UNIVERSIDAD DE GUADALAJARA

Centro Universitario de Ciencias Biológicas y Agropecuarias

Sistemática de *Salvia* sección *Membranaceae* (Lamiaceae) y diversidad de Lamiaceae en el occidente de México

Tesis
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Por

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CONTENIDO

RESUMEN

El género *Salvia* (Lamiaceae, Nepetoideae) es uno de los 236 géneros de la familia Lamiaceae, el más diverso de la misma, con un estimado de 900 a 1000 especies. Se distingue por poseer sólo dos estambres y conectivos alargados y modificados en estructuras a manera de timón hacia la porción distal. No es un grupo natural, sino que está conformado por tres clados en la base de los que están anidados los géneros *Dorystaechas*, *Meriandra*, *Perovskia*, *Rosmarinus* y *Zhumeria*. Uno de estos clados corresponde al subgénero *Calosphace* más la sección *Audibertia*, ambos considerados como grupos naturales, y exclusivos al continente americano. *Calosphace* alberga alrededor de 500 especies, lo que lo convierte en el linaje más diverso del género; se distribuye desde Estados Unidos hasta Argentina y Chile, con representantes también en las islas del Caribe. La riqueza elevada y la distribución amplia de este linaje han hecho problemática su clasificación y el reconocimiento de sus especies. La última propuesta inclusiva que lo aborda data de 1939; en ella y publicaciones sucesivas, Epling organiza a las especies en 104 secciones. La clasificación de Epling ha sido criticada por el número excesivo de divisiones, la dificultad para reconocerlas y su evidente artificialidad. En este contexto se realizó un estudio de la sistemática de una de sus secciones, *Membranaceae*, mediante la revisión taxonómica y el análisis filogenético. Se tomó como unidad de estudio a la sección debido a que esta categoría taxonómica sería mucho más manejable y fácil de abordar que el subgénero en su totalidad. Inicialmente se probó la naturalidad del grupo, para luego esclarecer las relaciones internas, evaluar su clasificación, cotejar la delimitación de sus especies y documentar su distribución. La taxonomía de la sección fue evaluada con base en la recolecta y examen de especímenes de herbario. Se reconocieron 12 especies, para las cuales se proveyó de una clave dicotómica, descripciones estandarizadas y complementadas, lista exhaustiva de sinónimos, discusión diagnóstica, fotografías y mapas de distribución. Los análisis filogenéticos se llevaron a cabo con base en caracteres morfológicos y secuencias de ADN de las regiones nucleares ETS e ITS, y del cloroplasto *trn*L-F. En los análisis morfológicos se incluyeron las 12 especies de *Membranaceae* más 58 especies de otras secciones de *Calosphace*; *Salvia munzii* fue empleada para enraizar los árboles obtenidos. Los análisis de parsimonia recuperaron a la sección como monofilética pero con soporte bajo, las subsecciones no se recuperaron como monofiléticas. Los análisis parsimonia de las secuencias de ADN incluyeron 71 especies, con representantes de todas las especies de *Membranaceae* excepto de *Salvia verecunda*, de la que no se obtuvieron secuencias. *Dorystaechas hastata* fue empleada para enraizar los árboles. Los resultados coincidieron en recuperar la sección como monofilética y las susbsecciones como grupos artificiales. En consecuencia, se propone como innecesario e incorrecto reconocer una clasificación infra-seccional.

De manera paralela, y como respuesta ante los vacíos de información percibidos respecto a la familia Lamiaceae en México, se desarrolló un análisis de su diversidad y distribución en el occidente del país. Para los análisis biogeográficos se elaboró una base de datos de los especímenes de herbario examinados. Se verificó que las coordenadas y altitudes dadas para cada ejemplar fueran correctas; cuando se carecía de coordenadas, éstas se estimaron con base en la información de la localidad de colecta acorde a los criterios de Wieczorek pero sin el cálculo de incertidumbre. La base de datos incluyó 6 504 registros, que se analizaron mediante sistemas de información geográfica y el programa DIVA-GIS para determinar la riqueza por unidad política, región biogeográfica, cuadrícula

de tamaño dependiente a la amplitud máxima de los taxones, tipo de vegetación y coordenadas espaciales (altitud, latitud y longitud). Se registraron 20 géneros y 163 especies silvestres o naturalizadas en la región, de las cuales 49 son endémicas del área. Se descubrieron o confirmaron 24 taxones no descritos repartidos en los géneros *Cunila*, *Hyptis*, *Salvia* y *Scutellaria*. La mayor riqueza se concentró en *Salvia* (101 spp.), *Hyptis* (14) y *Scutellaria* (10). Las sierras de Manantlán, El Cuale y San Sebastián del Oeste destacaron por su riqueza de labiadas. Las especies se concentraron en mayor grado en bosques de pino-encino, encino y tropical caducifolio en un rango de altitud de 1300-2400 m. Por último, derivado tanto del préambulo de los análisis filogenéticos de *Membranaceae* como de diversidad de la familia, se recopilan las descripciones de los taxones nuevos descubiertos, notas taxonómicas y biogeográficas.

Capítulo 1. Introducción

Capítulo I. Introducción

1.1 Lamiaceae

La familia Lamiaceae (Labiatae *nom. cons.*, y conocidas como labiadas) agrupa hierbas anuales y perennes, arbustos y árboles, carece de elementos epífitos o parásitos, sus hojas son simples y opuestas, con inflorescencias cimosas, flores gamosépalas y gamopétalas, sus corolas por lo regular son bilabiadas, presentan cuatro o dos estambres epipétalos, el estilo es con frecuencia ginobásico y los dos carpelos se dividen en dos por el desarrollo de un septo falso, los frutos en mericarpios con una semilla cada uno, su polen es tricolpado o hexacolpado, y su número cromosómico varía de 10 a 240 (Harley *et al*., 2004). Es común que presenten una gama amplia de compuestos químicos, entre ellos los de tipo terpeno les confieren la propiedad de ser aromáticas (Richardson, 1992; Tomás-Barberán & Gil, 1992). Esta característica ha propiciado que se aprovechen como condimentos, en la medicina vernácula y en la industria a través del uso de sus aceites (Heinrich, 1992; Lawrence, 1992; Rivera-Nuñez & Obón De Castro, 1992; Ayerza & Coates, 2005; Jenks & Kim, 2013). Además algunas especies son apreciadas por su valor ornamental (Clebsh, 1997; Froissart, 2008).

Lamiaceae fue redefinida a partir de los resultados de análisis filogenéticos que demostraron la necesidad de transferirle varios géneros de la familia Verbenaceae a fin de constituirla como un grupo monofilético (Cantino, 1992a, 1992b; Olmstead *et al.*, 1992; Harley *et al.*, 2004; Marx *et al.*, 2010; Schäferhoff *et al.*, 2010). De esta manera su grupo hermano sería un clado conformado por las familias Orobanchaceae, Paulowniaceae, Phrymaceae *s.l.* y el género *Rehmannia* Lisboch ex Fitsch & C.A.Mey, aunque con un soporte bajo (Marx *et al*., 2010). Existen conflictos sobre la naturalidad de varios de sus géneros, lo que ha estimulado cambios y sugerido otros que aún quedan pendientes (Steane *et al*., 1997, 1999; Lindqvist & Albert, 2002; Walker *et al*., 2004; Walker & Sytsma, 2007; Bräuchler *et al*., 2010; Scheen *et al*., 2010; Yuan *et al*., 2010; Bendiksby *et al*., 2011; Drew & Sytsma, 2011, 2013; Pastore *et al*., 2011; Agostini *et al*., 2012; Jenks *et al*., 2013).

La diversidad que reúne a escala global es de 236 géneros y 7173 especies (Harley *et al*., 2004), las cuales se distribuyen en todo el globo con excepción de las áreas de mayor latitud y altitud (Hedge, 1992). México resguarda una riqueza de 32 géneros y 591 especies nativas o naturalizadas, 379 endémicas al país (Martínez-Gordillo *et al*., 2013). Lo que posiciona a la familia como la octava más diversa entre las plantas vasculares de la flora mexicana (Villaseñor, 2003). Sin embargo, a pesar de su riqueza e importancia, su conocimiento sigue siendo insuficiente y fragmentado. Esto se refleja en su ausencia en las floras contemporáneas con la excepción de la *Flora Fenerogámica del Valle de México* (Calderón de Rzedowski & Rzedowski, 2005) y *Flora Mesoamericana* (Davidse *et al*., 2012), y por el constante descubrimiento de taxones nuevos de la misma (Turner & Reveal, 2004; Klitgaard, 2007; Turner, 2008a, 2008b, 2008c, 2009a, 2009b, 2010, 2011a, 2011b, 2013a, 2013b; Martínez-Gordillo & Valencia-Ávalos, 2009; Cuevas-Guzmán, 2010; Bedolla-García *et al*., 2011; Martínez-Gordillo & Lozada-Pérez, 2011; González-Gallegos & Castro-Castro, 2012; González-Gallegos *et al*., 2012a, 2012b; Iltis *et al*., 2012; García-Peña & González-Gallegos, 2013; González-Gallegos, 2013; González-Gallegos & Castro-Castro, 2013; González-Gallegos & Vázquez-García, 2013; González-Gallegos *et al*., 2013;

Fragoso-Martínez & Martínez-Gordillo, 2013; Lara-Cabrera *et al*., 2013); más de 40 especies nuevas tan sólo en la última década. Su inclusión en las floras regionales e inventarios regionales, con base en una revisión exhaustiva de literatura, especímenes de herbario y trabajo de campo [como el realizado por Cornejo-Tenorio & Ibarra-Manríquez (2011) para el género *Salvia* en Michoacán], son una estrategia efectiva para solventar las deficiencias actuales en el conocimiento de esta familia.

1.2 *Salvia* L.

El género *Salvia* destaca del resto de los integrantes de Lamiaceae por la morfología particular de sus estambres. Éstos se han reducido a dos; las tecas de cada uno de ellos separadas por el conectivo alargado y donde con frecuencia las tecas posteriores son infértiles y los conectivos de ambos estambres sufren fusión entre sí (Harley et al., 2004; Walker & Sytsma, 2007). El filamento se inserta de manera flexible al conectivo y éste ocluye el acceso al disco nectarífero que está en la base del ovario. Cuando el polinizador presiona los conectivos para acceder al néctar, provoca que la porción anterior baje como un balancín y deposite el polen sobre su cuerpo (Claßen-Bockhoff et al., 2004; Walker & Sytsma, 2007). A tal interacción se le ha denominado como mecanismo de polinización por palanca o balancín, y aunque es típica del género, en algunas especies ha dejado de ser funcional (Wester & Claßen-Bockhoff, 2006, 2007, 2011).

El estimado de 900 a 1000 especies (Standley & Williams, 1973; Harley *et al*., 2004; Walker *et al*., 2004) de *Salvia* le posicionan como el género más rico de Lamiaceae, y con una distribución tan amplia como la de la familia misma. En México reúne 307 especies (Martínez-Gordillo et al., 2013), siendo uno de los tres géneros más ricos (Villaseñor, 2004) y característicos del país, ya que se encuentra en toda la República y en casi todos los tipos de vegetación (Ramamoorthy & Elliott, 1998; Domínguez-Vázquez *et al*., 2002; Cornejo-Tenorio & Ibarra-Manríquez, 2011).

La condición especial de los estambres de *Salvia* y su cohesión morfológica llevó a considerar al grupo como natural (Ramamoorthy & Lorence, 1987; Walker *et al*., 2004). Sin embargo, los análisis filogenéticos realizados recuperan de manera recurrente tres clados en cuyas bases se anidan otros géneros; *Perovskia* Kar. y *Rosmarinus* L. en la base del clado I (incluye especies de Norteamérica, La Cuenca del Mediterráneo y Asia), *Dorystaechas* Boiss. & Heldr. ex Benth. en la del clado II (especies americanas), y *Meriandra* Benth. y *Zhumeria* Rech. f. & Wendelbo en la del clado III (especies del este de Asia) (Walker *et al*., 2004; Walker & Sytsma, 2007). El clado II conjunta a las especies del subgénero *Calosphace* (Benth.) Epling y de la sección *Audibertia* (Benth.) Epling, cada uno de estos grupos a la vez monofiléticos. El primero de ellos alberga 500 especies que abarcan desde el centro de Estados Unidos hasta el norte de Argentina y Chile, con representantes en El Caribe; es el clado de *Salvia* más rico en especies (Epling, 1939; Jenks et al., 2013). *Calosphace* fue una de las principales preocupaciones de Carl Epling, quien desarrollara el tratado completo más reciente del grupo (Epling, 1939, 1940, 1941, 1944, 1947, 1951, 1960; Epling & Mathias, 1957; Epling & Játiva, 1963, 1966, 1968). En el mismo divide al subgénero en 104 secciones, varias de ellas monotípicas. Su propuesta fue tachada de impráctica y ampliamente cuestionada respecto a la naturalidad de los grupos que definió (Standley & Williams, 1973; dos Santos, 1991, 1994). En los análisis filogenéticos que se han realizado, la mayoría de las secciones aparecen como polifiléticas, con una estructura geográfica más marcada que la que Epling reflejó en su clasificación (Walker *et al*., 2004; Walker & Sytsma, 2007; Jenks *et al*., 2011, 2013). Dichos análisis se han realizado con base en secuencias de ADN de varias de las secciones del subgénero, pero la representación de las especies se mantiene por debajo del 30% y la de secciones todavía no está completa.

Derivado de lo anterior, es crítico que se incremente el muestreo de especies para poder llegar a un panorama estable que permita estructurar una clasificación natural para el subgénero. Por otra parte, su elevada riqueza y la carencia de un tratado actualizado dificultan la capacidad para determinar de manera correcta los taxones. Por ello, la elaboración de sinopsis morfológicas es crucial como punto de partida a la realización de análisis filogenéticos. En este sentido se han logrado revisiones para algunas de las secciones, lo que ha aclarado la delimitación de especies, esclarecido taxones problemáticos y descrito aquellos que resultaron nuevos (Peterson, 1978; Espejo & Ramamoorthy, 1993; Torke, 2000; Turner, 2008a, 2009a, 2009b, 2010, 2011b, 2013b; Zona *et al*., 2011).

Enclavado en este contexto el presente trabajo pretende contribuir al conocimiento de *Salvia* al analizar una sección cuyos miembros no han sido incluidos en análisis filogenéticos. Se refiere a la sección *Membranaceae* (Benth.) Epling. Sus especies son hierbas anuales y perennes, y arbustos, los verticilastros de sus inflorescencias están provistos de brácteas conspicuas y persistentes, por lo general de colores llamativos y de una consistencia membranosa, con venación reticulada marcada, corolas en la mayoría menores de 1 cm de largo, azul claro y con guías nectaríferas blancas sobre el labio inferior. De acuerdo con la propuesta original de Epling (1939, 1940) este grupo incluye 15 especies, pero existe controversia respecto a su reconocimiento por autores más recientes (Standley & Williams, 1973; Pool, 2001; Klitgaard, 2012). Epling (1939) propuso dos subsecciones *Elscholtzioideae* y *Lophanthoideae*, que no obstante no parecen sostenerse bien con base en la morfología de los taxones. Por lo tanto, aquí se provee de una revisión taxonómica de las especies y de análisis filogenéticos para esclarecer la monofilia de la sección, de las subsecciones y las relaciones evolutivas entre sus especies.

1.3 Presentación y justificación del proyecto

El presente trabajo se desenvolvió de manera paralela entorno a dos ejes: la sistemática de *Salvia* sección *Membranaceae* (Lamiaceae) y el análisis de la riqueza y distribución de las especies de la familia en el occidente del país. La dualidad del proyecto se fundamenta en la necesidad de forjar un conocimiento sólido y de amplio espectro en la taxonomía del grupo en estudio, a partir del cual pueda desenvolverse un análisis sistemático con certeza en la identidad de los taxones empleados. Al mismo tiempo pretende contrarrestrar al conocimiento insuficiente de un grupo que pese a su riqueza elevada, importancia actual y potencial, sigue estando un tanto relegado. Por ello, se decidió que el estudio de la diversidad de la familia en una región sería un buen instrumento para lograr un dominio aceptable de su taxonomía. El occidente se eligió en función de limitantes logísticas. Tareas tales como la revisión de especímenes de herbario y la exploración botánica se compartieron entre los ejes, maximizando los recursos invertidos respecto a los resultados generados. El trabajo taxonómico se realizó con base en el examen de características morfológicas en especímenes de herbario y muestras recolectadas en campo. Los análisis filogenéticos se llevaron a cabo a través del empleo de matrices morfológicas y de secuencias de ADN (ETS, ITS y *trn*L-F) de los miembros de la sección *Membranaceae* y representantes de otras secciones de *Salvia* subgénero *Calosphace*. Los análisis de distribución y riqueza de especies se realizaron mediante el uso de bases de datos y el manejo de programas de sistemas de información geográfica.

