the nearest neighbour, *Stamnodes modocata* (n = 2), is 4.67%.

Stamnodes annellata (Hulst, 1887)
Figs 33, 94–95

Marmopteryx annellata Hulst, 1887: 191. Type locality: Pacific Coast [USA]. [AMNH].
Stamnodes catastrophata Dyar, 1923: 20. Type locality: San Diego, California, USA. [USNM].
Stamnodes gratificata Dyar, 1923: 21. Type locality: Claremont; San Diego, California, USA. [USNM].

Coenocalpe annellata – Hulst 1896: 287. — Dyar 1902: 285 (cat.).
Stamnodes annellata – Pearsall 1909b: 366. — McDunnough 1938: 151 (checklist). — McFarland 1965: 62. — Ferguson 1983: 103 (checklist). — Furniss *et al.* 1988: 7. — Poole & Gentili 1996: 686 (checklist). — Brown & Bash 2000: 73. — Scoble 1999: 901 (catalogue). — Scoble & Hausmann 2007 (online catalogue). — Lee 2014: e86 (inventory). — Pohl *et al.* 2016: 448 (checklist). — Rajaei *et al.* 2022 (online catalogue).

Distribution

Mexico: *Stamnodes annellata* is found in the chaparral associations, foothills, canyons, and Pacific coastal scrub communities of northwestern Baja California. USA: the core of this species' range lies in California.

Biology

The adult flight peaks from December to February with mature caterpillars following from early spring into May. Larvae are hosted by birch leaf mountain mahogany (*Cercocarpus betuloides*) (McFarland 1965).

Molecular characterization

Mexican individuals will almost certainly belong to the BOLD BIN: BOLD:AAF9421 (n = 29, Southern California). At present, the average pairwise intraspecific distance is 1.27%, and the distance to the nearest neighbour, *Stamnodes* nr *annellata* (n = 5, California: Channel Islands), is 4.62%.

Remarks

According to preliminary molecular data (Matson & Wagner in prep.), there is significant phylogeographic structure throughout the western North American range of *S. annellata*. Accordingly, *S. annellata* may be a complex of multiple species that warrants further study. Mexican individuals will belong to the same barcode haplotype grouping as the many sequenced specimens from San Diego Co., California, and bordering USA counties.

Stamnodes seiferti (Neumoegen, 1882)
Figs 34, 94–95

Marmopteryx seiferti Neumoegen, 1882: 135. Type locality: Prescott, Arizona, USA. [USNM].

Coenocalpe seifertii – Hulst 1896: 287. — Dyar 1902: 286 (cat.). — Pearsall 1906: 204.
Stamnodes seifertii – Pearsall 1909b: 366.
Stamnodes seiferti – McDunnough 1938: 151 (checklist). — Ferguson 1983: 103 (checklist). — Poole & Gentili 1996: 686 (checklist). — Scoble 1999: 903 (catalogue). —Knudson & Bordelon 2002: 7–8. — Scoble & Hausmann 2007 (online catalogue). — Powell & Opler 2009: 226; pl. 32 figs 26–27. — Lee 2014: e86 (inventory). — Pohl *et al.* 2016: 449 (checklist). — Rajaei *et al.* 2022 (online catalogue).

Diagnostic remarks

This species may only be confused with *S. tenebrosa* sp. nov. (Fig. 35); however, so far as known, the two species are allopatric. While *S. seiferti* extends from the northern Sierra Madre Occidental to central Arizona, northern New Mexico, and the Trans-Pecos region of Texas (USA), all known specimens of *S. tenebrosa* are from the mountainous Northern Oaxaca Highlands and Oaxaca's Sierra Madre del Sur. *Stamnodes seiferti* is lighter in colour and slightly smaller than *S. tenebrosa*, and while sharing many of the same pattern elements, *S. seiferti* can be differentiated by the absence of a pale, arcing, medial, transverse band on a darkened hindwing upperside; in *S. seiferti*, the hindwing upperside is lighter, given toward dull yellow, and lacking a defined transverse band. Male genitalia are exceedingly similar; however, the laterodistal shoulders of the shield-shaped juxta are acuminate or pointed in *S. seiferti* and more rounded in *S. tenebrosa*, and although some cornuti are increasingly tiny and difficult to visualize, *S. seiferti* appears to have around 7–8 spinose cornuti, while *Stamnodes tenebrosa* appears to have around 5–6.

Distribution

Mexico: *Stamnodes seiferti* inhabits the rocky hillsides, open woodlands, and chaparral communities of the northern Sierra Madre Occidental. USA: this species is found from central Arizona to West Texas.

Biology

The peak adult flight is September and October, with some captures of adults through November. Larvae feed on mountain mahogany (*Cercocarpus montanus*) (Powell & Opler 2009), and are one of the most cold-hardy and latest-developing in the genus. Caterpillars do not hatch until October and seldom mature before the middle of November.