Por otra parte se ha señalado que el conocimiento global de la riqueza de especies dista de reflejar la realidad (MoraStork, 1993; Mora et al., 2011; Guiry, 2012; Martínez-Mayer et al., 2014). Exploraciones que contrastan lo que se conoce en la actualidad respecto a lo que se estima hace falta conocer es contrastante. Por ejemplo, en el caso de las angiospermas, Martínez-Mayer et al. (2014) estiman que en México faltan por describirse 7 000 especies, lo que equivale a casi una tercera parte de su diversidad conocida en el país. Por tanto, el valor de revitalizar el quehacer taxonómico, en términos del inventario y descripción de la biodiversiad es una tarea crítica (Wheeler et al., 2004; Llorente-Bousquets et al. 2008). En este sentido se dio énfasis a la descripción de las especies que fueron reveladas en esta investigación, tanto a partir del muestreo para la revisión y análisis filogenéticos de la sección *Membranaceae*, como de los análisis de la diversidad de Lamiaceae en el occidente.

El documento consiste de cinco capítulos. El presente es una introducción general de la investigación de *Salvia* y Lamiaceae, donde se señalan las diferentes facetas y elementos que le componen, antecedentes breves y los objetivos.

El segundo capítulo aborda la taxonomía y relaciones filogenéticas de *Salvia* sección *Membranaceae*, y a su vez se divide en dos. En el apartado 2.1 se provee una sinopsis morfológica de las 12 especies que componen al grupo. Su elaboración requirió la consulta y captura de especímenes de las siguientes colecciones (siglas de acuerdo al *Index Herbariorum*): CHAPA, CIIDIR, CIMI, CREG, ENCB, GUADA, HEM, HUMO, IBUG, IEB, MEXU, MICH, OAX, SERO, UAGC, UC, USON, WIS, XAL, XALU, ZEA; y los herbarios de la Universidad Autónoma de Nayarit y Universidad Autónoma de Zacatecas. Se comenta la morfología general de la sección, aparece una clave dicotómica, se complementa la descripción de cada especie con su lista completa de sinónimos, se hace una discusión a manera de diagnosis y para aclarar taxones problemáticos, y se adicionan notas sobre su ecología y distribución. Se incluyen también ilustraciones de las hojas y características florales, mapas de distribución y fotografías de la mayoría de especies. Con base en lo anterior, se contradice la postura de Klitgaard (2012) respecto a sumergir *S. lophanthoides* M.Martens & Galeotti como sinónimo de *S. mocinoi* Benth., y la de reconocer a *S. rubiginosa* Benth. como una especie diferente a la anterior. Se proporcionan notas sobre la inconsistencia en la asignación de algunas especies a una u otra subsección propuesta por Epling (1939), acorde con las características morfológicas que exhiben. Aquí se exponen los resultados de un análisis filogenético de Parsimonia basado en una matriz de 36 caracteres morfológicos cualitativos. El árbol obtenido tiene poco soporte, pero la sección y una de las dos subsecciones (*Elscholtzioideae* Epling) se recuperan como monofiléticas; la otra subsección, *Lophanthoideae* Epling, aparece como un grupo parafilético. Se propone entonces no reconocer subsecciones. El apartado 2.2 incluye los análisis de Parsimonia y Máxima Verosimilitud de secuencias de ETS, ITS y *trn*L-F. Lo que se obtuvo coincide con lo derivado de la morfología, ya que se recuperan *Membranaceae* y *Elscholtzioideae* como monofiléticas y *Lophanthoideae* como parafilética; esto da certeza a la decisión de no reconocer a las subsecciones. Además se dan observaciones sobre las relaciones generales dentro de *Calosphace* y en particular entre algunas de las especies de la sección *Sigmoideae* Epling, la cual también tuvo una buena representación en los análisis. De igual manera se señala la falta de sentido en reconocer subsecciones para este grupo en contraposición a la clasificación de Epling (1939) y Espejo & Ramamoorthy (1998).

El capítulo tercero aborda un análisis de la riqueza y distribución de la familia Lamiaceae en el occidente de México. Su realización giró en gran medida en la creación de una base de datos con registros de colectas con coordenadas geográficas, o para las que fueron calculadas o corregidas mediante las recomendaciones de Wieczorek (2001). Se consideraron en exclusivo a las especies nativas o naturalizadas del área de estudio. Esta última se delimitó de manera equivalente al concepto de Nueva Galicia de McVaugh (1961) y con las precisiones a municipios hechas por Carvajal & Acosta-Sotelo (2010). Los registros se adquirieron mediante recolecta en campo, revisión de especímenes de herbario (los mismos señalados en el párrafo anterior), y en menor grado en literatura especializada. En conjunto se obtuvo una base de 6 504 registros (5 880 con coordenadas geográficas), el descubrimiento de 24 taxa nuevos y varias extensiones en la distribución de algunas especies. Las labiadas del occidente comprenden 20 géneros y 163 especies. Su mayor riqueza se concentró en el estado de Jalisco y los municipios de Cuautitlán, Autlán de Navarro, Mascota y Talpa de Allende. La Faja Volcánica TransMexicana fue la provincia con más especies. Los bosques templados reunieron la mayor cantidad. En términos espaciales la riqueza se ubicó en valores intermedios de latitud, longitud y altitud. Se puntualiza la prioridad que debe darse a la exploración botánica.

El capítulo cuarto trata la descripción de los taxones nuevos descubiertos en los dos capítulos anteriores, novedades biogeográficas y taxonómicas. Esta conformado por 13 apartados.

4.1 González-Gallegos & Castro-Castro (2012). Incluye la descripción de *Salvia cualensis* J.G.González y *S. cualensis* var. *perezii* J.G.González. Se destaca la importancia de la Sierra de El Cuale como reservorio de la diversidad vegetal, se afina la circunscripción de *S. jaimehintoniana* B.L.Turner al ser la especie más similar en morfología a los taxones descritos, y dentro de ella se sumerge *S. jacalana* B.L.Turner como sinónimo.

4.2 González-Gallegos et al. (2012a). Se describe a *Salvia cacomensis* J.G.González, J.Morales et J.Rodríguez, la cual es endémica del municipio de Villa Purificación, Jalisco.

4.3 González-Gallegos et al. (2012b). Se describen *Salvia meera* Ramamoorthy ex J.G.González & Cuevas, *S. rogersiana* Ramamoorthy ex J.G.González & Santana Mich., *S. santanae* Ramamoorthy ex J.G.González & Guzmán-Hernández, y *S. concolor* var. *iltisii*

J.G.González & A.Vázquez. Las tres especies habían sido identificadas por Ramamoorthy como especies nuevas en *Flora de Manantlán* (Vázquez-García et al. 1995), pero nunca se habían validado. Destaca en el artículo una discusión sobre la coloración blanca en las corolas de *Salvia*, característica presente en *S. meera*. Se provee de una clave para la determinación de las 15 especies mexicanas con corolas siempre blancas.

4.4 Iltis et al. (2012). Se describen *Salvia vazquezii* H.H.Iltis & Ramamoorthy y *S. vazquezii* subsp. *tancitaroensis* J.G.González & A.Vázquez. En el documento se incluye una descripción complementada de *Salvia gravida* Epling, la especie más semejante en morfología a los taxones descritos. Además, aparece una discusión breve sobre las inflorescencias péndulas y flores resupinadas que exhiben las especies tratadas, respecto a los polinizadores.

4.5 González-Gallegos (2013). Se describen *S. albicalyx* J.G.González y *S. topiensis* J.G.González, ambas especies endémicas de Durango y de distribución restringida, la primera del sur y la segunda del noroeste.

4.6 González-Gallegos & Castro-Castro (2013). Se describen *Salvia albiterrarum* J.G.González & Art.Castro y *S. pugana* J.G.González & Art.Castro. Se complementa la descripción de *S. platyphylla* Briq. (la especie con la que se contrastan los nuevo taxones) y se hacen notar características morfológicas que se habían confundido o pasado por alto en trabajos previos (Briquet, 1898; Epling, 1939; Espejo & Ramamoorthy, 1993), como los estilos glabros en lugar de pilosos, o la presencia de bractéolas no sólo en esta especie, sino en el resto de los miembros de la sección *Sigmoideae*. Se abordan los síndromes de polinización en *Salvia* y se propone que de confirmarse una relación de parentesco entre *S. albiterrarum* y *S. platyphylla* o *S. pugana*, podrían servir como modelo para estudiar el cambio de polinizador como factor de diversificación en el género.

4.7 González-Gallegos & Vázquez-García (2013). Se describen *Scutellaria cuevasiana* J.G.González & A.Vázquez y *S. sublitoralis* J.G.González. *Scutellaria sublitoralis* crece en la línea costera del Pacífico a menos de 150 m de altitud, de ahí su nombre. Durante mucho tiempo se le había determinado como *S. pallidiflora* Epling, pero en el artículo se aclara cómo esta especie, que se conoce sólo del ejemplar tipo, es diferente y que las condiciones del hábitat en que se recolectó difieren también.

4.8 González-Gallegos et al. (2013). Se describen *Salvia carreyesii* J.G.González, *S. ibugana* J.G.González y *S. ramirezii* J.G.González. Las tres especies endémicas del occidente del estado de Jalisco. Se descubre la peculiaridad de la marcada diferencia entre plantas juveniles y maduras de *S. carreyesii*, y se documenta la presencia de una característica poco frecuente que no se había registrado antes para el género. Se trata de la presencia de protuberancias dendriformes a lo largo de tallos, peciolos y ejes florales de *S. ibugana*. Esta característica que merece un estudio anatómico para entender mejor su origen y su papel en la arquitectura de la especie.

4.9 García-Peña & González-Gallegos (2013). Se describe a *Cunila jaliscana* García-Peña & J.G.González, una especie confundida con *Cunila lythrifolia* Benth., pero con peculiaridades marcadas en sus inflorescencias que la hacen distintiva.

4.10 González-Gallegos & Aguilar-Santelises (201X). Se describe *Salvia tilantongensis* J.G.González & Aguilar-Santelises, una especie conocida solo del Monte Negro de Santiago Tilantongo, Oaxaca. Es Semejante a *Salvia fulgens* Cav. *y S. gesneriflora* Lindl. & Paxton, pero fuera del área de distribución de ambas.

4.11 González-Gallegos & Gama-Villanueva (2013). En este documento se restablecen ocho especies de *Salvia* (*S. brachyodonta* Briq., *S. dichlamys* Epling, *S. heterotricha* Fernald, *S. iodantha* Fernald, *S. nepetoides* Kunth, *S. punicans* Epling, *S. subpatens* Epling y *S. unicostata* Fernald) que se desconocieron y sumergieron como sinónimos de otras en *Flora Mesoamericana* (Klitgaard, 2012), sin argumento alguno que respaldara dicha posición. También se señalan algunas imprecisiones encontradas en esa obra.

4.12 González-Gallegos & Cuevas-Guzmán (201X). Se documenta el hallazgo de una población de *Lepechinia flammea* Mart.Gord. & Lozada-Pérez en Jalisco, especie conocida antes de Guerrero y Oaxaca. También se provee de una descripción complementada de *L. glomerata* Epling, una especie representada por pocas colectas en los herbarios.

4.13 González-Gallegos et al. (201X). Se documenta el descubrimiento de *Hyptis pseudolantana* Epling en Jalisco y Michoacán como un registro nuevo para la flora de estos estados. Además se describen *H. cualensis* J.G.González & Art.Castro e *H. macvaughii* J.G.González & Art.Castro. Se señala y justifica una postura en contra de la propuesta de clasificación para la subtribu Hyptidinae de Harley & Pastore (2012).

En el capítulo quinto se da una discusión y conclusiones generales, y se señalan oportunidades y necesidades de investigación a futuro.

1.4 Objetivos

Objetivo generales

1. Elucidar las relaciones evolutivas de *Salvia* sección *Membranaceae*

2. Analizar la riqueza y distribución de la familia Lamiaceae en el occidente de México.

3. Describir los taxones y novedades biogeográficas que sean reveladas a partir de los análisis filogenéticos de *Membranaceae* y del estudio de diversidad de Lamiaceae.

Objetivos particulares

1. Determinar si la sección *Membranaceae* es un grupo natural con base en estudios de morfología y secuencias de ADN (ETS, ITS, *trn*L-F).

2. Determinar si las subsecciones propuestas por Epling (1939) corresponden a grupos monofiléticos con base en el estudio de morfología y secuencias de ADN (ETS, ITS, *trn*L-F).

3. Complementar y actualizar las descripciones de las especies de *Salvia* sección *Membranaceae*.

4. Definir y describir los taxones que deben reconocerse dentro de la sección *Membranaceae*.

8. Contribuir a la taxonomía del género *Salvia* mediante la descripción de taxones nuevos, de novedades en las características de valor diagnóstico y al ampliar la distribución de las especies.

5. Analizar la riqueza y distribución de las especies de Lamiaceae en el occidente de México.

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Capítulo 2. Relaciones filogenéticas y taxonomía de *Salvia* sección *Membranaceae* (subgénero *Calosphace*)

2.1 González-Gallegos, J.G. 201X. Morphological cladistic analysis and revision of *Salvia* section *Membranaceae* (Lamiaceae). *Telopea*

Morphological cladistic analysis and revision of *Salvia* section *Membranaceae* (Lamiaceae)

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Abstract
A phylogenetic analysis of *Salvia* section *Membranaceae* was conducted based on morphological characters. The 12 recognized species of this group were included together with representatives of other 15 sections of the genus and *Salvia munzii* from section *Audibertia* was employed to root the three. Parsimony analyses recovered 893 trees with resolved relationships, but with poor support for each clade. The section was recovered as a monophyletic lineage. However, internal relationships did not justify Epling's subsectional classification, which consequently was not followed. Finally, a taxonomic revision of the section is presented with improved standarized descriptions, photographs, distribution maps, a comprehensive list of synonyms and a discussion about the delimitation of problematic taxa.
Key words: Central America, *Elscholtzioideae*, Lamiaceae, *Lophanthoideae*, Mesoamerican Flora, Mexico

Introduction
Salvia L. is one of the largest vascular plant genera (Frodin 2004), with 900–1100 species worldwide (Standley & Williams 1973, Hsi-wen & Hedge 1994, Harley et al. 2004, Walker et al. 2004). It has a subcosmopolitan distribution, absent only from the highest latitudes and Australasia, with the major centers of diversity in Mexico-Central America and the Mediterranean Basin-Middle East (Walker et al. 2004). It occupies a broad habitat spectrum, temperate and tropical forests, arid and semi-arid scrubs, alpine and secondary vegetation, from sea level to 4800 m elevation (Hsi-wen & Hedge 1994, Ramamoorthy & Elliott 1998). Various species of this genus have been part of popular medicine in different regions and cultures (Rivera et al. 1994, Ceroni-S. 2002, Cahill 2003, Dweck 2000, Jäger & Van Staden 2000, Martínez-Moreno et al. 2006, Ramírez et al. 2006, Cheng 2007, Jenks 2008, Jenks & Kim 2013), and recent studies are uncovering the underlying chemicals responsible for its healing properties (Perry et al. 2000, Yokozawa 2000, Veličović et al. 2003, Ramírez et al. 2006, Cheng 2007, Ramírez et al. 2007, Li et al. 2012). Some individual species have had great relevance and have been employed for several purposes, such as *Salvia hispanica* L., which was employed by Mesoamerican people as food, medicine and oil (Cahill 2003), and that is now reappraised as a valuable nutritional resource (Ayerza & Coates 2005, Peiretti & Gai 2009). Furthermore, *S. divinorum* Epling & Játiva, possesses medicinal and stimulating properties that are utilized by Mazatec people in divination rites (Wasson 1962, Valdés-III et al. 1987, Reisfield 1993), and is presently gaining popularity as a hallucinogenic in different countries (González et al. 2006, Lange et al. 2008). In addition, some species of *Salvia* have been a popular

ornaments and continues to be prized as a decorative garden plants (Clebsh 1997, Froissart 2008).

Phylogenetic evidence based on molecular data revealed *Salvia* as a non-monophyletic genus, but rather a polyphyletic group comprised of three clades. In these, *Dorystaechas* Boiss. & Heldr. ex Benth., *Meriandra* Benth., *Perovskia* Kar., *Rosmarinus* L., and *Zhumeria* Rech.f. & Wendelbo are intermixed (Walker et al. 2004, Walker & Sytsma 2007). One of the recovered clades includes *Salvia* subgenus *Calosphace* (Benth.) Epling and *Salvia* section *Audibertia* (Benth.) Epling; altogether, it embraces about 520 species, being the richest clade. *Salvia* sect. *Audibertia* is restricted to the Californian floristic province with 18–20 species (Epling 1938, Strachan 1982), whereas *Salvia* subg. *Calosphace* occurs from the United States to northern Argentina and Chile, including Caribbean Islands, but none in the Amazonian forest; it accomodates about 500 species (Walker 2004). The most comprehensive revision of subg. *Calosphace* (1939) has been followed with successive publications that describe new sections and species, add and emend data about sectional and species delimitations, and geographical distribution (Epling 1940, 1941, 1944, 1947, 1951, 1960; Epling & Mathias 1957; Epling & Játiva 1963, 1966, 1968). Ever since, other modifications have been accumulated. For example, after consulting the database of the Missouri Botanical Garden (2013), only in the last 10 years at least 34 new species have been published within subg. *Calosphace*. In view of these recent advances, a current revision of the subgenus is much needed.

Salvia subg. *Calosphace* is an interesting example of species diversification and represents a difficult challenge for any plant taxonomist, simply because there are many species and they are spread across a wide geographical area. Before this, the efforts have been centered on unravelling the taxonomy of small manageable sections (Espejo & Ramamoorthy 1993, Santos 1991, 1996, Torke 2000, Santos & Harley 2004, Fernández-Alonso 2006, Zona et al. 2011). Occasionally the species analyses were circumbscribed by political bounderies (Turner 2008, 2009a, 2009b, 2010, 2011), or for accomplishing regional floras (Wood & Harley 1989, Pool 2001, Wood 2007, Klitgaard 2012).

This study focuses on a revision of *Salvia* subg. *Calosphace* sect. *Membranaceae* (Benth.) Epling. According to Epling (1939, 1940) the section is composed of 15 species, with most of the species restricted to Mexico and only one extending to northern Peru, Ecuador, Colombia and Venezuela in South America. This section has undergone many taxonomic changes since its description by Bentham (1833), the addition of new species and proposals for infra-sectional classification (table 1). In this paper, we conducted a phylogenetic analysis using a morphological matrix in order to test monophyly of the group and evolutionary relationships.

Materials & Methods

Taxon sampling

A total of 1041 herbarium specimens of *Salvia* section *Membranaceae* were examined for this study. Thirty-five species were included in th phylogenetic analyses. The specimens examined were held at the following herbaria: CHAPA, CREG, CIIDIR, CIMI, ENCB, GUADA, HEM, Herbario de Bioquímica de la Universidad Autónoma de Guerrero (here abbreviated as HBQ), Herbario de la Universidad Autónoma de Nayarit (here abbreviated as UAP), HUAA, HUMO, IBUG, IEB, MEXU, MICH, NY, OAX, SERO, UAGC, UC, USON, WIS, XAL, XALU, and ZEA. The complete *Salvia* collections of these herbaria were inspected in order to find all specimens of *Salvia* sect *Membranaceae*, except for NY herbarium, where only *Salvia mocinoi* Benth. was checked. Specimen pictures provided online in the webpages of some herbaria (ARIZ, CAS, G, K, LA, MO, NY, RSA-POM, UC, US) were also examined, chiefly, those belonging to type specimens.

Field exploration was carried out to observe aspects of growth, development and morphology, and to collect botanical samples.

Morphological data

A search was made for qualitative characters (only those with two or more character states and that could be unequivocally scored). Most of them were those employed in the literature to define sections and delimit species within *Salvia* subg. *Calosphace* (Epling 1939, 1940, 1941, 1944, 1947, 1951, 1960; Epling & Mathias 1957; Epling & Játiva 1963, 1966, 1968; appendix 2). Quantitative variables were counted or measured with a rule and caliper, and these data were used to enhance descriptions of the species. Plant height and flower colour were taken from specimen labels when available and from field observations. A dissecting microspcope was used to survey floral characters. Flowers were first hydrated with warm water until corolla tube and lips were turgid and unwrapped, before being dissected and surveyed. Altogether, 37 qualitative characters were surveyed for the phylogenetic analyses (appendix 2).

A morphological data matrix was constructed with speices as rows and variables as columns (table 2). A data summary by species was used in morphological conspectus, species description improvement and phylogenetic analyses.

Phylogenetic analyses

Phylogenetic analyses were implemented including all *Salvia* subg. *Calosphace* sect. *Membranaceae* species. Thirty-five species were included to represente 16 different sections of the subgenus *Calosphace* (appendix 1); these were used as functional outgroups. *Salvia munzii* Epling was used to root the three; this species belongs to *Salvia* section *Audibertia*, which has been recovered as the sister to *Salvia* subg. *Calosphace* in previous phylogenetic analyses (Walker et al. 2004, Walker & Sytsma 2007, Jenks 2008). Parsimony analyses were conducted with Nona (Goloboff 1997) hosted in Winclada (Nixon 2002). Multiple TBR + TBR (mult*max*) search strategy was used with the following settings: characters treated as equally weighted and unordered, unconstrained search, holding 10000 trees (Hold= 10 000), 1000 replications (mult*= 1 000), and starting with 1 tree (hold/= 1). Branch support was calculated using Bootstrap (BS) analysis with 1000 replications, 10 random search repetitions, and 1 tree saved per repetition.

Taxonomic treatment

The taxonomic treatment was based on morphological data observations made on specimens examined, and field observations. It is preceded by a morphological conspectus of the species. Genus, subgenus, section and species descriptions are included in alphabetical order. A key for the identification of the species included in section *Membranaceae* is provided. A complete list of synonyms is given for each taxon, and *Salvia mocinoi* synonyms are clarified in an expanded discussion.

A database with the information of the specimen labels was done, focused specially on spatial information that was used in the preparation of distribution maps. Those specimens without or with wrong geographic coordinates were georeferenced according to recommendations of Wieczoreck et al. (2004), but without calculation of uncertainty.

Results

Phylogenetic analyses

Parsimony analyses recovered 893 most parsimonious trees (one of them is shown in figure 1) with a lenght of 263 steps (CI= 0.38; RI= 0.61). Thirty-five characters were parsimony informative. *Salvia* section *Membranaceae* is recovered as a monophyletic group supported by one synapomorphy, namely, membranaceous floral bracts, consisting of thin semi-translucid structures with a reticulate evident distribution of the veins. Inside *Membranaceae*, a clade comprised of *S. compsostachys* Epling plus *S. glabra* M.Martens & Galeotti, and *S. lophanthoides* Fernald is sister to the remnant species of the section. The crown group is composed of two clades (supported by cordate floral bracts as a synapomorphy) and a grade at base conformed by *S. langlassei* Fernald and *S. sanctae-luciae* Seem. The first clade includes *S. mexiae* Epling and *S. mocinoi* nested with *S. nitida* M.Martens & Galeotti and *S. confertispicata* I.Fragoso & Mart.Gord. The second includes subsection *Elscholtzioideae*: *S. bupleuroides* J.Presl. ex Benth., *S. lasiocephala* Hook. & Arn. and *S. verecunda* Epling. A clade including *S. bupleuroides* y *S. lasioecephala* is supported by lenticular mericarps as a synapomorphy. The species analyzed from section *Fulgentes* Epling (*S. microphylla* Kunth and *S. fulgens* Cav.) are recovered as the sister group but with low support and without any synapomorphy sustaining such realationship.

Bootstrap support was lower than 50 for most of the clades except for: 1) *Salvia* subgenus *Calosphace* 2) all *Calosphace* excluding *S. axillaris* Moc. & Sessé, 3) clade of *S. iodantha* Fernald and *S. purpurea* Cav., 4) clade of *S. patens* Cav. and *S. subpatens* Epling, 5) clade of *S. gesneriflora* Lindl. ex Paxton and *S. longistyla* Benth., 6) clade of *S. albo-caerulea* Linden y *S. mexicana* L., 7) clade of *S. fulgens* y *S. microphylla*, 8) section *Membranaceae*, 9) subsection *Elscholtzioideae*, and 10) S. *bupleuroides* and *S. lasiocephala* (figure 1).

Taxonomic treatment

Morphological conspectus of Salvia *section* Membranaceae

Most of the species of *Salvia* section *Membranaceae* are subshrubs to shrubs, only three of them are herbs: *Salvia bupleuroides*, *S. lasiocephala* and *S. verecunda*. They grow erect except for the always trailing or subscandent *S. confertispicata* and *S. langlassei*; moreover, *S. mocinoi* and *S. sanctae-luciae* use to be sprawled and supported on surrounding plants when they grow in dense vegetation. Height, length, branching and robustness degree are variable, but plants from 0.6–1.5 m tall, profusely branched and robust are the most common. In *S. confertispicata* and *S. langlassei* several stems arise from the ground and are poor branched, or with long internodes and short lateral branches. *Salvia lasiocephala* and *S. mexiae* sometimes could be monopodic or with branching just before inflorescences. The three herbs of the section generally are the less tall and the most delicate, though, *S. verecunda* is composed by both delicate and robust plants.

The stems are quadrangular and caniculate between the angles and often reddish or dark magenta tinged; old stems tend to be terete in *S. mexiae*, *S. mocinoi* and *S. sanctae-luciae*, glabrescent and brown to green colored. Nodes are slightly thickened and more densely pubescent. Pubescence is more or less uniform between species, pilose to moderately hirsute, puberulent, or rarely hispidulous, sometimes difficult to be unambigously assigned to any or other kind; it is of no worth for distinguishing taxa within this section. The hairs are simple (and sometimes glandular-capitate in *S. bupleuroides*), uniseriate, pellucid or sometimes yellowish to ferruginous in *S. mocinoi*, usually retrorse or variably curled. Stems in *S. confertispicata*, *S. langlassei* and *S. nitida* are often glabrous.

The leaves along the entire stem are sessile to subsessile only in *S. mexiae* and *S. nitida*, in the rest, leaves are always petiolate and progressively sessile toward and close to the inflorescences. Blades are usually ovate to ovate-lanceolate, rounded to cordate at base, acute to acuminate at apex; margin is always serrate. *Salvia mexiae* is the single species possessing narrow lanceolate blades; in *S. sanctae-luciae* they are elliptic to ovate-elliptic and attenuated at base, and in *S. bupleuroides*, ovate to rhombic-ovate; *Salvia mocinoi* has the most variable blades: ovate, ovate-lanceolate, ovate-elliptic to rhombic-ovate and rounded, subcordate, cuneate, obliquous, or long attenuated at base. Upper surface is commonly bullate or rugose except in *S. confertispicata* and *S. nitida*, and some populations of *S. mocinoi* from Veracruz, Mexico, that correspond to what was described as *S. zacuapanensis* Brandegee. Pubescence is sparse and composed of appressed simple (sometimes also glandular-capitate hairs in *S. bupleuroides* and *S. mocinoi*), uniseriate hairs, and puberulent in both surfaces, but more abundant and glandular dotted below, and frequently with the hairs concentrated in the veins and along the margin. Blades of *S. confertispicata* and *S. nitida* are almost glabrous and lustrous above, especially in the latter.

The inflorescences are terminal or axillar racemes, composed by verticillasters, which consist of two demiwhorls that are subtended at base by a floral bract. Verticillasters are multi-flowered, crowded together to long separate from each other, variation is broad, lax and totally crowded inflorescences can be found in the same species and even within a same population; compaction degree is progressive from base to apex of floral axis. Most of *S. bupleuroides* inflorescences have only one vertcicillaster (monocephalous). It should be noted that in Epling's monograph of subgenus *Calosphace* (1939) and some of his subsequent publications (Epling 1940, 1941, 1944, 1951) the term verticillaster was applied as synonym for demiwhorl, so this must be consider when making a comparison. Floral bracts in section *Membranaceae* are very showy and usually bright colored, reddish to magenta, bluish to violet, or green, often of straw color when dried; they are reniform to ovate, acuminate at apex to long caudate as in *S. glabra*, *S. lophanthoides* and sometimes in *S. mocinoi*, truncate to subcordate at base, with finely serrate and usually ciliated margin, outer surface puberulent, covered with some appressed and sometimes with also glandular-capitate hairs and sessile glandular dots as in *S. bupleuroides*, or almost glabrous as in *S. nitida*, inner surface is always glabrous except for the joint to floral axis which is covered by appressed hairs. The bracts persist even in fruit. Floral axis manifests a similar pubescence than stems, but additionaly it has often glandular-capitate hairs.

Flowers are subsessile to clearly pedicellate. Pedicels are pilose and frequently covered also with glandular-capitate hairs. Calyces are tubular, green, magenta to dark magenta, violet or purplish, they share a similar pubescence than the pedicels in the outer surface, but usually concentrated on the veins and additionally glandular dotted, inner surface is somehow verrucose or covered with short pyramidal hairs toward the apex; the lips are acute to shortly acute and ciliated, the upper is furrowed by 5–7 veins extending till the margin; the two lower lobes are distinct or connate ⅔ to ¾ of their length as in *S. sanctae-luciae* and sometimes in *S. langlassei*. Corollas are sky blue or violet as in *S.*

confertispicata, the tubes are paler to white toward the base, upper lip is white only in *S. mexiae*, lower lip is ornate with white nectar guides near corolla entrance. Corolla pubescence is shortly pilose and almost restricted to dorsal surface of upper and ventral surface of lower lip, the upper is also bordered by short glandular-capitate hairs along the ventral margin. Corolla tube is longer than the lips, straight or ventricose, invaginated or not at base, it is internally ornate with two papillae or naked as in *S. bupleudoides, S. compsostachys*, and *S. lasiocephala*; lower lip is longer than the upper one. There are two stamens transversely disposed within corolla tube, hence blocking acces to the nectary of the ovary. Stamens are often accompanied by two staminodes above and behind filament insertion to corolla tube. Filaments are shorter than connectives, these bear one fertile theca, posterior portion of connectives are connate between stamens. Connectives are ornate at ventral midportion with an acute tooth, sometimes truncate as in *S. mexiae* and *S. nitida*. Thecae are ellipsoid, dorsifixed, longitudinally dehiscent and extrorse. Ovary is supported by a gynobase with a prominence known as gynobasic horn that acts as a nectary; locules are usually longer than gynobasic horn; style is inserted between the locules, is glabrous except in *S. sanctae-luciae* in which it presents some simple hairs just before stylar branches, these are unequal, the upper is longer and arquate, the lower is straight, acute or truncate at apex; in *S. bupleuroides* the lower branch has an abrupt and short twist at apex.

There are two kinds of mericarps in section *Membranaceae*, both are smooth and glabrous, and release mucilage when moistened, they differ in shape and color. The first is the most common and consists of ovoid structures, light brown and dark brown marbled. In contrast, in *S. bupleuroides* and *S. lasiocephala*, they are lenticular, and uniformely bright black.

Taxonomic Treatment

Salvia L. (1753: 23).
Lectotype (designated by Britton & Brown 1913: 128): *Salvia officinalis* L.

Schraderia Medik. (1791: 40). Type: *Schraderia hastata* Moench.
Audibertia Benth. in Lindley (1832: t. 1469). Type: *Audibertia incana* Benth.
Kiosmina Raf. (1836: 92). Type: *Kiosmina hispanica* (L.) Raf.
Salviastrum Heist. ex Fabr. (1759: 231). Type: *Salviastrum texanum* Scheele
Polakia Stapf (1885: 43). Type: *Polakia paradoxa* Stapf.
Ramona Greene (1892: 301). Type: *Ramona polystachya* (Benth.) Greene.
Pycnosphace (Benth.) Rydb. (1918: 1066). Type: *Pycnosphace columbariae* (Benth.) Rydb.
Arischrada Pobed. (1972: 247). Type: *Arischrada bucharica* (Popov.) Pobed

Herbs or shrubs, annual or perennial, often aromatic and with glandular hairs, variously pubescent to glabrous, sometimes with branched hairs. Leaves simple, sessile or petiolate, pinnatifid to pinnatisect, usually dentate, serrate to lobate, sometimes entire. Inflorescence spiciform racemes with 2 to many-flowered verticillasters at each node or less frequently a thyrse, flowers clearly to shortly pedicellate. Floral bracts deciduous or persistent, tiny and inconspicuous to large and showy, entire, dentate to serrate, or rarely spinulose. Bracteols present or absent. Flowers small or large. Calyx ovoid, tubular or campanulate, glabrous at the throat, 15-veined, often accrescent, bilabiate, 3 or 5-lobed, upper lip entire to sometimes

3-dentate or 3-lobed, lower lip alway 2-lobed. Corolla tube included or exserted from the calyx, bilabiate, with uniform diameter all along or ventricose to expanded toward the lips, straight or invaginated near the base, internally naked or ornate with 2–4 papillae or bolds; upper lip usually erect and concave as a hood, entire or emarginate, lower lip 3-lobed, incurved to deflexed, the middle lobe wider and emarginate or rarely entire. Stamens 2, inserted or exserted from the corolla, with 1 or 2 fertile thecae; filaments short; connective extended, usually larger than the filament, entire, geniculate or dentate, anterior arm always bearing a fertile theca, the posterior generally without fertile theca and connate between both stamens; staminodes usually present. Gynobasic disc 4-lobed (lobes between ovary locules) with one of them usually larger (gynobasic horn); style bifid at apex, pubescent to glabrous, branches subulate, equal or unequal in length, lower stylar branch acute, truncate or sigmoid. Mericarps ovoid, triquetrous to lenticular, concolorous to variously marbled, usually glabrous or pilose and sometimes covered with branched hairs, smooth to verrucose, with a small abscission scar, mucilaginous or not. 2n= 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 42, 44, 46, 48, 60, 66, 84, 86, 240.