Molecular characterization

This species is represented in BOLD by two BINs: BOLD:AAH5624 (n = 7) and BOLD:AAM3492 (n = 4). The pairwise distance between these two BINs is 2.99%. The distance to their nearest interspecific neighbour, *Stamnodes ululata* (n = 21), is around 9–10% (Fig. 94); however, the presumed sister species, *S. tenebrosa* sp. nov., has not been successfully sequenced.

Stamnodes tenebrosa sp. nov.
urn:lsid:zoobank.org:act:70D831DE-EBB5-4442-9B83-688D10DECFB4
Figs 35, 38, 89, 95

Diagnosis

Stamnodes tenebrosa sp. nov. is very similar to *S. seiferti* (Fig. 34), but so far as known the two species are allopatric. Known specimens of *S. tenebrosa* are from the mountainous Northern Oaxaca Highlands and Oaxaca's Sierra Madre del Sur, while *S. seiferti* is a northern Sierra Madre Occidental entity that extends into central Arizona, northern New Mexico, and the Trans-Pecos region of Texas. *Stamnodes tenebrosa* is darker and slightly larger than *S. seiferti*, and while sharing many of the same pattern elements, *S. tenebrosa* can be differentiated by its pale, arcing, medial, transverse band on the darkened hindwing upperside; in *S. seiferti*, the hindwing upperside is lighter, given toward dull yellow, and lacks a well-differentiated transverse band. Male genitalia are exceedingly close to those of *S. seiferti*; a notable difference is the rounded laterodistal shoulders of the shield-shaped juxta in *S. tenebrosa* and more pointed or acuminate shoulders in *S. seiferti*. *Stamnodes tenebrosa* also appears to have around 5–6 spinose cornuti while *S. seiferti* has around 7–8; however, some of the cornuti are increasingly tiny and difficult to visualize and these counts should be considered with caution.

Etymology

The specific epithet *tenebrosa*, Spanish for 'dark, gloomy, or murky', was inspired by this species' dark wings relative to the much lighter colouration of its apparent sister, *S. seiferti*.

Material examined

Holotype

MEXICO • ♂; Oaxaca, Mpio. Ixlepejl [Ixtepejl], Cerezal; [17.26° N, 96.56° W]; elev. 2300 m; 7 Nov. 1980; E.C. Welling leg.; genitalia: TAM-2022-097; AMNH_IZC 00352924.

Paratypes (11 ♂♂)

MEXICO – **Oaxaca** • 2 ♂♂; same collection data as for holotype; genitalia: TAM-2021-096 (USNM 154203); USNMENT01771242, USNMENT01771243 • 1 ♂; same collection data as for holotype; genitalia: TAM-2021-097; AMNH_IZC 00353017 • 2 ♂♂; same collection data as for holotype; CNIN • 1 ♂; Mpio. Río Hondo, San José Pacífico; [16.16° N, 96.50° W]; elev. 2400 m; 5 Nov. 1971; E.C. Welling leg.; USNMENT01771244 • 1 ♂; same collection data as for preceding; 21 Nov. 1971; AMNH_IZC 00352923 • 1 ♂; Mpio. Paxtlán, Agua Azul; [16.21° N, 96.51° W]; elev. 2300 m; 9 Nov. 1977; E.C. Welling leg.; AMNH_IZC 00352922. – **Puebla** • 2 ♂♂; 7.5 km NE of Azumbilla; [18.70° N, 97.36° W]; elev. 2200 m; 22 Aug. 1987; Brown and Powell leg.; EMEC1748448, EMEC1748449 • 1 ♂; same collection data as for preceding; CNIN.

Description

Male

Forewing length. 18–19 mm (n = 12).

Head. Antenna filiform, grey scales above. Vertex and frons mostly grey, white around eyes and base of antennae. Labial palpus slightly porrect, 1.5× diameter of eye, grey and white. Cephalic collar mostly grey.

Thorax. Patagium grey; tegula grey at base, more fuscous distally. Mesothorax grey to cream. Legs mixture of grey and white scales; tibial spur formula 0–2–4; epiphysis well developed.

Forewing. Ground colour fuscous, gradually darkening toward outer margin. Costomedial area with subquadrangular, dark fuscous patch terminating near center of wing and outwardly highlighted by U-shaped band of lighter scales. Underside fuscous in basal half, tan and speckled with fuscous scales in distal half; basal and distal areas separated by medial transverse band; band forming near right angle in center of wing that opens toward base. Fringe lighter than fuscous area of outer margin above, concolourous with underside below.

Hindwing. Concolourous with forewing ground colour above, darkening toward outer margin, and bearing pale, arcing, medial transverse band. Underside tan, speckled with fuscous scales, and bearing darkened medial transverse band. Fringe as in forewing.

Abdomen. Fuscous to ochreous above, white below.

Genitalia (Fig. 58). Uncus long, slender, and strongly spatulate at apex. Juxta shield-shaped, posteriorly concave with dozens of erect setae between rounded laterodistal shoulders or protuberances. Valva ear-shaped with costal sclerite terminating in subapical area; inner face of valva with two prominent hair tufts: first tuft arising from large rounded tubercle in antemedial area; second tuft, shorter, linearly extended in costomedial depression. Vesica with 5–6 spinose cornuti greatly decreasing in size in succession.