Salvia* subgenus *Calosphace (Benth.) Epling (1939: 4). Lectotype (designated by Epling 1939: 4): *Salvia coccinea* Buc'hoz ex Etl.

Basionym: *Salvia* section *Calosphace* Benth. (1832–1836: 198) Lectotype (designated by Epling 1939: 4): *Salvia coccinea* Buc'hoz ex Etl.

Salvia section *Microphace* Benth. (1832–1836: 198). Lectotype: *Salvia occidentalis* Swartz.

Salvia subgenus *Jungia* Briq. in Engl. (1897: 277). Type: *Salvia mexicana* L.

Calosphace (Benth.) Raf. (1836: 91). Lectotype (designated by Epling 1939: 4): *Salvia coccinea* Buc'hoz ex Etl.

Herbs perennial, rarely annual, shrubs or arborescent plants. Leaves petiolate or sessile; blades mostly ovate, but also elliptic, lanceolate to linear, reniform to deltoid, thin to subcoriaceous, usually bullate above, glabrous or variously pubescent, sometimes with branched and/or glandular-capitate hairs. Flowers arranged in spiciform racemes with verticillasters or thyrses at each node, terminal or axillary, rarely the flowers solitary or in small fascicles at the axils, surrounded by inconspicuous or conspicuous, deciduous or persistent bracts; bracteoles generally absent. Upper calyx lip usually entire, or less frequently trimucronate, 3–9-veined. Corolla concolorous or nuance, blue, red, magenta to pink, violet or rarely white or yellow; tube straight to ventricose, internally naked or ornate with 2 or 4 papillae or bolds, often invaginate at base; upper lip erect, hooded, lower lip 3-lobed, the middle lobe emarginate. Stamens inserted or exserted, with one fertile theca, or rarely with two; connective geniculate, dentate or entire, posterior arms of both stamens distally connate; a pair of staminodes usually present. Style pilose to glabrous, lower branch acute, truncate or sigmoid.

Salvia* section *Membranaceae (Benth.) Epling (1939: 143). Type: *Salvia bupleuroides* J.Presl ex Benth.

Basionym: *Salvia* subsection *Membranaceae* Benth. (1833: 202). Type: *Salvia bupleuroides* J.Presl ex Benth.

Herbs annual or perennial, shrubs, erect, or trailing to subscandent. Leaves generally ovate, ovate-lanceolate, lanceolate, rhombic, elliptic to lanceolate or rarely linear. Inflorescences in compact or lax racemes, verticillasters many-flowered (usually with more than 10 flowers), floral bracts persistent, reniform, membranaceous with manifest reticulate veins, abruptly acuminate at apex, cordate to truncate at base, often showy colored, somehow translucid and with reticulate venation visible to the naked eye. Flowers subsessile to shortly pedicellate. Upper calyx lip 5–9-veined, deltoid, obtuse to acute, lobes of the lower lip more or less enclosing the throat at maturity. Corolla sky blue to violet, part of the tube and sometimes the upper lip white, the lower lip generally with white nectar guides; tube straight or ventricose, straight or invaginate at base, internally naked to ornate with 2 or 4 papillae; upper lip shorter than the lower one, bordered with glandular-capitate hairs at ventral portion. Stamens included in the corolla; connective ornate with a retrorse or antrorse acute or truncate tooth at midportion. Gynobasic horn longer than ovules; style glabrous or rarely pubescent, upper branch attenuated, lower branch rounded or obutse and caniculate. Mericarp ovoid or lenticular, concolor or irregularly marbled, smooth and glabrous.

Key to the species of *Salvia* subgenus *Calosphace* section *Membranaceae*

1a. Leaves sessile to subsessile (petioles never more than 8 mm long)……….......……......2

1b. Leaves petiolate (petioles of midstem leaves more than 15 mm long) ……….………..3

2a. Blades narrow lanceolate, 6–15 cm long; inflorescence 5–12 cm long, verticillasters usually crowded. Plants from Jalisco (Mexico)…...………..……….……..…..*S. mexiae*

2b. Blades ovate to ovate-lanceolata, 2–3(–5.5) cm long; inflorescence (9–)14–24 cm long, lax. Plants from Oaxaca and Guerrero (Mexico)……...……………...…..……...*S. nitida*

3a. Annual herbs, usually less than 80 cm tall; corolla tube internally epapillate; lower stylar branch truncate; mericarps lenticular and uniformely black ……………………..4

3b. Perennial herbs, subshrubs to shrubs, usually more than 100 cm tall; corolla tube internally papillate or epapillate, lower stylar branch acute or truncate; mericarps ovoid, brown and irregularly dark brown marbled.…….……………………………...………..5

4a. Inflorescence in racemes with only one verticillaster or rarely two, and floral axis arranged in pseudo-umbels; lower stylar branch oblong and slightly curved upward at apex. Plants from Guerrero (Mexico)….……………………………….…..…..*S. bupleuroides*

4b. Inflorescence in racemes generally with 3–25 verticillasters, floral axis not arranged in pseudo-umbels; lower stylar branch truncate. Widely distributed through the Mexican eastern and western mountain ranges to north of South America.………...*S. lasiocephala*

5a. Corolla tube epapillate.…………………………………………….…..…………6

5b. Corolla tube papillate………………………………………….……...……………7

6a. Subshrub; violet to bluish and green tinged floral bracts and calyces; 5–7-veined upper calyx lip; connective 1.2–1.4 mm long; lower stylar branch truncate. Plants from eastern Mexico: Nuevo León, Tamaulipas, Querétaro, Hidalgo, northern Veracruz and northern Puebla.………..…………………………………………………........*S. compsostachys*

6b. Perennial herb; magenta to reddish and green tinged or green floral bracts and calyces; alway 5-veined upper calyx lip; connective 2–2.3 mm long; lower stylar branch acute. Plants from norhtwestern Mexico: Sonora, Chihuahua and Durango.…..…..*S. verecunda*

7a. Blades broad ovate to ovate-lanceolate, rounded to subcordate at base; floral bracts long caudate at apex (cauda up to 8.2 mm long, longer or as long as a half bract length); mericarps 1.1–1.3 mm × 0.6–0.9 mm. Plants from northeastern Querétaro and northwestern Hidalgo, eastern Guerrero and western Oaxaca (Mexico)………………...8

7b. Blades ovate, ovate-lanceolate, elliptic to rhombic-ovate, cuneate, rounded, rounded and shortly cuneate, truncate, to long attenuated at base; floral bracts generally acuminate at apex, or if caudate, the cauda less than half bract length; mericarps 1.2–2.3 mm × 1–1.6 mm. Plants variously distributed but not present in Querétaro and Hidalgo (Mexico)..9

8a. Floral axis covered with glandular-capitate hairs; cauda of the floral bract 5–8.2 mm long; pedicel in flower (1.3–)1.5–2(–2.8) mm long; calyx 7–8 mm × 3–3.7 mm, calyx lips (1–)1.6–2.2 mm long, the upper one 5 or 7-veined; corolla tube 6–6.9(–7.7) × 1.8–2.9(–3.4) mm; style (6–)8.7–9.8 mm long…………………………….......…..*S. glabra*

8b. Floral axis without glandular-capitate hairs; cauda of the floral bract 2.3–4.8 mm long; pedicel in flower 0.2–0.5 mm long; calyx 5–5.9 mm × 2.3–3.1 mm, calyx lips 1.1–1.2 mm long, the upper one 5-veined; corolla tube 5–5.6 mm × 2.3–3.1 mm; style 6.7–7.4 mm long ……………………………………………………………*S. lophanthoides*

9a. Trailing to subscandent shrubs; corolla violet, tube (6.3–)7.5–9.6(–10) mm × (3–)4.3–5.5 mm; connective 4.5–5.6 mm long ……………...……….…...….....*S. confertispicata*

9b. Erect or subscandent shrubs; corolla sky to pale blue and sometimes with white tube and upper lip, tube (4.4–)5–7 mm × 2.2–3.8 mm; connective 2.4–5.2 mm long.……....10

10a. Floral bracts usually exceeding pedicel an calyx length; calyx 5–7.5 mm × 2–3.2(–4) mm, lips short acute or subtruncate, up to 1.6 mm long, lobes of lower lip distinct; corolla tube not invaginated at base. Plants widely distributed from the Trans-Mexican Volcanic Belt to northern Nicaragua…………………………………………..*S. mocinoi*

10b. Floral bracts usually not exceeding pedicel and calyx length; calyx (7.2–)7.6–9.1 × 4–5.7 mm, lips acute 2.5–4.3 mm long, lobes of lower lip usually connate ⅔ to ¾ of their length; invaginated corolla tube at base. Plants from southern Sinaloa and Nayarit, or Guerrero (Mexico)………………...………………………………...…..……..…..11

11a. Subscandent shrubs; blades lanceolate to ovate-lanceolate; upper calyx lip 7-veined; style glabrous; mericarp (1.1–)1.6–1.8 mm long. Plants from Guerrero (Mexico) ……..……………………………………………………………………......*S. langlassei*

11b. Erect shrubs; blades elliptic to rhombic-ovate; upper calyx lip 5-veined; style dorsally hispidulous at apex; mericarp (1.7–)2.2–2.3 mm long. Plants from southern Sinaloa and Nayarit……………………………………………………..………….*S. sanctae-luciae*

1. *Salvia bupleuroides* J.Presl ex Benth.(1833: 271). Type: MEXICO. Guerrero: road from Acapulco to Mexico City, 1832 (fl), *Haenke* s.n. (lectotype PR, isolectotype K; designated in Epling 1939: 145). (figs. 2, 3L, 4A).

Annual herb, erect, 20–70 cm tall; stems pilose and moderately hirsute. Leaves with petioles (0.5–)1–1.8 cm long, covered with retrorse hairs and sometimes with glandular-capitate ones; blades broadly ovate to rhombic-ovate, 1.6–2.7(–5) cm × (0.8–)1–1.9 cm, acute at apex, rounded to subcordate or truncate to subcuneate at base, margin crenate to serrate, both surfaces glabrous or tiny puberulent. Inflorescences composed by several monocephalous (one verticillaster) or rarely bicephalous (two verticillasters) racemes in a secondary umbelliform arrangement (3–8 racemes per pseudoumbel), floral axis (3.6–)6–19(–28) cm long, covered with glandular-capitate hairs and/or eglandular retrorse ones, with verticillasters 10–32-flowered. Floral bracts broadly ovate to reniform, 5.4–13 mm × (7–)10–14.6 mm, persistent, green and irregularly magenta tinged, sparsely covered with eglandular hairs in the outer surface and glabrous in the inner one, acuminate at apex, subcordate at base, margin serrate and bordered with short glandular-capitate hairs and/or eglandular ones. Pedicel 1–2 mm long, covered with short glandular-capitate hairs. Calyx 3.5–4.6(–5.5) mm × (1.5–)2.6–3.8(–4.4) mm, usually green, densely covered with glandular-capitate hairs and sparsely glandular dotted, covered with short conical hairs in the inner surface, lips short acute, 1–1.4 mm long, upper lip 5–veined. Corollas sky blue with white nectar guides in the lower lip, upper lip sparsely pilose and bordered with glandular-capitae hairs, the rest glabrous; tube 3.7–4.5 mm × 1–1.2 mm, ventricose and not invaginated at base, internally naked (epapillate); upper lip 1–2 mm long, lower lip 3.4–4.1 mm × 4.5–5 mm long. Stamens included; filament 0.5–1 mm long; connective 1.2–1.5 mm long, with a rounded antrorse tooth near theca insertion; theca 0.5–0.7 mm long; staminodes absent. Gynobasic horn 0.5–1 mm long; style 2.5–4 mm long, glabrous (very rarely and scarcely pilose) at apex, lower branch oblong (1 mm long) and slightly curvedupward at apex, and truncate. Mericarp lenticular, 0.5–1 mm in diam., black, smooth, glabrous.

Distribution, habitat and phenology: *Salvia bupleuroides* is endemic to the lowlands of the state of Guerrero, Mexico (fig. 5A). It grows in open areas in the confluence between pine-oak or pine, with tropical deciduous forests, from 700–1050 m elevation. It shares habitat with *Pinus oocarpa* Shiede ex Schltdl., *Quercus glaucescens* Bonpl., *Acacia farnesiana* (L.) Willd., *A. cochliacantha* Humb. & Bonpl. ex Willd, *Clethra lanata* M.Martens & Galeotti, *Cochlospermum vitifolium* (Willd.) Spreng., *Asterohyptis stelullata* (Benth.) Epling, *Elytraria imbricata* (Vahl) Pers., *Lobelia laxiflora* Kunth. It flowers and fructifies from October to February.

Etymology: The name of this species derives from the Greek word βου (bou, ox) and πλευρον (pleuron, rib), such epithet is used to designate several plants that belong to the current genus *Bupleurum* L. (Apiaceae); hence, it makes reference to the likelihood between the umbels of those species and the pseudoumbels of this *Salvia*.

Specimens examined: MEXICO. Guerrero: km 339–40 between Acahuizotla and Agua de Obispo on highway to Acapulco, 914 m, 30 September 1949 (fl, fr), *H.E. Moore 5124* (UC); Mexico Acapulco highway N of Acapulco, 807 m, 23 January 1955 (fl), *M.C. Carlson 3100* (MICH); carretera cerca de Acapulco, 24 December 1958 (fl), *L. Paray 2849* (ENCB, MEXU); entre Chilpancingo y Tierra Colorada, 27 December 1954 (fl), *L. Paray 1485* (ENCB); Rincón Viejo, 17°17’40”N, 99º30’00”O, 750 m, 1 November 1960 (fl), *G.B. Hinton et al. 580* (ENCB, MEXU); 1.5 miles W of logging road off Mexico Hwy 95 (Acapulto to Iguala), 0.2 miles S of km 34 marker, 18.7 miles S of Chilpancingo, 25 October 1975 (fl), *K.M. Peterson et al. 333* (MEXU); 5.2 km al O del Ocotito, camino a Jaleaca, 735 m, 10 November 1982 (fl), *R. Torres-C. et al. 1757* (ENCB, MEXU, XAL); 3.5 km al N de Soyatepec, brecha maderera, 920 m, 12 November 1982 (fl, fr), *M. Martínez-M. & R. Torres-C. 2574* (MEXU); 3.5 km al SE de Soyatepec por el camino al Cerro El Toro, 17º18’40”N, 99º32’00”O, 1000 m, 14 November 1982 (fl), *L.C. Rodríguez-M. 2492* (MEXU); 5 km al O de El Ocotito, camino a Jaleaca, 700 m, 24 November 1983 (fr), *E. M. Martínez-S. 5744* (IBUG, MEXU); Agua de Obispo, 25 km al NE de Tierra Colorada, 1040 m, 29 October 1984 (fl), *J.C. Soto-N. 6863* (MEXU); Tecpan, El Campamento, 2 km al NE de El Porvenir, 780 m, 7 February 1986 (fl), *J.C. Soto-N. et al. 12316* (MEXU); Chilpancingo, 5 km al NO de El Ocotito, por la brecha hacia Tlahuizopa (Jaleaca), a la orilla de la brecha, 17º16’12.4”N, 99º33’34.6”O, 716 m, 1 February 2010 (fl, fr), *J.G. González-G.594* (CIIDIR, ENCB, GUADA, IBUG, IEB, MEXU, XAL, ZEA).

Epling (1939) recognized *Salvia bupleuroides* as a synonym of *S. galinosogifolia* Fernald. But lately, in an unpublished manuscript saved in the Royal Botanic Gardens, Kew, and in the University of Maryland, he emerges *S. bupleuroides* as a valid species, different from *S. galinsogifolia*. The last approach is here accepted, since its monocephalous inflorescences, secondarily arranged in pseudoumbels, and oblong and upwardly curved lower stylar branch, are clearly distinctive. It is morphologically similar to *S. lasiocephala*, which can be distinghuished by its terminal or axillar racemes with at least 3 verticillasters per floral axis, and truncate and not curved lower stylar branches. Some specimens of *S. lasiocephala*, as *Rzedowski 17898* (MEXU), *González-O. 234* (MEXU) and *Saunders-S. 1589 & Dieringer* (MEXU), exhibit axillar inflorescences with only one verticillaster, but not arranged in pseudoumbels, and accompanied with a terminal inflorescence with more than three verticillasters; so they cannot be confused with *S. bupleuroides*.