Female

No material available.

Distribution (Fig. 89)

Mexico: so far as known, *Stamnodes tenebrosa* sp. nov. inhabits the mountainous Northern Oaxaca Highlands and the Sierra Madre del Sur in Oaxaca and Puebla at elevations around 2200–2400 m.

Biology

Adults fly in November after sympatric *S. catarina* sp. nov., *S. churro* sp. nov., and *S. patamon*. Larvae are predicted to immediately follow the adult flight. *Stamnodes seiferti*, the presumed sister taxon of *Stamnodes tenebrosa* sp. nov., has some of the most cold-hardy and latest developing caterpillars in its native range. It would be unsurprising if *S. tenebrosa* also matures under unusually cold conditions. It is likely that the larvae of *S. tenebrosa* will feed on *Cercocarpus*.

Molecular characterization

This species has not been sequenced.

Stamnodes affiliata Pearsall, 1911
Figs 36, 94–95

Stamnodes affiliata Pearsall, 1911: 253. Type locality: San Diego, California, USA. [AMNH].

Stamnodes affiliata – McDunnough 1938: 151 (checklist). — McFarland 1965: 62. —Ferguson 1983: 103 (checklist). — Furniss *et al.* 1988: 7. — Poole & Gentili 1996: 686 (checklist). — Brown & Bash 2000: 73. — Scoble 1999: 901 (catalogue). — Scoble & Hausmann 2007 (online catalogue). — Pohl *et al*. 2016: 448 (checklist). — Rajaei *et al.* 2022 (online catalogue).

Diagnostic remarks

Adults can be distinguished from sister species *S. reckseckeri* by the absence of the dark brown oblique streak on the underside of the hindwing (this replaced by a discal spot in *S. affiliata*). The basal half of

the hindwing underside is light brown to tan and lightly maculated with dark brown scales while the distal half is dark brown and maculated with a few light brown scales. The medial separation between these halves stair-steps toward the outer margin about one-third down from the costa.

Distribution

Mexico: *Stamnodes affiliata* is found in the coastal sage and chaparral associations of northern Baja California. USA: the core of this species' range lies in California, where its *Salvia* hosts are more widely distributed.

Biology

Adults fly from November to February with a single larval generation to follow. Mature caterpillars are primarily found in February and March. McFarland (1965) records white sage (*Salvia apiana* Jeps.) (Lamiaceae) and black sage (*Salvia mellifera* Greene) as hosts of this species. David L. Wagner and I have subsequently reared this species from both these aforementioned *Salvia* hosts in California (USA). Additional unpublished life history details and larval illustrations are forthcoming (Matson & Wagner in prep.).

Molecular characterization

This species is represented in BOLD by two BINs: BOLD:AAE9252 (n = 24, USA: Southern California) and BOLD:AEV4151 (n = 2, Northern California). The pairwise distance between these two BINs is 1.93%. The distance to their nearest adjacent interspecific neighbour, *Stamnodes reckseckeri* (n = 1), is around 10% (Fig. 94).

Stamnodes reckseckeri Pearsall, 1910
Figs 37, 94–95

Stamnodes reckseckeri Pearsall, 1910: 213. Type locality: San Diego, California, USA. [AMNH].

Stamnodes rickseckeri – McDunnough 1938: 151 (checklist).
Stamnodes reckseckeri – Ferguson 1983: 103 (checklist). — Poole & Gentili 1996: 686 (checklist). — Brown & Bash 2000: 73. — Scoble 1999: 903 (catalogue). — Scoble & Hausmann 2007 (online catalogue). — Pohl *et al.* 2016: 448 (checklist). — Rajaei *et al.* 2022 (online catalogue).

Diagnostic remarks

Adults can be distinguished from *S. affiliata* by their central, dark brown, oblique streak on the underside of the hindwing that runs parallel to the costa, and the subtle, dark brown, maculation covering the distal third of the hindwing underside. In *S. affiliata*, the oblique streak is replaced by a discal spot and the light brown distal half of the hindwing underside is more crisply demarcated from the tan basal scaling.

Distribution

Mexico: *Stamnodes reckseckeri* is found in the coastal sage, chaparral, and premontane communities of northern Baja California. Records extend as far south as Punta San Jose, but the range likely extends southward along the coast for many miles. USA: although the core of this species' range is likely Mexican, most institutional records are from southern California.

Biology

The flight season extends from November to March, with the peak flight in December. Larvae directly follow the adult flight and feed on new growth in the early spring. David L. Wagner and I recently collected the first larval record of *Stamnodes reckseckeri* in southern California from white sage, *Salvia*

apiana (Lamiaceae). The larva is to our eyes indistinguishable from sister species *S. affiliata*, and worse, the two are sympatric, synchronic, and share *Salvia* as a host. So far as known, molecular identification will be required to disambiguate the immature stages of these related taxa. Although our single record was from white sage, it is possible that *S. reckseckeri* also feeds on black sage (*Salvia mellifera*) and other woody *Salvia*, as does *S. affiliata*.

Molecular characterization

This species is represented in BOLD by BIN: BOLD:AEA0773. The distance to the nearest adjacent interspecific neighbour, *Stamnodes affiliata* (n = 26), is around 10% (Fig. 94).

Stamnodes apollo Cassino, 1920
Figs 38, 59, 94–95

Stamnodes apollo Cassino, 1920: 115. Type locality: Hereford, Arizona, USA. [MCZ].

Stamnodes apollo – McDunnough 1938: 151 (checklist). — Ferguson 1983: 103 (checklist). — Poole & Gentili 1996: 686 (checklist). — Scoble 1999: 901 (catalogue). — Scoble & Hausmann 2007 (online catalogue). — Pohl *et al.* 2016: 448 (checklist). — Rajaei *et al.* 2022 (online catalogue).

Diagnostic remarks

Stamnodes apollo is readily confused with *S. agapetica*. It can be distinguished from *S. agapetica* by its lighter buff-orange ground colour, cream to buff forewing underside apex, and hindwing venter, which bears subtle, dark brown, transverse striations. Male genitalia offer the most diagnostic characters; *S. agapetica* has pointed lateral projections on the juxta (Fig. 60a) and only a single, large, spinose cornutus on the vesica (Fig. 60b), while *S. apollo* has a more rounded juxta that lacks lateral projections (Fig. 59a) and a pair of large spinose cornuti on the vesica (Fig. 59b). It should be noted, the pointed lateral projections of the juxta in *S. agapetica* are not easily visualized in Fig. 60a.

Distribution

Mexico: *Stamnodes apollo* is found throughout the Sierra Madre Occidental and Trans-Mexican Volcanic Belt regions to at least the state of Morelos. USA: this species is a montane Madrean endemic with individuals recorded from the Santa Rita, Santa Catalina, Chiricahua, and Huachuca mountains of Arizona. *Stamnodes apollo* is often sympatric with related *S. agapetica*.

Biology

Stamnodes apollo is spring and summer active with adult records extending from March through July, with most records from earlier months. The immature stages remain unknown.

Molecular characterization

Stamnodes apollo is represented in BOLD as BIN: BOLD:ACG1155 (n = 3). At present, the average pairwise intraspecific distance is 0.2% and the pairwise maximum intraspecific distance is 0.31%. The distance to the nearest adjacent interspecific neighbour, *Stamnodes agapetica* (n = 5), is around 7% (Fig. 94).

Stamnodes agapetica (Dyar, 1916)
Figs 39, 60, 94–95

Coenocalpe agapetica Dyar, 1916: 32. Type locality: Zacualpan [State of Mexico], Mexico. [USNM].
Stamnodes artemis Rindge, 1958: 1–2, figs 1–2, 13–14, **syn. nov.** Type locality: Upper Camp Pinery Canyon, Chiricahua Mountains, Cochise Co., Arizona, USA. [LACM, AMNH].

Stamnodes artemis – Ferguson 1983: 103 (checklist). — Furniss *et al*. 1988: 8. — Poole & Gentili 1996: 686 (checklist). — Scoble 1999: 901 (catalogue). — Scoble & Hausmann 2007 (online catalogue) — Pohl *et al.* 2016: 448 (checklist). — Rajaei *et al.* 2022 (online catalogue).
Stamnodes agapetica – Scoble 1999: 901 (catalogue). — Scoble & Hausmann 2007 (online catalogue). — Rajaei *et al.* 2022 (online catalogue).
Coenocalpe agapetica – Beutelspacher-Baigts 2013: 95, 257.

Taxonomic act

Stamnodes artemis is regarded as a new synonym of *S. agapetica*. Dyar's original description of *S. agapetica* is weakly informative, but the types of *S. artemis* match in fine detail the holotype of *S. agapetica*. Genetic evidence further supports this new synonymy; a COI barcoded individual (BOLD Process ID: LNAUY473-19; GenBank OP898460) collected at 9000 ft in Hidalgo shows only a subtle genetic barcode divergence (~ 1%) from Arizona's *S. artemis*. Although neither the holotype nor topotypical specimens of *S. agapetica* have been sequenced, the sequenced specimen from Hidalgo appears to be representative – Hidalgo and the type locality of Zacualpan are quite close. Rindge (1958) was probably unaware of *S. agapetica* when he described *S. artemis*, as it was classified in *Coenocalpe* Hübner and no prior work had consolidated the many *Stamnodes* species that were at that time spread across a few disparate genera.