The nearest populations of *Salvia bupleuroides* to the costline in Guerrero (municipality of Tecpan de Galeana) present glandular-capitate hairs in stems, petioles and leaves; the populations of the municipality of Chilpancingo exhibit in a lesser degree or not glandular-capitate hairs throughout stems, petioles and leaves.

2. *Salvia compsostachys* Epling (1940: 519). Type: MEXICO. Nuevo León: Villa de Santiago, trail between Potrero Redondo and Las Ajuntas, 24 August 1939 (fl), *C.H. Muller 2982* (holotype UC, isotype LL) (figs. 3F, 4B, 6).

Shrub to subshrub, erect, 30–80(–100) cm tall; stems moderately pilose between the ribs. Leaves with petioles (1.5–)3–6 cm long, moderately pilose; blades ovate or ovate–lanceolate, (3.1–)5–8 cm × (1.5–)3–3.7(–5) cm, long acuminate at apex, rounded or short cuneate at base, margin crenate to serrate, upper surface sparsely pilose, lower one pilose, mainly on the veins. Inflorescences in racemes, floral axis 14–21 cm long, pilose, with 5–9 verticillasters, each one 8–12-flowered, 1–4 cm gradually apart toward the base. Floral bracts reniform to ovate, (7–)10–12.2 mm × 8–12 mm, persistent, violet to bluish and green tinged, outer surface sparsely pilose, inner one glabrescent, abruptly acuminate at apex (acumen up to 2.5 mm long), truncate to subcordate at base, margin entire and profusely bordered by a line of simple and glandular-capitate hairs. Pedicel (1.6–)2.1–3mm long, densely pilose. Calyx (4.6–)5–6 mm × (1.9–)3–3.3 mm in flower (up to 6.5 mm × 4 mm in fruit), violet to bluish and green tinged, externally pilose with eglandular and glandular-capitate hairs, internally sparsely covered with tiny conical hairs, lips acute and widely deltoid, 2–2.5 mm long, the upper one 5 or 7–veined. Corolla sky blue and with white nectar guides in the lower lip, only the upper lip short pilose and covered with short glandular-capitate hairs; tube 4–4.6 mm × 1.7–2 mm, not ventricose, not invaginated at base and internally naked (epapillate); upper lip (1.6–)2–2.7 mm long, lower lip (4.1–)5.3–7.8(–8.5) mm × (5.8–)6.8–7.4 mm. Stamens included; filament 0.7–1.1 mm long; connective 1.2–1.4 mm long, ventrally ornate with an acute tooth at midpoint; theca 0.8–0.9 mm long; staminodes absent or present above and behind filament insertion. Gynobasic horn 0.5–1 mm long; style 5–5.7 mm long, glabrous, lower branch short and truncate at apex. Mericarp ovoid, 0.9–1.1 mm × 0.5–0.7 mm, light brown and irregularly dark brown marbled, smooth, glabrous.

Distribution, habitat and phenology: *Salvia compsostachys* is endemic to the Mexican states of Nuevo León, Tamaulipas, San Luis Potosí, Querétaro, Hidalgo, northern Veracruz and northern Puebla (fig. 5B). It inhabits oak and montane cloud forests, and subtropical scrubs from (550–)1000–1500(–1900) m elevation. It grows together with *Bunchosia lanceolata* Turcz., *Cyathea mexicana* Schltdl. & Cham., *Dendropanax arboreus* (L.) Decne. & Planch., *Heliocarpus terebinthinaceus* (DC.) Hochr., *Licaria peckii* (I.M. Johnst.) Kosterm., *Ostrya virginiana* (Mill.) K. Koch, *Platanus mexicana* Moric., *Prunus samydoides* Schltdl., *Quercus coccolobifolia* Trel., *Q. laeta* Liebm., *Q. polymorpha* Schltdl.

& Cham., *Q. rysophylla* Weath., *Pinus greggii* Engelm. ex Parl., *Rollinia membranaceae* Triana & Planch., *Sideroxylon palmeri* (Rose) T.D.Penn., *Turpinia insignis* (Kunth) Tul., *Carya ovata* (Mill.) K.Koch, *Liquidambar styraciflua* L., *Juglans mollis* Englem., *Bocconia frutescens* L., *Heimia salicifolia* Link, *Dodonaea viscosa* Jacq., and *Euphorbia dioscoreoides* Boiss. It flowers and fructifies from May to December.

Etymology: The name of this species derives from Greek words κομψος (compsos, graceful), and σταχυσ (stachys, spikelet); making reference to its delightful inflorescences.

Specimens examined: MEXICO. Hidalgo: Puerto del Zopilote, near km 329 on highway between Santa Ana and Chapulhuacán, 1158 m, 25 September 1949, (fl), *H.E. Moore 5078* (UC); Mex. Highway 85 at town of Palomas, 41.4 mi S of Tamazunchale and 22.9 mi N of Jacala, 1480 m, 4 July 1979 (fl, fr), *C.R. Broome & R.K. Solomon 2490* (MEXU); 10 km al NE de Tenango de Doria, hacia San Bartolo Tutotepec, 1240 m, 20 June 1983 (fl), *R. Torres-C. 3002 & H. Hernández* (MEXU). Nuevo León: Villa de Santiago, trail between Potrero Redondo and Las Ajuntas, 14 August 1920, (fl), *C.H. Muller 2982* (UC); Horsetail falls near Villa de Santiago, 10 miles of Monterrey, August 1934, (fl), *L.A. Kenoyer 134* (UC); Horstail Falls, 10 October 1937 (fl), *L.A. Kenoyer 342* (F); near Las Mitras, 4 mi from Monterrey, August 1946 (fr), *J.J. Roybal 640* (MEXU); Cola de Caballo, Monterrey, 17 September 1959 (fl, fr), *C.L. Díaz-L. s.n.* (ENCB); Hacienda Cola de Caballo, formerly Hacienda Vista Hermosa, ca. 30 km S of Monterrey, 25.37ºN, 100.17ºO, 900 m, 1 December 1985 (fl, fr), *S.A. Reisfield 1308* (MEXU, XAL); Cañón El Diente, Sierra Madre Oriental, 20 km al S de Monterrey, 25.57ºN, 100.23ºO, 700 m, 21 September 1989 (fl), *J. Valdés-R. et al. 1964* (CHAPA), *4964* (MEXU); Aramberri, Cerro El Viejo, 1270 m, 2 October 1993 (fl, fr), *G.B. Hinton et al. 23825* (MEXU, MO). Puebla: Ixtepec, Hotel Mi Ranchito, Villa Juárez, 1600 m, 1 November 1966 (fl), *L.M. Villarreal de Puga 12673* (IBUG). Querétaro: alrededores de Agua Zarca, 1300 m, 12 October 1987 (fl), *J. Rzedowski 45224* (IEB); 2 km al NE de El Humo, 1100 m, 13 December 1989 (fl, fr), *H. Rubio 1413* (IEB); 6.5 km al NE de El Humo por el camino a Neblinas, 21.26ºN, 99.97ºO, 1120 m, 25 September 2002 (fl), *S. Zamudio-R. 12116 & V. Steinmann* (IEB). San Luis Potosí: km 253 de la carretera San Luis Potosí-Antiguo Morelos, 1200 m, 28 October 1956 (fl, fr), *J. Rzedowski 8370* (ENCB); 5 km al NE de ejido de Xilitlilla, 1400 m, 5 May 1959 (fl), *J. Rzedowski 10543* (ENCB); 5 km al W de Ahuacatlán, 1450 m, 16 September 1970 (fl), *J. Rzedowski 27705* (MEXU); entrada a Xilitla a partir de la carretera Querétaro-Xilitla, 21.32ºN, 996ºO, 1170 m, 22 August 2010 (fl), *J.G. González-G.654* (ENCB, IBUG, IEB, MEXU, ZEA); 4 km al O de Ahuacatlán, a la orilla de la carretera Xilitla-Landa de Matamoros, cerca de La Gloria, 21.31ºN, 99.06ºO, 1245 m, 25 August 2010 (fl), *J.G. González-G.656* (ENCB, IBUG, IEB, MEXU, ZEA). Tamaulipas: near Frank Harrison's rancho El Cielo, in Sierra de Guatemala, above Gómez Farías, 28 August 1952 (fl), *A.J. Sharp* et al. *52098* (UC); near rancho El Cielo, 1000 m, 27 August 1955 (fl), *A.J. Sharp 50289* (UC); Aldama, región of Rancho Las Yucas, ca. 40 km NNW of Aldama, 14 October 1957 (fl, fr), *R.L. Dressler 2418* (UC); Puerto de Arrazola, Sierra de Guadalupe, 18 August 1985 (fl, fr), *F. González-M.* et al. *14722* (MEXU); Victoria, Puerto El Encinal, 6 km al Sur de la Escondida, 1900 m, 18 August 1985 (fl, fr), *F. González-M. et al. 14722* (MEXU-521372); rancho el Cielo, 11 km al NO de Gómez Farías, 1200 m, 19 September 1971 (fl, fr), *F. González-M. et al. 3592* (MEXU); rancho El Cielo (Harrison Rancho of Martin & Harrell), 6.4 km NW of Gómez Farías, 108 km SSW of Ciudad Victoria, 1100–1300m, 11 August 1991 (fl), *H.H. Iltis 30628 & B. Simon* (WIS); Hidalgo, Divisadero, 1025 m, 21 September 1994 (fl, fr), *G.B. Hinton et al. 24799* (IEB, MEXU, MO); km 86 de la carretera Ciudad Victoria-Soto La Marina, 550 m, 12 December 2003 (fl), *S. Zamudio-R. 12679 & A. Ibarra* (IEB). Veracruz: Dos Ríos, El Roble, 600 m, 8 June 1979 (fl), *F. Ventura-A. 16188* (XAL); Tepetzintla, Sierra de la Peña Blanca, Sierra de Tantima, 21º19'24"N, 97º51'42"O, 21 September 1989 (fl), *P. Zamora-C. et al. 1232* (XAL).

Salvia compsostachys is similar to *Salvia verecunda*. However, it is distinctive by its violet to bluish and green tinged floral bracts and calyces (*vs* magenta to reddish and green tinged, or green), 5–7-veined upper calyx lip (*vs* always 7-veined), shorter connective (1.2–1.4 mm *vs* 2–2.3 mm long), and truncate lower stylar branch (*vs* acute). Furthermore, the arid lands of the Central Mexican Plateau separates both species, the first growing in Sierra Madre Oriental (Nuevo León, Tamaulipas, San Luis Potosí, Querétaro, Hidalgo, Veracruz and Puebla), and the second in Sierra Madre Occidental (Chihuahua, Sonora and Durango; compare figs. 5B *vs* 19B).

It is also morphologically similar to *Salvia glabra*, but can be differentiated from this by its abruptly acuminate floral bracts (*vs* long caudate at apex), shorter calyces in flower (4.6–6 mm *vs* 7–8 mm long), shorter corolla tube [4–4.6 mm *vs* 6–6.9(–7.7) mm long], shorter upper corolla lip [1.6–2.7 mm *vs* (2.6–)3–3.9 mm long], shorter connective [1.2–1.4 mm *vs* (2.3–)3.2–5 mm long], shorter style [5–5.7 mm *vs* (6–)8.7–9.8 mm long], and lower stylar branch truncate (*vs* acute). They have not been collected in the same locality, though their general distributions overlap in Querétaro and Hidalgo region (fig 5B and 8B).

3. *Salvia confertispicata* Fragoso & Mart.Gord. (2013: 2). Type: MEXICO. Guerrero: Chilpancingo, 4.5 km al SW de Omiltemi por el camino a La Soledad, 2360 m, 18 January 1984, *J. Contreras 1456* (holotype FCME, isotypes IEB, MEXU, NY). (figs. 3J, 4C, 7).

Shrub, trailing to subscandent, (0.8–)1.5–2.5(–4) m long; stems pilose and soon glabrescent. Leaves with petioles (0.7–)1.4–3(–3.7) cm long, caniculate, the ribs bordered by a line of simple hairs; blades ovate to ovate-lanceolate, (2.6–)3–5(–8.9) cm × (1.2–)2–3(–5) cm, acute to acuminate at apex, rounded and shortly cuneate to truncate at base, margin serrate, upper surface glabrous or pilose on the main vein, lower surface sparsely pilose, mainly on the veins. Inflorescence in racemes, floral axis (2.5–)3.5–6(–7.8) cm long, sparsely pilose, with 3–4(–8) verticillasters, each one 6–20-flowered, up to 1.5 cm gradually apart toward the base in mature inflorescences. Floral bracts ovate, (5.1–)11–14.5(–16.8) mm × (5.2–)10–15(–24) mm, persistent, dark violet, both surfaces almost glabrous, acuminate to caudate (cauda up to 4.5 mm long) at apex, truncate to subcordate at base, margin entire and sparsely ciliated. Pedicel (1.2–)1.5–2 mm long in flower (up to 4.8 mm long in fruit), pilose. Calyx 6–7(–8.4) mm × (2.8–)3.5–5.1 mm in flower (up to 8.6 mm long in fruit), dark violet, sparsely pilose and covered with glandular-capitate hairs, internally covered with short conical hairs, lips acute, (1.7–)2.4–2.8 mm long, upper lip 7–veined. Corolla violet with whitish nectar guides in the lower lip, pilose and covered with glandular-capitate hairs in the upper lip and along the throat; tube 7.5–9.6(–10) mm × 4.3–5.5 mm, slightly ventricose, invaginated at base, internally ornate with a pair of papillae (1 mm long); upper lip 2.9–4.4 mm long, lower lip 4.7–8 mm × 6.6–8 mm. Stamens included; filament 1.4–2.1 mm long; connective 4.5–5.6(–7.6) mm long, ventrally ornate with an acute tooth at midportion; theca (1.4–)1.8–2 mm long; a pair of staminodes present above and behind the insertion of the filament to the corolla. Gynobasic horn 0.6–0.8 mm long;

style 8.8–11.5(–13) mm long, glabrous, lower branch acute. Mericarps ovoid, 2–2.2 mm × 1.5–1.6 mm, light brown and irregularly dark brown marbled, smooth, glabrous.

Distribution, habitat and phenology: *Salvia confertispicata* is endemic to the Mexican states of Guerrero and Oaxaca (fig. 8A). It grows exclusively in Sierra Madre del Sur, in montane cloud, pine-oak, pine, and oak forests, from (1779–)2200–2800 m elevation. It shares habitat with *Pinus ayacahuite* C.Ehrenb. ex Schltdl., *P. oocarpa* Schiede ex Schltdl., *P. strobus* L., *Quercus acutifolia* Née, *Q. castanea* Née, *Q. magnoliifolia* Née, *Q. liebmannii* Oerst. ex Trel., *Q. nixoniana* S.Valencia & Lozada-Pérez, *Q. obtusata* Bonpl, *Abies guatemalensis* Rehder, *Chiranthodendron pentadactylon* Larreat., *Clethra galeottiana* Briq., *Cleyera integrifolia* (Benth.) Choisy, *Oreopanax echinops* (Cham. & Schltdl.) Decne. & Planch., *Clinopodium macrostemum* (Moc. & Sessé ex Benth.) Kuntze, *Roldana langlassei* (Greenm.) H.Rob. & Brettell, *Salvia carnea* Kunth, *S. cinnabarina* M.Martens & Galeotti, *S. karwinskii* Benth., *S. mexicana* L., *S. mocinoi* Benth., *S. polystachya* Cav., *S. protracta* Benth., *S. roscida* Fernald, *S. tricuspidata* M.Martens & Galeotti, *S. tubifera* Cav., *S. vitifolia* Benth., and *Villadia nelsoni* Rose. It flowers and fructifies from the end of October to beginnings of May.

Etimology: The name of this species makes reference to its typical compact inflorescences, from the Latin confertus (crowded, dense, thick) and spicatus (spike).