Diagnostic remarks

Stamnodes agapetica is readily confused with *S. apollo*. It can be distinguished from *S. apollo* by its deep orange ground colour that lies in contrast to the lighter buff-orange colour of *S. apollo* and a forewing underside apex and hindwing underside that are maculated with red to brown scales that darken to form a medial transverse band on the hindwing underside; the same areas in *S. apollo* are cream to buff in colour with the hindwing underside showing subtle dark brown, transverse striations. Male genitalia offer the most diagnostic characters; *S. agapetica* has pointed lateral projections on the juxta (Fig. 60a) and only a single, large, spinose cornutus on the vesica (Fig. 60b), while *S. apollo* has a more rounded juxta lacking lateral projections (Fig. 59a) and a pair of large spinose cornuti on the vesica (Fig. 59b). It should be noted, the pointed lateral projections on the juxta in *S. agapetica* are not easily visualized in Fig. 60a.

Distribution

Mexico: so far as known, *S. agapetica* is the only species found throughout the Sierra Madre Occidental, Trans-Mexican Volcanic Belt, and Sierra Madre Oriental. Collections spanning this vast range are few, and gene flow is presumably maintained across the high elevation pine-fir forests that punctuate its mountainous habitat. The distribution of this species largely overlaps that of its sister, *S. apollo*, which may also have a similarly expansive, yet unconfirmed, Mexican distribution. USA: *Stamnodes agapetica* is only known from the Madrean sky islands of southeast Arizona in the USA.

Biology

Stamnodes agapetica is spring and summer active, March through July, and appears to be more common in later months. The immature stages remain unknown.

Molecular characterization

This species is represented in BOLD as BIN: BOLD:AAJ5005 (n = 5). At present, the average pairwise intraspecific distance is 0.2% and the pairwise maximum intraspecific distance is 0.52%. The distance to the nearest adjacent interspecific neighbour, *Stamnodes apollo* (n = 3), is around 7% (Fig. 94).

Stamnodes albiapicata Grossbeck, 1910
Figs 40, 90, 94–95

Stamnodes albiapicata Grossbeck, 1910: 202. Type locality: Redington, Arizona, USA. [USNM].

Stamnodes albiapicata – Grossbeck 1912: 283. — Swett 1915: 155, 156.—McDunnough 1938: 151 (checklist). — McFarland 1965: 62. — Ferguson 1983: 103 (checklist). — Furniss *et al*. 1988: 7. — Poole & Gentili 1996: 686 (checklist). — Scoble 1999: 901 (catalogue). — Brown & Bash 2000: 73. — Brown 2004: 110. — Powell 2005: 369. — Scoble & Hausmann 2007 (online catalogue). — Powell & Opler 2009: 226, pl. 32 figs 22–23. — Lee 2014: e86 (inventory). — Pohl *et al.* 2016: 448 (checklist). — Rajaei *et al*. 2022 (online catalogue).

Diagnostic remarks

In the USA, this taxon may be difficult to distinguish from closely related congeners, especially at the northern end of its range in California. In Mexico, however, this species cannot be confused with other members of the genus.

Distribution

Mexico: *Stamnodes albiapicata* is found in the chaparral associations, canyons, and Pacific coastal scrub communities of Baja California. Records extend well into the Baja California Desert as far south as El Rosario. So far as known, no moths have been taken from Sonora, though it is recorded a short distance away in Pima Co., Arizona (USA). USA: *Stamnodes albiapicata* ranges from Southern California to just south of the Bay Area, and east to central Arizona.

Biology

There is a single winter flight from December through February with a few individuals persisting into March. Larvae directly follow the adult flight and are found on new foliage in the spring. McFarland (1965) lists various hydrophylloid Boraginaceae as the hosts of this species, including *Phacelia* Juss., *Pholistoma* Lilja, and *Nemophila* Nutt. David L. Wagner and I have collected larvae (Fig. 90) from both *Phacelia* and *Pholistoma* in California. Additional unpublished life history details and larval illustrations are forthcoming (Matson & Wagner in prep.).

Molecular characterization

This species is represented in BOLD as BIN: BOLD: AAF2594 (n = 29). At present, the average pairwise intraspecific distance is 0.44% and the pairwise maximum intraspecific distance is 1.44%.

Discussion

This manuscript provides an initial review of Mexico's diverse *Stamnodes* fauna; however, I estimate that there may be a half dozen species left untreated: mainly undescribed taxa from under-collected areas and cryptic taxa. During the preparation of this manuscript, a dilemma arose regarding USA species with a high likelihood of distribution in Mexico but with no Mexican records found in the studied material. After careful consideration, these taxa (e.g., *S. cassinoi*, *S. costimacula*, *S. annellata*, *S. fervefactaria*, etc.) were included in this review as they are commonly found along the USA border and are likely to be present in Mexico.

Prior to this effort, four species of *Stamnodes* were described from Mexico: *S. agapetica*, *S. patamon*, *S. penguinifera*, and *S. sistenata* (Dyar, 1913). Of these, *S. sistenata* is left untreated, as it more closely resembles *Stamnoctenis* Warren, 1901 in its wing colour, patterning, and bipectinate male antennae. The taxonomy of *Stamnoctenis* in the USA is currently a taxonomic challenge, with a significant degree

of uncertainty regarding species boundaries. The Mexican *Stamnoctenis* fauna promises to be equally complex, and therefore insurmountable at this time. Two additional *Stamnodes* are described from neighbouring Guatemala: *S. cannonaria* (Figs 2, 42) and *S. proana* Druce, 1893 (Fig. 18). *Stamnodes cannonaria* is closely allied to *S. aumatlapalli* sp. nov. (Fig. 1), while *S. proana* superficially resembles the Old-World type species *S. pauperaria* (Eversmann, 1848). Both species are left untreated, as neither is known to range into Mexico.

Biogeography (Fig. 95)

The *Stamnodes* of Mexico largely follow common Mexican biogeographic patterns and can be readily assigned to defined regions identified by Morrone (2020). Below, I use Morrone's nomenclature to classify and discuss the distributional patterns of *Stamnodes*.

Californian Province

Included species: *S. affiliata*, *S. albiapicata*, *S. cassinoi*, *S. coenonymphata*, *S. costimacula*, *S. reckseckeri*, *S. ululata*.

A significant number of Mexican *Stamnodes* inhabit a relatively small area of coastal sage and chaparral communities of the California Floristic Province that extends into northwestern Baja California. Among them, *Stamnodes affiliata*, *S. reckseckeri*, and *S. albiapicata* appear to extend further south due to their host plant ranges, which include *Salvia* spp. for the former two and various hydrophylloid genera for the latter. Except for the Chihuahuan *S. fergusoni*, this is the only group of *Stamnodes* in Mexico not associated with temperate montane pine, pine-oak, or pinyon-juniper forest habitats.

Mexican Plateau Province (Chihuahuan)

Included species: *S. fergusoni*.

So far as known, *S. fergusoni* is the only *Stamnodes* with a principally Chihuahuan distribution. The species is not found in hard desert, but rather in grassland, steppe, thorn scrub, and foothill habitats of the Chihuahuan desert.

Sierra Madre Occidental Province

Included species: *S. agapetica* (in part), *S. apollo* (in part), *S. deceptiva*, *S. carota* sp. nov., *S. clara* sp. nov., *S. disrupta* sp. nov., *S. fervefactaria*, *S. formosata*, *S. franckata*, *S. fuego* sp. nov., *S. lampra*, *S. mariachi* sp. nov., *S. patamon* (in part), *S. seiferti*, *S. splendorata* (in part)

Stamnodes found in the northern Sierra Madre Occidental are among the better known of the Mexican fauna, as the northern extremes of their ranges often extend into the USA, where the lepidopteran biodiversity has been more extensively studied. Biologists and collectors venturing to the mountains of southern Arizona, New Mexico, and west Texas often prize these taxa as Madrean sky island endemics, valued for their apparent rarity and often striking colouration.

All species are associated with pine-oak forest, pinyon-juniper forest, or chaparral-mountain shrub habitats. Those that likely feed on mints (Lamiaceae), i.e., *S. deceptiva*, *S. carota* sp. nov., *S. clara* sp. nov., *S. disrupta* sp. nov., *S. fervefactaria*, *S. fuego* sp. nov., *S. mariachi* sp. nov., and *S. splendorata*, appear to be tied to more seasonally xeric mid-elevation habitats. Meanwhile, those that feed on *Cercocarpus* typically require higher-elevation habitats with more mesic conditions. Except for *S. agapetica* and *S. apollo*, the phenology of all species appears to be tied to spring and monsoonal rains and the subsequent availability of new growth for caterpillars. *Stamnodes agapetica*, *S. apollo*, and *S. splendorata* also inhabit the Trans-Mexican Volcanic Belt; and while a few species included above have not been confirmed from this region, it would be unsurprising if they were found there too

someday. Several other predominantly Sierra Madre Occidental taxa, i.e., *S. formosata*, *S. franckata*, *S. splendorata*, and *S. seiferti*, also inhabit the isolated pine-oak forests of west Texas, which share elements of the Sierra Madre Oriental fauna. Additionally, *S. patamon* is found throughout the Sierra Madre del Sur and potentially into the Sierra Madre Oriental (see Remarks, *S. patamon* treatment).

No doubt, still more *Stamnodes* will be discovered as most of the western slope of the Sierra Madre Occidental remains unexplored, particularly in areas where violence has hampered studies of biodiversity.

Trans-Mexican Volcanic Belt Province

Included species: *S. agapetica* (in part), *S. apollo* (in part), *S. aumatlapalli* sp. nov. (in part), *S. erupta* sp. nov., *S. penguinifera* (in part), *S. splendorata* (in part)