Specimens examined: MEXICO. Guerrero: Sierra Madre prope Chilpancingo, 2743–3048 m, 24 December 1894 (fl, fr), *E.W. Nelson 2206* (UC); San Antonio Buenos Aires, district Montes de Oca, 22 December 1937 (fl), *G.B. Hinton et al. 11703* (UC); second ridge W of Petlacala, 1915 m, 1 January 1938 (fl, fr), *Y.E.J.Mexia 9058* (UC); Laguna Soyate, 2100 m, 23 March 1939 (fl), *G.B. Hinton et al. 14106* (UC); Puerto Rico, distr. Mina, 1750 m, 15 April 1939 (fl, fr), *G.B. Hinton 14162* (ENCB); Puerto Rico, 1700 m, 15 April 1939 (fl, fr), *G.B. Hinton et al. 14168* (UC); Cerro de Teotepec, December 1946 (st), *L. Paray 82* (ENCB); Cerro Teotepec y cercanías, March 1947 (st), *L. Paray 4034* (MEXU); 5 km al W de Camotla, 2600 m, 8 April 1963 (fl), *J. Rzedowski 16404* (ENCB, MEXU); about 10 km W of Camotla, about 40 km W of Chilpancingo, 2500 m, 30 November 1963 (fl), *J.V.A. Dieterle 3184* (MICH); Puerto Chico, 10 km al W de Camotla, 2500 m, 30 November 1963 (fl), *J. Rzedowski 18005* (ENCB); at and just below summit of Cerro Alquitrán, 17–18 km by road west of Mex. highway 95 and Mazatlán, 2600 m, 6 December 1966 (fl), *W.R. Anderson 4427 & G.W. Laskowski* (ENCB); Cerro Alquitrán, cerca de Mazatlán, 2600 m, 6 December 1966 (fl), *J. Rzedowski 23671* (ENCB); Cerro Alquitrán (cima), 17º23'30"N, 99º31'31"W, 2400 m, 2 May 1969 (fl), *H. Kruse 2485* (MEXU, IEB); eastern slopes of Cerro Alquitrán, 5–7 km (straight line distance) west-southwest of Mazatlán, 2450 m, 11 February 1970 (fl), *W.R. Anderson 5712 & C. Anderson* (ENCB); WNW of Filo del Caballo on road to Puerto El Gallo, 2500 m, 11 November 1973 (fl), *D.E. Breedlove 36012* (MEXU); 16 km al SW de Filo de Caballo, along road to Atoyac, 2590 m, 5 October 1988 (fl), *D.E. Breedlove 64928* (MEXU); 6 km al W de Omiltemi, camino a la Soledad Las Joyas, 27 March 1982 (fl), *E. M. Martínez-S. 270 & O. Téllez* (ENCB, XAL); 6 km al NW de Omiltemi, brecha Chilpancingo-Omiltemi-Las Joyas, 2530 m, 11 November 1982 (st), *P. Tenorio-L. et al. 2658* (IBUG, MEXU); 10 km adelante de la vuelta rumbo a Atoyac, 2530 m, 8 January 1983 (fl), *A.R. López-F. 220* (MEXU); Nueva Delhi, 23 km al NE de Paraiso, carretera Atoyac-Filo de Caballo, 1510 m, 1 February 1983 (fl, fr), *P. Tenorio-L. et al. 3227* (MEXU); 12 km al SO de Filo de Caballo camino a Puerto del Gallo, 2580 m, 25 February 1984 (fl), *E. Martínez-S et al. 6144* (XAL); 26 km al SW de la Hierbabuena, camino a Filo de Caballo-Pto. Del Gallo, 26

February 1984 (fl), *E. M. Martínez-S. 6155* (IBUG); 5–10 km above and SW of Filo del Caballo, along road to Puerto El Gallo, 2440 m, 19 October 1984 (fl), *D.E. Breedlove 61900* (MEXU); 14 km al SO de Filo de Caballo, camino a Puerto del Gallo, 2610 m, 21 April 1985 (fl), *J.C. Soto-N. 8356 & S. Aureoles-C.* (CIIDIR, IBUG, IEB); Carrizal de Bravo, 4 km al S, 17º35'7"N, 99º50'50"W, 2800 m, 4 March 1986 (fl), *J. Calónico-S. 8298* (MEXU); 21 km al NE de Filo de Caballo, carretera a Puerto del Gallo, 2200 m, 4 May 1986 (fl, fr), *O.R. Dorado-R. et al. 1559* (HUMO); El Chayotal, parque estatal Omiltemi, 2400 m, 20 February 1994 (fl), *N. Diego 6977* (UAGC); Balsamar, 6 km al NE de Filo de Caballo, 17º35'46"N, 99º49'49"W, 2400 m, 9 November 1997 (fl), *J. Calónico-S. 6765* (MEXU); El Jilguero, 2 km al N, 17º30'45"N, 100º0'0"W, 2610 m, 16 January 1999 (fl), *R. Cruz-D. 3547* (MEXU); ejido de Yextla, 4 km al SW de Filo de Caballo, aprox. 2 km al W de Carrizal de Bravo, 17º37'15.1"N, 99º51'51"W, 2673 m, 31 January 2010 (fl), *J.G. González-G. 589* (IBUG); 3.8–4 km al SW de Filos de Caballo y 2 km al W de Carrizal de Bravo, 17º37'12.94"N, 99º51'51"W, 2706 m, 11 February 2012 (fl, fr), *J.G. González-G. 1184* (IBUG); 1 km al S de Carrizal de Bravo, 17º35.845'N, 99º5096'W, 2597 m, 30 October 2012 (fl, fr), *J.G. González-G .et al. 1377* (IBUG); Malinaltepec, Ojo de Agua de Cuauhtémoc, 17ª11'8.9"N 98º39'32.5"O, 2231 m, 27 December 2012 (fl), *B. Nepomuceno-C. 132 & E. Cándido-B.* (IBUG, UAGC). Oaxaca: 4 km al S de Lachao, km 183 carretera Oaxaca-Puerto Escondido, 1850 m, 14 April 1965 (fl, fr), *J. Rzedowski s.n.* (ENCB); S-slopes of Sierra Madre del Sur, between Suchixepec and La Soledad, on Oaxaca-Puerto Angel road (Mexican highway 175), 2340 m, 8 November 1966 (fl), *W.R. Anderson & C.W. Laskowski 4165* (MICH); 15 km al W de San Jerónimo Coatlán, brecha a Juquila, 1940 m, 14 December 1985 (fl), *P. Tenorio-L. 10729* (MEXU); 13 km al SO de San Jerónimo Coatlán, brecha a San Gabriel Mixtepec, 16º12'N, 96º57'57"W, 1100 m, 20 February 1988 (fl), *A. Campos-V. et al. 1288* (CHAPA, MEXU); 3 km al N de San Pedro el Alto, 1980 m, 15 January 1988 (fl), *A.R. López-F. et al. 593* (UAP); 0.5 km al S de S. M. Yucunicoco, distrito de Juxtlahuaca, 2600 m, 3 March 1988 (fl, fr), *S. Salas-M. 126* (OAX); paraje El Campanario, comunidad de San Pedro El Alto, 2400 m, 29 November 1998 (fl), *A.G. Miranda-M. 782* (MEXU, OAX); paraje el Manzanal, San Pedro el Alto, 2700 m, 6 February 1995 (fl), *F. García-B. 33* (MEXU); 3 km de San Pedro Chayuco, carretera por el aserradero, 17.12ºN, 98ºW, 1855 m, 19 February 1995 (fl), *J.I. Calzada 19782* (MEXU); 2 km al S de San Juan Mixtepec, 16º15.3'N, 96º18.3'18.3'W, 2400 m, 14 November 1996 (st), *E. Hunn 439* (OAX); reserva ecológica, 5 km al NW de San Miguel Suchixtepec, 2600 m, 26 March 2011 (fl), *B. Hernández et al. 82* (MEXU); inmediaciones del paraje El Campanario, 5.2 km al E en línea recta de Santiago Textitlán, 16º41'54.88"N, 97º12'12"W, 2650 m, 17 November 2012 (fl), *J.G. González-G. & J.H. Zárate-J. 1438*(IBUG); Cerca del paraje El Manzanal, 11.3 km en línea recta al O de San Vicente Lachixio y 14.5 E km de Santiago Textitlán, 16º42'14.2"N, 97º7'7"W, 2343 m, 17 November 2012 (fl), *J.G. González-G. & J.H. Zárate-J. 1422*(IBUG).

Salvia confertispicata was diagnosed in a key to *Salvia* section *Membranaceae* subsection *Lophanthoideae* species in Guerrero, Mexico (Fragoso-Martínez & Martínez-Gordillo 2013). The distinctive characters indicated were ascendant floral bracts (*vs* reflexed or divaricate) with caudate apex (*vs* acuminate), and compact inflorescences with internodes less than 1 cm long (*vs* lax with internodes more than 1 cm long). However, floral bract orientation relative to inflorescence axis relies on the number of flowers and their state of development; the more flowers and more developed, floral bracts will tend to be divaricate, otherwise, they will be ascendant. This can be appreciated in several specimens of *S.*

confertispicata, where floral bracts changed from divaricate to ascendant from base to top of the inflorescence [*J.G. González-G.589* (IBUG), *1184* (IBUG), *J.G. González-G. 1422 & J.H. Zárate-J.* (IBUG) and *1438* (IBUG), *E. M. Martínez-S. et al. 6155* (IBUG), *J.C. Soto-Núñez 8356 & S. Aureoles-C.* (IBUG), and *P. Tenorio-L. et al. 2658* (IBUG)]; thereby, this feature is not adequate to delimit the species. Besides, in *S. langlassei* Fernald and *S. mocinoi* Benth. (species against *S. confertispicata* was contrasted) floral bracts are not always acuminate but also caudate; so apex shape of floral bracts does not helps either to differentiate clearly between these species. The features that allows the distinction between *S. confertispicata* and *S. mocinoi* are its violet corollas with whitish (poor developed) nectar guides in the lower lip (*vs* sky blue with clear white nectar guides), longer corolla tubes [(7.5–9.6(-10) mm *vs* (4.4–)5–6.6(–7.5) mm long)] and invaginated at base (*vs* not invaginated), longer connective [4.5–5.6(–7.6) mm *vs* 2.4–3.6(–4.5) mm long], longer style [8.8–11.5(–13) mm *vs* 5.4–9.3 mm long] and slightly wider mericarps (1.5–1.6 mm *vs* 1–1.2 mm wide). These species grows together only in Filo de Caballos, Guerrero; *S. mocinoi* has a much more extensive distribution (compare figs. 8A *vs* 16A). *Salvia confertispicata* can be distinguished from *S. langlassei* by its smooth blades above (*vs* bullate), shorter floral axis [(2.5–)3.5–6(–7.8) cm *vs* 11–30.2 cm long], more crowded verticillasters (up to 1.5 cm from each other *vs* 4–6 cm of separation), usually bigger floral bracts [(5.9–)11–14.5(– 16.8) mm × (5.2–)10–15(–24) mm *vs* (5.5–)7.9–9 mm × 4–4.6(–6.2) mm], shorter pedicel in flower [(1.2–)1.5– 2 mm *vs* 2.4– 3.4(– 6.3) mm long], shorter calyx lips [(1.7–)2.4– 2.8 mm *vs* 3– 3.7(– 4.8) mm long], corolla violet with witish nectar guides in the lower lip (*vs* blue with clear white nectar guides in the lower lip), bigger corolla [7.5–9.6(–10) mm × 4.3–5.5 *vs* 5.8–6.5 mm × (2.5–)3.3– 4.3 mm], and slightly bigger mericarps [2–2.2 × 1.5–1.6 mm *vs* (1.1–)1.6– 1.8 × 1–1.4 mm]. Furthermore, *S. confertispicata* usually grows in higher elevations than *S. langlassei* [(1779–)2200–2800 *vs* 1400–2100 m]. *Salvia confertispicata* can be also morphogically similar to *S. sanctae-luciae* Seem., mainly in terms of inflorescence architecture, but it is distinguished from this by ovate to ovate-lanceolate blades (*vs* elliptic to rhombic-elliptic) and rounded and shortly cuneate to truncate base (*vs* cuneate to long attenuated), 7-veined upper calyx lip (*vs* 5-veined), violet corolla with whitish nectar guides in the lower lip (*vs* white upper lip and corolla tube with blue lower lip without clear defined nectar guides), bigger corolla tube [7.5–9.6(–10) mm × 4.3–5.5 mm *vs* 5.5–6.5 mm × 3.4–3.7 mm], and longer [8.8–11.5(–13) mm *vs* 8.3–9.1 mm long)] and glabrous style (*vs* hispidulous toward the apex). Moreover, *S. sanctae-luciae* is known from Sierra Madre Occidental and northwestern Trans-Mexican Volcanic Belt in Nayarit and Sinaloa, whereas *S. confertispicata* is exclusive of Sierra Madre del Sur in Guerrero and Oaxaca (compare figs. 8A *vs* 10A).

A very peculiar feature in *S. confertispicata*, that also helps to differentiate it from *S. mocinoi* and *S. sanctae-luciae*, but not from *S. langlassei*, is its trailing to subscandent habit, long branches (up to 4 m long) that can climber into medium size trees or hang down along ravines or dirt road walls. However, the inflorescences are not pendulous but erect by means of a distal twist of the branches, which secures the usual nototribic pollination way described by Wester and Claßen-Bockhoff (2007). Some populations of *S. mocinoi* can emulate a similar pattern but never with branches as long and delicate as those of *S. confertispicata.*

4. *Salvia glabra* M.Martens & Galeotti (1844: 68). Type: MEXICO. Oaxaca: Cordillera, in Sierra de Llano Verde, April–November 1840 (fl), 5700 ft (1737 m), *H.G. Galeotti*

714 (holotype BR-511071, isotypes BR-511080, BR-511104, BR-511137, G). (figs. 3C, 4D).

Subshrub, erect, around 40–80(–100) cm tall; stems glabrous to sparsely pilose and puberulent. Leaves with petioles (1.4–)2–8 cm long (the uppermost leaves with petioles 0.3–5 mm long), sparsely pilose, with axillary fascicles of several immature leaves; blades broad ovate, (4–)6–10.9 cm × (2–)3–5(–7.4) cm, acute to acuminate at apex, rounded to subcordate at base, margin serrate, both surfaces glabrous or sometimes sparsely covered with appressed hairs in the veins, puberulent. Inflorescences in racemes, floral axis 3–18 cm long, pilose and with some glandular-capitate hairs, with 5–11 verticillasters, each one (6–)12–16-flowered, 0.8–1.9(–3.5) cm gradually apart toward the base, the uppermost crowded. Floral bracts ovate, 7–16.2 mm × (6.4–)7.4–12 mm, persistent, green to purplish, glabrescent to sparsely covered with appressed hairs, long caudate at apex (cauda 5–8.2 mm long, longer than or as long as half bract length), truncate at base, margin entire to shortly and irregularly crenate and bordered by a line of long simple hairs. Pedicel (1.3–)1.5–2(–2.8) mm long, pilose and occasionally with some glandular-capitate hairs intermixed. Calyx 7–8 mm × 3–3.7 mm, green, dark magenta to dark purple, externally glabrous or scarcely pilose and with short glandular-capitate hairs, puberulent, internally covered with short conical hairs, scarcely accrescent, lips acute, (1–)1.6–2.2 mm long, the upper lip5 or 7-veined. Corolla sky blue with white nectar guides in the lower lip, glabrous except for the upper lip which is scarcely pilose and ventrally bordered with glandular-capitate hairs; tube 6–6.9(–7.7) mm × 1.8–2.9(–3.4) mm long, slightly ventricose and not invaginated at base, internally papillate; upper lip (2.6–)3–3.9 mm long, lower lip (4–)6–7(–8.8) mm × 3.4–4.6(–8.4) mm. Stamens included; filament (0.8–)1–1.7 mm long; connective (2.3–)3.2–5 mm long, ventrally ornate with an acute tooth at midportion; thecae (0.8–)1.2–1.8 mm long; a pair of staminodes present above and behind the insertion of the filament to the corolla. Gynobasic horn 0.4–0.8 mm long; style (6–)8.7–9.8 mm long, glabrous, lower branch acute. Mericarp ovoid, 1.1–1.2 mm × 0.6–0.9 mm, light brown and irregularly dark brown marbled, smooth and glabrous.

Distribution, habitat and phenology: *Salvia glabra* is endemic to Mexico, growing in Sierra Madre Oriental (Querétaro and Hidalgo) and Sierra Madre del Sur (Oaxaca), Mexico (fig. 8B). It inhabits oak and montane cloud forests, from (900–)1200–1800(–2120) m elevation. It shares habitat with the trees *Juglans mollis*, *Liquidambar styraciflua*, *Platanus mexicana*, *Quercus polymorpha*, *Tilia mexicana* Schltdl. and the herbs *Arthrostemma ciliatum* Pav. ex D. Don. and *Hybanthus attenuatus*. It flowers and fructifies from September to March.

Etimology: The specific epithet makes reference to the supposedly hairlessness throughout the plant, from the Latin glaber (hairless); however, although the plant is not too pubescent, the stems, leaves, floral bracts, petioles and calyces are sparsely pilose or covered with appressed hairs.