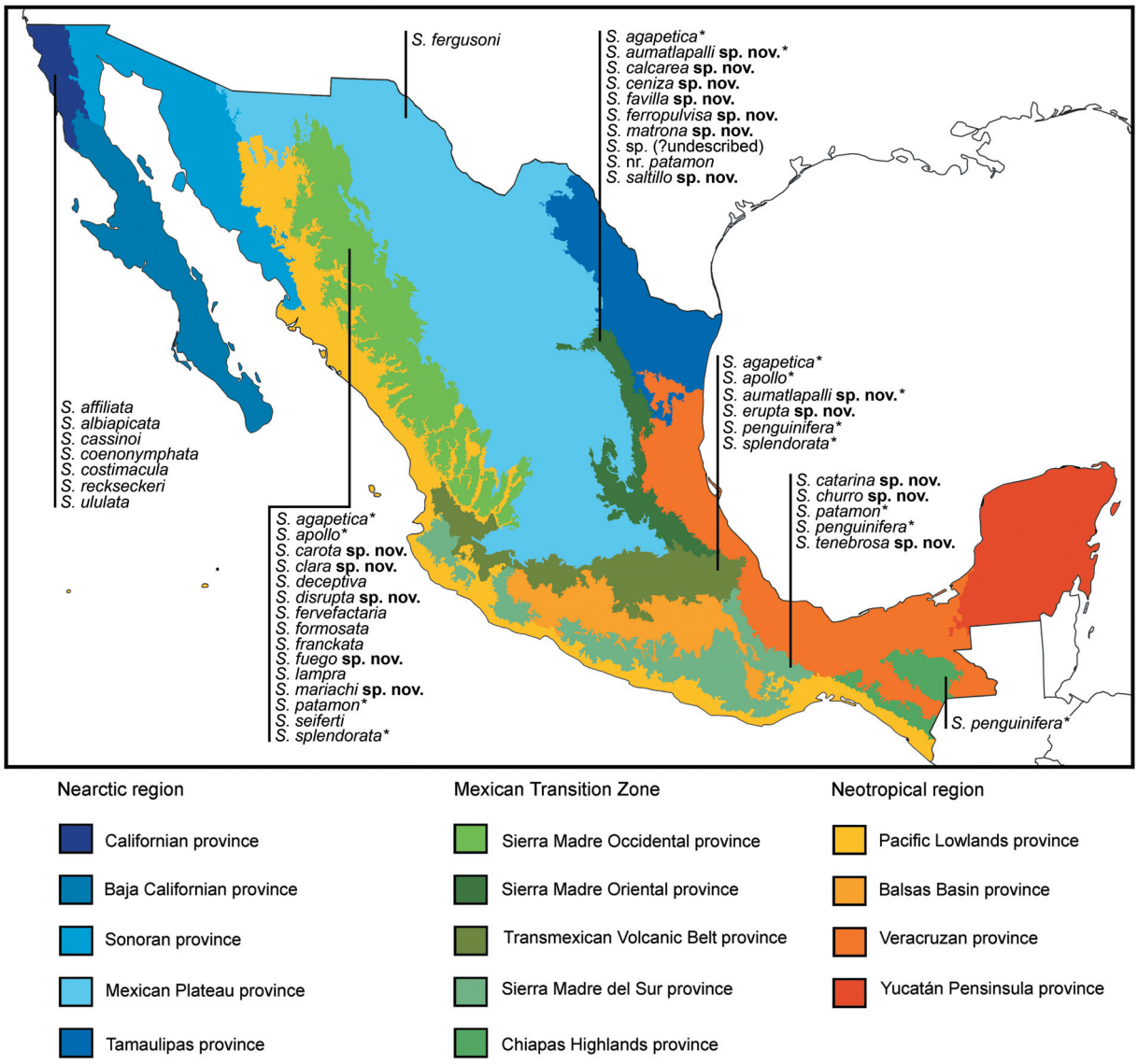


Fig. 95. Biogeographic associations of Mexican *Stamnodes* Guenée, [1858]. (*) denotes species found in two or more provinces. Underlying biogeographic provincial map taken from Morrone (2020: fig. 4.5) with permission to reproduce this figure granted by author Juan J. Morrone.

The Trans-Mexican Volcanic Belt represents a significant transition zone and area of faunal overlap for *Stamnodes*, as most species of this province are found, in part, to be elements of other biogeographic provinces. *Stamnodes agapetica*, *S. apollo*, and *S. splendorata* also inhabit the Sierra Madre Occidental and range north into the USA, and *S. agapetica* is confirmed from the Sierra Madre Oriental as well. *Stamnodes aumatlapalli* sp. nov. is primarily found in the southern Sierra Madre Oriental, while *S. penguinifera* mainly inhabits the Sierra Madre del Sur. I also suspect *S. patamon* will be found among this fauna in time.

Sierra Madre Oriental Province

Included species: *S. aumatlapalli* sp. nov. (in part), *S. agapetica*, *S. calcarea* sp. nov., *S. ceniza* sp. nov., *S. favilla* sp. nov., *S. ferropulvisa* sp. nov., *S.* nr *patamon*, *S.* sp. (?undescribed), *S. matrona* sp. nov., *S. saltillo* sp. nov.

Many *Stamnodes* inhabit the pine-oak belt of the Sierra Madre Oriental, ranging from just north of Mexico City to central Coahuila. At the northern end of this range, the city of Saltillo (Coahuila), and the surrounding mountains are rich with *Stamnodes*; type specimens for three newly described species were collected from Saltillo, and it's likely that additional undescribed species remain to be discovered.

Stamnodes agapetica is remarkably widespread, and represents the first instance of a *Stamnodes* with a range that spans the Sierra Madre Occidental, Trans-Mexican Volcanic Belt, and Sierra Madre Oriental. *Stamnodes apollo* and *S. patamon* are other species that may have similarly expansive ranges (see Remarks in the *S. patamon* treatment).

Sierra Madre del Sur Province

Included species: *S. catarina* sp. nov., *S. churro* sp. nov., *S. patamon*, *S. penguinifera* (in part), *S. tenebrosa* sp. nov.

The temperate pine-oak forests of the Northern Oaxaca Highlands and the Sierra Madre del Sur of Oaxaca and Guerrero harbour many endemic species of *Stamnodes*, despite being poorly surveyed. With increased sampling efforts, I anticipate the discovery of several more endemic taxa. By way of example, three *Stamnodes* species I describe from this region are mostly known from a single collecting event by Eduardo C. Welling in Santa Catarina Ixtepeji, Oaxaca, in November 1980.

While institutional records of *Stamnodes* from this biogeographic province are concentrated in the Oaxacan Highlands, I suspect that all five of the species listed above will also be found to the west in the Sierra Madre del Sur of Guerrero, as well as potentially in southern Michoacán, Colima, and western Jalisco. To the east, the Isthmus of Tehuantepec serves as a significant biogeographic boundary separating the Sierra Madre del Sur from the Chiapas Highlands. However, a single record of *S. penguinifera* from Chiapas suggests that at least this species has dispersed across the Isthmus. *Stamnodes penguinifera* may be a notable exception with a less restricted range overall, as it has also been collected from the Trans-Mexican Volcanic Belt in the state of Morelos.

Life history

Although there is currently a lack of biological data for Mexican *Stamnodes*, particularly for new taxa described in this review, on ongoing effort to sequence the New World Stamnodini (unpublished data) provides valuable phylogenetic context for inferring life history and host plant associations. Likely, many of the newly described species' feed on mints (Lamiaceae), mountain mahogany (*Cercocarpus*), or cliffrose (*Purshia*) – the latter two genera both rosaceous shrubs. I suspect, that the more brightly coloured *Stamnodes*, e.g., *S. deceptiva*, *S. favilla* sp. nov., *S. fuego* sp. nov., etc., will be found to feed on various species of *Salvia*, which is especially taxonomically diverse in Mexico (Martínez-Gordillo

et al. 2017). But, surely, other Lamiaceae will also be found to host *Stamnodes* and other Stamnodini in Mexico. *Stamnodes patamon*, *S. calcarea* sp. nov., *S. churro* sp. nov., *S. catarina* sp. nov., *S. tenebrosa* sp. nov., and *S. ferropulvisa* sp. nov. are expected to be found on *Cercocarpus* across their respective ranges, and should be easy to locate for those willing to search. *Stamnodes saltillo* sp. nov. is likely to be hosted by *Purshia*, although *Cercocarpus* is also a possibility.

Stamnodes caterpillars (Figs 90–93) are generally stocky, i.e., less elongate than those of many other geometrids. Ground colours tend to be either green (leaf-resters) or brown (bark-resters), with orange, brown, white, and/or black patterning over the dorsum. They can display a high degree of colour variation, especially among bark-resting caterpillars on rosaceous shrubs. The integument is often densely set with microscopic excrescences. Many have relatively deep transverse creasing. Those that feed on mint flowers may have more colourful pigmentation, e.g., *Stamnodes fergusoni* (Fig. 93). Early instars are typically green and set with black pinacula.

Concluding remarks

In the last few years, geometrid higher classification has been in a state of renaissance. A Eurocentric-anchored classification – now evolving with abundant molecular data and a collaborative culture seeded in large part through Forum Herbulot – is being revised to yield a global phylogeny and more natural classification (Sihvonen *et al*. 2011; Õunap *et al*. 2016; Brehm *et al*. 2019; Murillo-Ramos *et al*. 2019). Many New World species placed into Old World genera are being reclassified, often into new genera and tribes.

Currently, I am preparing a monographic treatment of the Stamnodini of North America north of Mexico that reviews the phylogeny, species-level taxonomy, distribution, and life histories of all USA taxa (Matson & Wagner in prep.) This larger work will be anchored to a multiple gene mito-nuclear phylogeny, based on as many Mexican and USA Stamnodini taxa as possible. As genetic work continues within Stamnodini, it is likely that many, if not most, of the South American species of *Stamnodes* will be placed in different genera (Brehm *et al*. 2019), and in time *Stamnodes* will likely come to be considered a primarily Holarctic taxon. The taxonomy of this genus is further complicated by preliminary phylogenetic work (Matson & Wagner in prep.) that suggests the primarily Central American genus *Eutrepsia* Herrich-Schäffer, [1855] is nested within *Stamnodes*. As *Eutrepsia* bears the older name, the use of *Stamnodes* as the generic placeholder for many New World species may be ending. If such were to hold true, some of the species reviewed here may need to be transferred to *Eutrepsia* or placed into new genera.

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Supplementary material

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