Additional material examined: Hidalgo: carretera México-Zimapan, km 129, 2100 m, 21 October 1966 (fl), *L.M. Villarreal de Puga 779* (IBUG). Querétaro: La Cuesta, 3 km al S de Escanelilla, 2113 m, 14 December 1983 (fl), *Fernández 2113 & Acosta* (CIIDIR, IEB); La Cuesta, 3 km al S de Escanelilla, 1100 m, 14 December 1983 (fl), *Fernández 2144 & Acosta* (IEB); cerca del Llano, 12 km al NE de Pinal de Amoles, sobre la carretera a Jalpan, 1800 m, 13 October 1987 (fl), *J. Rzedowski 45257* (IBUG, IEB); Jalpan de Serna, 3 km al S del Carrizal por el camino a San Pedro el Viejo, 930 m, 8 December 1988 (fl), *S. Zamudio-R. 6135* (IEB, IBUG); aprox. 2 km al O de San Pedro Escanela, 1840 m, 10

December 1988 (fl), *E. Carranza-G. 1245* (IBUG, IEB); 7 km al W de San Pedro Escanela, sobre el camino a El Llano, 1850 m, 11 December 1988 (fl), *J. Rzedowski 47993* (IBUG, IEB); 24 km al NE de Landa de Matamoros, sobre la carretera a Xilitla, 1450 m, 12 December 1988 (fl), *J. Rzedowski 48069* (IEB); 2 km al NW del Cerro de La Palma, 1500 m, 1 November 1989 (fl), *H. Rubio 1283* (IBUG, IEB); aproximadamente 4 km al SW de Acatitlán de Zaragoza, 1400 m, 6 November 1989 (fl, fr), *E. González-P. 1218* (IBUG); 2–3 km al NNW de San Pedro El Viejo, 1680 m, 6 November 1989 (fl), *E. Carranza-G. 2191* (IBUG); aprox. 3 km al SE de la Vuelta, 1370 m, 11 December 1989 (fl), *E. González-P. 1333* (IBUG, IEB); cerca de Huazmazontla, 13 km al NE de Pinal de Amoles, sobre la carretera a Jalpan, 1300 m, 12 March 1989 (fl), *J. Rzedowski 48407* (IEB); aprox. 2 km al S de El Carrizal de Los Sánchez, 1000 m, 26 January 1989 (fl), *E. Lugo-L. 44* (IBUG, IEB); 1 km al E de San Onofre, 900 m, 12 November 1990 (fl), *H. Rubio 2095* (IBUG, IEB); 1 km al SW de El Sabinito, 1450 m, 30 September 1989 (fl), *H. Rubio 1156* (IBUG, IEB); aproximadamente 1 km al E de El Llano de Huazquilico, 1740 m, 12 November 1990 (fl), *E. Carranza-G. 2902* (IBUG, IEB); Milpa Vieja, cerca del Aguacate, por la carretera San Joaquín, Casa de Máquinas, 1950 m, 17 November 1993 (fl*), H. Díaz 7447 & E. Carranza-G.* (IEB); 16 km de La Florida, por el camino a Concá, 1200 m, 21 *November 1995 (fl), E. Pérez-C. 3283 & S. Zamudio-R.* (IEB); Cerro Grande, 3 km al SE de Carrera de Tancama, 1180 m, 9 December 1997 (fl), *M. Chávez L. 183* (IBUG, IEB); sobre el camino de San Joaquín-Bucareli, 1773 m, 27 November 2002 (fl), *P. Balderas 248* (IEB); en el camino de San Joaquín a Bucareli, 21.000112ºN, 99.579159ºW, 1773 m, 27 November 2002 (fl), *Y. Pantoja 390* (IEB).

Salvia glabra resembles *S. compsostachys*, *S. lophanthoides* and *S. verecunda*. Nonetheless, *S. glabra* differs in several ways from *S. compsostachys* that are explained in the discussion of the latter. *Salvia glabra* is similar to *S. lophanthoides*, in fact, Epling (1939) was hesitant about if they were actually conespecific; however, they can be easily differentiated by the visible floral axis between the verticillasters and covered with glandular-capitate hairs of the first (*vs* floral axis hidden between verticillasters by flowers and floral bracts and without glandular-capitate hairs), longer cauda of floral bracts (5–8.2 mm *vs* 2.3–4.8 mm long), longer pedicels in flower [(1.3–)1.5–2(–2.8) mm *vs* 0.2–0.5 mm long], longer calyces (7–8 mm *vs* 5–5.9 mm long), longer calyx lips [(1–)1.6–2.2 mm *vs* 1–1.2 mm long] and 5–7-veined upper lip (*vs* always 5-veined), longer corolla tubes [6–6.9(–7.7) mm *vs* 5–5.6 mm long], and usually longer style [(6–)8.7–9.8 mm *vs* 6.7–7.4 mm long]. Regarding *S. verecunda*, it differs by its long caudate apex (*vs* acuminate) and truncate base (*vs* cordate) of floral bracts, longer calyces in flower [7–8 mm *vs* 4.5–5.5(–6) mm long] and with 5 or 7-veined upper lip (*vs* 7-veined), longer corolla tube [6–6.9(–7.7) mm *vs* 4–4.3 mm long], longer upper corolla lip [(2.6–)3–3.9 mm *vs* (1.5–)2.5–2.8 mm long], and longer style [(6–)8.7–9.8 mm *vs* 5.5–5.8 mm long]. Additionaly, they are isolated from each other; *S. glabra* grows in Sierra Madre del Sur and Sierra Madre Oriental, whereas *S. verecunda* is restricted to Sierra Madre Occidental (compare figs. 8B *vs* 19B).

5. *Salvia langlassei* Fernald (1910: 417). Type: MEXICO. Sierra Madre (états de Michoacán et de Guerrero), 1700 m, 27 January 1899 (fl), *E. Langlassé 805* (holotype GH, isotypes K, US). (figs. 3E, 4E, 9).

Shrub, subscandent, 1–4 m long; stems sparsely pilose with the hairs concentrated in the ribs to glabrous and puberulent. Leaves with petioles 4.5–18 mm long, pilose and frequently covered with glandular-capitate hairs, with axillary fascicles of several immature leaves; blades lanceolate to ovate-lanceolate, (1.9–)4.5–10.1 cm × (1.4–)2–4.2 cm, acuminate to acute at apex, rounded to shortly cuneate or subequal at base, margin serrate, bullate above, both surfaces sparsely covered with appressed hairs, mainly in the main vein, to glabrous. Inflorescence in racemes, floral axis 11–30.2 cm long, pilose and with glandular-capitate hairs, with 4–11 verticillasters, each one 10–16-flowered, up to 4–6 cm apart toward the base. Floral bracts ovate to ovate lanceolate, (5.5–)7.9–9 mm × 4–4.6(–6.2) mm, persistent, green and sometimes magenta tinged, glabrescent to sparsely covered with appressed hairs, acuminate to short caudate at apex, truncate at base, margin entire and ciliated. Pedicel 2.4–3.4(–6.3) mm long, pilose and covered with glandular-capitate hairs. Calyx 7.6–9.1 mm × 4.6–5.7 mm, green and usually with magenta tinged upper lip, externally covered with glandular-capitate hairs, internally verrucose to smooth, lips acuminate, 3–3.7(–4.8) mm long, the upper lip 7-veined, the two lower lobes sometimes connate ¾ of their length. Corolla blue with white nectar guides in the lower lip, glabrous except for the upper lip which is pilose and ventrally bordered with short glandular-capitate hairs; tube 5.8–6.5 mm × (2.5–)3.3–4.3 mm, slightly ventricose and invaginated at base, internally ornate with two papillae; upper lip (3.1–)3.7–4.5 mm long, lower lip (6.2–)7–9.2 mm × (6.4–)6.8–10.6 mm. Stamens included; filament 1.9–2.4 mm long; connective 4.4–5.1 mm long, ventrally ornate with and acute tooth at midportion; thecae 1.6–1.8 mm long; a pair of staminodes present above and behind the insertion of the filament to the corolla. Gynobasic horn 0.8–1 mm long; style 7.9–9.1 mm long, glabrous, lower branch acute. Mericarp (1.1–)1.6–1.8 mm × 1–1.4 mm, brown and irregularly dark brown marbled, smooth and glabrous.

Distribution, habitat and phenology: *Salvia langlassei* is endemic from Sierra Madre del Sur in the Mexican state of Guerrero (fig. 10A). It inhabits ecotones between oak and montane cloud with tropical sub-evergreen forests. It dwells from 1400–2100 m in elevation. It shares habitat with *Alchornea latifolia* Sw., *Alsophila firma* (Baker) D.S.Conant., *Conostegia volcanalis* Standl. & Steyerm., *Cyathae bicrenata* Liebm., *Dendropanax arboreus*, *Quercus salicifolia* Née, *Siparuna thecaphora* A.DC., *Ulmus mexicana* Planch. It flowers and fructifies from December to the beginnings of May.

Etimology: The name of this species honors the botanical explorer and earliest collector of the taxon, Eugène Langlassé (1864–1900), who explored several inaccesible locations in southeastern Michoacán and southwestern Guerrero, Mexico, from 1898–1899 (McVaugh 1951; Rzedowski et al. 2009).

Specimens examined: MEXICO. Guerrero: Coahuayutla de José María Izazaga, San Antonio Buenos Aires, district Montes de Oca, 22 December 1937 (fl), *G.B. Hinton et al. 11703* (UC); San Miguel Totolapan, second ridge W of Petlacala, 1915 m, 1 January 1938 (fl, fr), *Y.E.J. Mexia 9058* (ARIZ, UC); Tecpan de Galeana, Puerto Rico, distr. Mina, 1750 m, 15 April 1939 (fl, fr), *G.B. Hinton 14162* (ENCB, Herbario Hinton); Tecpan de Galeana, Puerto Rico, 1700 m, 15 April 1939 (fl, fr), *G.B. Hinton et al. 14168* (UC); Laguna-Soyate, 2100 m, 23 March 1939 (fl), *G.B. Hinton et al. 14106* (UC); Atoyac de Álvarez, Nueva Delhi, 23 km al NE de Paraiso, carretera Atoyac-Filo de Caballo, 1510 m, 1 February 1983 (fl, fr), *P. Tenorio-L. et al. 3227* (MEXU); Atoyac de Álvarez, 11 km al SW de Puerto del Gallo, carretera Atoyac-Chichihualco, 2000 m, 29 March 1983 (fl), *J.C. Soto-N. 5133 & E. M. Martínez-S.* (MEXU); Atoyac de Álvarez, 15 km al SW de Puerto de Gallo camino a Atoyac, 1900 m, 27 February 1984 (fl, fr), *E.M. Martínez-S. et al. 6203*

(MEXU); Atoyac de Álvarez, Nueva Delhi, 62 km de Atoyac a Puerto de Gallo, 1415 m, 28 April 2013 (fl, fr), *J.G. González-G. et al. 1517* (IBUG).

Salvia langlassei is very similar to *S. confertispicata* about the habit. Both are subscandent or hanging down shrubs with a terminal twist in the inflorescences. The differences between these species are stated in the description of *S. confertispicata*.

6. *Salvia lasiocephala* Hook. & Arn. (1841: 306). Type: MEXICO. Nayarit: San Blas to Tepic, *A. Sinclair s.n.* (lectotype K-247994, isolectotype K-247995; designated in Epling 1939: 145). (figs. 3G, 4F, 11).

Salvia elscholtzioides Benth. (1846: 152). Type: HONDURAS. Valle: Gulf of Fonseca, *A. Sinclair s.n.* (lectotype K; designated in Nelson-Sutherland 1996: 59).

Salvia fracta L.O.Williams (1972: 110). Type: GUATEMALA. San Marcos: near Aldea Fraternidad between San Rafael Pie de la Cuesta and Palo Gordo, west facing slope of the Sierra Madre Mountains, 1800–2400 m, 10-18 December 1963, *L.O. Williams et al. 26099* (holotype F).

Salvia galinsogifolia Fernald (1900: 498). Type: MEXICO. Chihuahua: Hacienda San Miguel, August–November 1885 (fl), *E. Palmer 205* (lectotype GH, isolectotypes BM, K-247996, NY, PH, US-121484, US-731007; designated in Epling 1939: 145).

Salvia hyptoides M.Martens & Galeotti (1844: 74). Type: MEXICO. Oaxaca: hills of the Sierra, Sierra de Yavezia, 6500 ft (1980 m), December 1840 (fl, fr), *H.G. Galeotti 664* (lectotype BR-641259, isolectotypes BR-641253, BR-641255, K-247988, K-247990; designated in Epling 1939: 144).

Salvia hyptoides var. *subspicata* Fernald (1900: 498). Type: COSTA RICA. San José: pâturages sur les bords du Rio Torres près San Francisco de Guadalupe, 4 January 1893 (fl), *A.Tonduz 7228* (lectotype GH, isolectotypes BR, US; designated in Epling 1939: 144).

Salvia multispicata Rusby (1920: 111). Type: COLOMBIA. Magadalena: near Jiracasaca, in a damp clearing in a ravine, 2500 ft (762 m), 1898–1899 (fl), *H.H. Smith 1371* (holotype NY).

Annual herb, erect, 0.2–0.7(–1) m tall; stems pilose and usually hirsute. Leaves with petioles 0.5–4 cm long, pilose; blades ovate, (2–)3–7 cm × (1.5–)2.4–5.2 cm, acute at apex, cordate, rounded, truncate or sometimes oblique at base, margin widely serrate, both surfaces sparsely pilose. Inflorescence in racemes, floral axis (10–)15–45 cm long, densely to sparsely pilose, with (3–)5–25 verticillasters, each one16–50-flowered, 5–10 cm gradually apart toward the base, the uppermost usually crowded together. Floral bracts reniform, (3.8–)8–11.8 mm × (3.5–)5.8–10(–18.3) mm, persistent, green and turning into straw color when dried, rarely magenta tinged, pilose in the outer surface, acute to acuminate at apex, cordate at base, margin finely serrate near the apex and ciliated. Pedicel 1.4–1.9 mm long, pilose. Calyces 3.5–4(–5.1) mm × 1.5–1.9(–2.3) mm, green, densely pilose and sometimes covered with short glandular-capitate hairs, internally naked, lips acute and with the margin ciliated, 0.6–1.3 mm long (up to 1.6 mm long in fruit), upper lip 5-veined. Corolla sky blue with white nectar guides, glabrous except for the upper lip which is sparsely pilose and ventrally bordered by short glandular-capitate hairs; tube (2.5–)3–3.5 mm × 1–2.4 mm long, not ventricose nor invaginated at base, internally naked (epapillate); upper lip 1–1.5(–3) mm long, lower lip (2.6–)3–4(–4.5) mm × 2.6–4(–5.8) mm long. Stamens included; filament 0.7–0.9 mm long; connective 2–2.4 mm long, ventrally with an acute or rounded tooth at midportion; theca (0.7–)1–1.4 mm long; a pair of staminodes present above and behind the insertion of the filament to the corolla. Gynobasic horn 0.7–0.9 mm long; style (3.6–)5–5.5 mm long, glabrous, lower branch truncate (up to 0.8 mm long). Mericarps lenticular, 0.5–0.7(–1) mm in diam., uniformely bright black, smooth, glabrous.

Distribution, habitat and phenology: *Salvia lasiocephala* is the widest distributed species within section *Membranaceae* (fig. 10B). It grows from northern Mexico to northern South America (Colombia, Ecuador, Peru and Venezuela) throughout Central American countries (fig. 10B). In Mexico it inhabits almost all the states except for those of California and Yucatán Peninsulas and most arid areas of Mexican Central Plateau. It dwells mainly in tropical deciduous and subdeciduous forests, or associated to disturbed vegetation; it can also be found less often in oak, pine-oak or montane cloud forests. It occupies an elevetional range from 0–1800(–2840) m. It shares habitat with *Acacia farnesiana* (L.) Willd., *A. hindsii* Benth., *Bauhinia ungulata* L., *Byrsonima crassifolia* (L.) Kunth, *Bursera palmeri* S. Watson, *B. penicillata* (DC.) Engl., *Curatella americana* L., *Lysiloma divaricatum* (Jacq.) J.F.Macbr., *Pinus oocarpa*, *P. strobus*, *Quercus glaucescens*, *Ulmus mexicana*, *Muhlenbergia dumosa* Scribn. ex Vasey, *Pinguicula crenatiloba* A.DC., *P. moranensis* Kunth, *Salvia alamosana* Rose, *S. cinnabarina*, *S. misella* Kunth, *S. mocinoi*, *S. pringlei* B.L. Rob. & Greenm., *S. protracta,* and *S. purpurea* Cav. It flowers and fructifies from September to April, and occasionally also in May, June and July.

Etimology: The name of this species derives from Greek words λαιος (lasios, hairy), and κεφαλη (cephale, head); it talks about theinflorescence appearance, each verticillaster resembling a head, and pubescence.

Selected specimens examined: BELIZE: Gracie Rock, Sibun river, 12 April 1935 (fl), *P.H. Gentle 1595* (WIS). COLOMBIA. Antioquia: Planta Providencia, 26 km S & 23 km W (air) of Zaragoza, in valley of río Anorí, between Dos Bocas & Anorí, 400–700m, 16 November 1974 (fl), *J. Denslow 2486* (WIS); Planta Providencia, 26 kmS & 23 km W (air) of Zaragoza, in valley of río Anorí, between Dos bocas & Anorí, 400–700m, 13 February 1975 (fl), *J. Denslow 2712* (WIS). Meta: Río Ariari, 450–500m, 30 May 1988 (fl), *J.L. Fernández-A. 7920* (WIS). Santa Marta: Santa Marta, 304 m, November 1898–1901 (fl), *H.H. Smith 562* (WIS). COSTA RICA. San José: Liceo farm, Santiago de Puriscal, 1000 m, 14 November 1966 (fl), *A.S. Weston et al. 3249* (UC); premontane wet forest life zone, soccer field and environs, Motel del Prado, San Isidro de El General, 752 m, 28 nov 1966 (fl), *A.S. Weston et al. 3596A* (UC); about 4 km W of Santa Ana, highway 7 (Santa Ana Puriscal), 800 m, 22 December 1966, (fl), *A.S. Weston et al. 3732* (UC); about 4 km, W of Santa Ana, highway 7 (Santa Ana Puriscal), 800 m, 1 January 1967 (fl), *A.S. Weston et al. 3816* (UC). EL SALVADOR. Ahuacapán: P. N. El Imposible, Hda. San Benito, al O de la cabecera del Semillerón, 13º49’N, 89º56’W, 14 February 1992 (fl, fr), *L. Sandoval 825 & M. Sandoval* (MEXU); San Francisco Menéndez, El Cerezo, Mariposario, zona baja Los Sánchez, 13º49’N, 89º59’W, 125 m, 27 June 2000 (fl, fr), *J.M. Rosales 626* (MEXU, MO); alrededores de la Finca La Montaña, casi en la cima del Cerro El Yupe, aprox. 6 km al NO de Candelaria de la Frontera, 1300 m, 28 October 1993 (fr), *L.J. Linares 1024 & C.A. Martínez* (MEXU); entre Cerro Peña del Cuervo y el Cerro El Yupe, ± 6 km al NO de Candelaria de la Frontera, 14º8'30”N, 89º40'9”W, 1300 m, 4 December 1994 (fr), *L.J. Linares 2159 & C.A. Martínez* (MEXU). Morazán: monte de Caracansunga, immediately NW of Divisadero, 270 m, 4 December 1941 (fl), *J.M. Tucker 465* (UC). GUATEMALA. Alta Verapaz: prope Cobán, 1340 m,January 1880 (fl), *Gûrckheim 299* (ENCB). Chimaltenango: crops of Chimaltenango Experimental Station, 2000 m, 5 November 1971 (fl), *A. Molina-R. & A.R. Molina 26921* (MICH); Guatemala: near Amatitlán, 1170 m, 28 December 1938 (fl, fr), *P.C. Standley 61445* (UC). Huehuetenango: near El Reposo, about 8 km from Mexican frontier, 900–1000 m, 14 December 1972 (fl), *L.O. Williams et al. 41350* (MICH). Jutiapa: between Jutiapa and La Calera, SE of Jutiapa, 850 m, 2 November 1940 (fl), *P.C. Standley 76105* (UC). Sacatepéquez: above Pastores, 1680 m, 23 December 1938, (fl), *P.C. Standley 57826* (UC); San Miguel Dueñas, 1450 m, 19 September 1992 (fl, fr), *M. Véliz 922497* (MEXU). MEXICO. Chiapas: on slopes along the Tana Te' river, near Sahal K'esh, paraje of Mahben Chauk, 884 m, 27 November 1964 (fl), *D.E. Breedlove 7691* (ENCB); en el camino de Talquián a Chiquihuite, 1700 m, 3 February 1987 (fl, fr), *E. M. Martínez-S. 19323* (HEM, IEB, MEXU); 600–700 m al SO de Pueblo Nuevo, 17º9'12.69"N, 92º53'20.8"W, 1690 m, 15 November 2009 (fl), *J.G. González-G. et al. 453* (IBUG). Chihuahua: La Mesa Colorado, 17 October 1933 (fl), *H.S. Genry 569* (ARIZ); along arroyo Wimivo (arroyo Samachique), between Wimivo and Río Batopilas on N side of Barranca de Batopilas, 890 m, 28 February 1973 (fl), *R.A. Bye 3435* (MEXU). Colima: rancho El Jabalí, 22 km al NNO de Colima, por terracería cerca del lago Jabalí, 19º27"N, 103º42"W, 1250 m, 4 November 1982 (fl), *L. Vázquez-V. 264 & B. L. Phillip* (MEXU, HUMO); San Antonio, 15 km al N de Comala, 22 November 1987 (fl, fr), *F.J. Santana-M. 2655* (IBUG, IEB, ENCB, MEXU, XAL); El Zapote, poblado entre Comala y San Antonio, 1400 m, (fl, fr), *L.M. Villarreal de Puga 221* (ENCB, CHAPA). Durango: Tamazula, al E, alrededores de rancho El Carrizal, por el camino a Agua Caliente, 24º58'16"N, 106º56'17"W, 190 m, 9 March 2002 (fl, fr), *J.I. Calzada et al. 23126* (CIIDIR); 20 km al S de Canelas, 10 January 1986 (fl), *M. Vizcarra 205* (CHAPA, CIIDIR,IEB, ENCB, HUAA). Estado de México: Temascaltepec, Tejupilco, 1340 m, 20 November 1932 (fl), *G.B. Hinton 2654* (UC); Carboneras, 2030 m, 24 October 1932 (fr), *G.B. Hinton 2123* (ENCB, MEXU); La Junta, Santo Tomás, 750 m, 12 October 1953 (fl), *E. Matuda et al. 29414* (UC). Guerrero: Tecpan de Galeana, Moreno, 175 m, 11 April 1929, (fl), *G.B. Hinton et al. 14132* (UC); 1.5 miles W of logging road of Mexico highway 95 (Acapulco to Iguala), 0.2 mile S of km 34 marker, 18.7 miles S of Chilpancingo, 1250 m, 24 October 1975 (fl), *K.M. Peterson et al. 315* (WIS); 1 km al W de Filo de Caballos, rumbo a Carrizal de Bravo, 17º36.623'N, 99º50.384'W, 2338 m, 30 October 2012 (fl), *J.G. González-G. et al. 1363* (IBUG). Jalisco: bluffs of the Río Grande de Santiago near Guadalajara, 19 October 1889 (fl), *C.G. Pringle 2297* (MEXU); S–facing mountainsides 4 miles NNE of Talpa de Allende, 1450–1500 m, 12 October 1960 (fl), *R. McVaugh 20092* (MICH); aproximadamente 2 km al E de Epenche, carretera Valle de Juárez-Epenche, 2040 m, 12 October 1989 (fr), *I. García-R. 2098* (GUADA); 7–8 km al SE de San Pedro rumbo a Barandillas, por la brecha hacia San Andrés y el Cerro de El Cabro, 20º31'54.8"N, 105º4'32.6"W, 1105 m, 27 October 2011 (fl, fr), *J.G. González-G. 1151 y D. Juárez* (IBUG). Michoacán: 7 km al E de Villa Jiménez, sobre el camino a Copándaro, 5 October 1986 (fl), *J. Rzedowski 40723* (CIIDIR, IBUG, IEB, ENCB, MEXU); lado NE de los Chorros del Varal, 1000 m, 30 September 2004 (fl), *I. García-R. 6788 & A. Linares* (CIMI, IEB); carretera de Tancítaro a Apo, a aprox. 200 m del poblado de Tancítaro, 19º22'10"N, 102º23'11"W, 1986 m, 25 January 2009 (fl), *J.G. González-G. 273* (IBUG). Nayarit: Tepic, 5 February 1892 (fl, fr), *E. Palmer 1897* (UC); Río de los Talladeros, 14 November 1985 (fl), *I. Solís 602* (IEB); slopes and ravines along raod to microondas Santa Bárbara, 3–3.8 miles E of highway 15, ND m, 1 March 1987 (fl), *T.F. Daniel & B. Bartholomew 4729* (MICH); a la orilla de la carretera en el poblado de San Gabriel, sobre la carretera Tepic-Jalcocotán, 21º31'3.3"N, 104º56'24.3"W, 979 m, 2 January 2010 (fl), *J.G. González-G. 485*

(IBUG). Oaxaca: Mineral Zavaleta, Zimatlán, 1900 m, 1931 (fl), *C. Conzatti 4702* (MEXU 15 km al S de Sola de Vega, dto. Sola de Vega, 1960 m, 22 October 1985 (fl), *R. López-G. 806* (OAX, MEXU); 2 km al SE de San Juan Juquila Mixes, sobre la brecha que va hacia San Pedro Ocotepec, 16º55'47"N, 95º54'21.3"W, 1505 m, 24 January 2010 (fl), *J.G. González-G. 553* (IBUG). Puebla: On moist trailside bank, Huauchinango, 1494 m, 6 October 1944 (fl), *A.J. Sharp 44119* (MEXU). Sinaloa: La Gloria, 244 m, 9 October 1925 (fl), *Y.E.J. Mexia 211* (UC); 16 mi NW of Culiacán, 92 m, 18 December 1974 (fl), *G.L. Webster 19808* (MEXU); al borde de la carretera, Capilla de Taxtán, 2 km al O de Santa Lucía, 23º25'30.3"N, 105º51'45.5"W, 1258 m, 5 January 2010 (fl, fr), *J.G. González-G. 510* (IBUG). Sonora: between Quiriego and Cajeme, 6 March 1933 (fl), *F. Shreve 6186* (ARIZ); 2.7 km WNW of Tepoca on Mex. 16, 28º27'36"N, 109º15'48"W, 750 m, 17 March 1998 (fl), *A.L. Reina-G.* et al. *98-250* (USON). Veracruz: Valle de Córdoba, 12 December 1865 (fl), *M. Bourgeau 1587* (ENCB); Estación Biológica, Los Tuxtlas, 110 m, 2 July 1970 (fl, fr), *G. Martínez-C. 2200* (XAL, MEXU); Briones, 1500 m, 29 March 1996 (fl, fr), *R. Díaz 5* (XALU); 5.5 km al N de Huatusco por la carretera rumbo a Totutla, 19º10'7"N, 96º57'43"W, 1317 m, 22 December 2008 (fl), *J.G. González-G. 270 & S. Rúa-H.*(IBUG). NICARAGUA. Atlántico Norte: rain forest near Siuna, Mt. Liveco, Madregava, 7 January 1970 (fr), *F.C. Seymour 3276* (MEXU). Nueva Segovia: bed of dried–up river in ravine, Ocotal, 20 December 1968 (fl), *R.B. Hamblett 799* (WIS); 20 December 1968 (fl), *R.B. Hamblett 799* (WIS); 3 km W of Ocotal, 20 December 1968 (fr), *F.C. Seymour* 862 (MEXU; UC). PANAMA. Bocas del Toro: Chanquinola, E, 3 August 1923 (fl), *H.W. Stork 56* (UC). Chepo: sabanas near Chepo, 30 m, 20 January 1935 (fl), *A.A. Hunter 23 & P.H. Allen* (UC). Chimán: Chimán,12 December 1967 (fl), *W.H. Lewis* et al. *3325* (UC). Colón: vicinity of Madden Dam, 15 m, 3 December 1966 (fr), *W.H. Lewis* et al. *6* (ENCB). Los Santos: vicinity of headwaters of río Pedregal, 25 Tonosí, 762–914 m, 7 December 1967, (fl), *W.H. Lewis* et al. *2933* (UC). Panama: canal zone, vicinity of Madden Dam, 50 m, 3 December 1966, (fl), *W.H. Lewis 6* (UC); along road near entrance to Boy Scout camp, 1.6 km from Madden Dam rd., 24 December 1974 (fl), *S. Mori* et al. *4059* (MICH).

Salvia lasiocephala resembles mostly to *S. bupleuroides* the most. Together, these species are distinct within section *Membranaceae* because they are annual herbs, usually delicate, and have lenticular, bright black mericarps; whilst, the other species are perennial shrubs with ovoid, light brown and dark brown marbled mericarps. According to Epling (1939) they were grouped into subsection *Elscholtzioideae* Epling, however, later in his unpublished revision of subgenus *Calosphace*, it seemed he stopped recognizing subsectional classification since he did not alluded to it, this agrees with our current proposal. Although *S. lasiocephala* and *S. bupleuroides* are too similar, they differ consistently in inflorescence and stylar branch traits (see discussion at *S. bupleuroides* description). Furthermore, the first is widely distributed, contrasting with the restricted distribution of *S. bupleuroides* (compare figs. 10B *vs* 5A).

Salvia lasiocephala exhibits a wide range of morphological variation in features such overall and flower size, pubescence density, inflorescence length and flower number per verticillaster; this pattern might be related with the surface and diversity of the area it occupies. For instance, degree of separation between verticillasters along floral axis, and pubescence let to recognize of several taxa including what was named as *S. hyptoides*; which consists of an extreme of variation where verticillasters are all crowded together, contrasting in that way with those plants with verticillasters up to 10 cm apart. Though, a thorough examination of specimens at the herbaria and plants in situ at field reveals a train of morphological variation that allows connecting both extremes, avoiding the recognition of more than one taxon in this morphological complex.

7. *Salvia lophanthoides* Fernald (1900: 499). Type: MEXICO. Oaxaca: San Francisco Tlapancingo Mts. near Tlapancingo, 6000–8000 ft, 1829–2438 m, 7 December 1984 (fl), *E.W. Nelson 2086* (lectotype US, isolectotype GH; designated in Epling 1939: 151). (figs. 3C, 4G, 12).

Herb erect, 1–2 m tall; stems glabrous to puberulent. Leaves with petioles 1.1–2.2(–2.5) cm long, puberulent to shortly and sparsely pilose; blades ovate to ovate-lanceolate, 4.1–8 cm ×(2.1–)5–6.2 cm, acuminate at apex, rounded to slightly cordate at base, margin serrate, both surfaces glabrous except for the veins beneath where they are covered with appressed hairs. Inflorescence in racemes, floral axis (9.6–)14.8–32.5 cm long, puberulent and covered with appressed hairs, with 7–15 verticillasters, each one (12–)22–30-flowered, crowded together (floral axis hidden by floral bracts and flowers) or rarely up to 1.8 cm apart. Floral bract ovate to ovate-lanceolate, 5.7–12.3 mm × 5.3–9.6 mm, persistent, green, both faces glabrous or the outer puberulent, caudate at apex (cauda 2.3–4.8 mm long), truncate at base, margin entire to slightly corrugated and ciliated. Pedicel 0.2–0.5 mm long (up to 1 mm long in fruit), covered with glandular-capitate hairs. Calyx 5–5.9 mm × 1.9–3.9 mm, up to 7 mm long in fruit, green, covered with glandular-capitate hairs, internally with some tiny conical hairs to verrucose, lips acute, 1.1–1.2 mm long, upper lip 5-veined. Corolla sky blue with white nectar guides in the lower lip, upper lip pilose and bordered with tiny glandular-capitate hairs; tube 5–5.6 mm × 2.3–3.1 mm, slightly ventricose, not invaginated at base, internally ornate with a pair of papillae; upper lip (1.5–)2.6–3.7 mm long, lower lip (4.5–)5.3–6.6 mm × 4.5–5.3 mm. Stamens included; filament 1.2–1.8 mm long; connective 3.2–3.9 mm long, ventrally ornate with an acute tooth at midportion; theca 1–1.9 mm long; a pair of staminodes present above and behind the insertion of the filament to the corolla tube. Gynobasic horn 0.6–0.8 mm long; style 6.7–7.4 mm long, glabrous, lower branch acute. Mericarp ovoid, 1.2–1.3 mm × 0.8–0.9 mm, brown and irregularly dark brown marbled, smooth and glabrous.

Distribution, habitat and phenology: *Salvia lophanthoides* is an endemic species restricted to Sierra Madre del Sur in the eastern confluence between the Mexican states of Guerrero and Oaxaca (fig. 13A). It inhabits oak forests, from 1700–1900(–2450) m. It shares habitat with *Dendropanax arboreus* and *Salvia mexicana*. It flowers and fructifies from November to April.

Etymology: The name of this species derives from the Greek words λοφος (lophos, crested), ανθος (anthos, flower), and the suffix –οειδες (oides, similar to); it is about the similarity of the compact spikelike inflorescence with small and numerous flowers of this *Salvia* with those of the genus *Lophanthus* Adans. (Lamiaceae).

Additional material examined: MEXICO. Guerrero: 20.1 km al E de Petlaltina ó 68.1 km al E de Chilapa, camino a Tlapa, 1700 m, 14 November 1982 (fl), *R. Torres-C.* et al. *1920* (MEXU, MO, XAL); Atlixtlac, 300–400 m antes de Mesones a partir de Atlixtlac, 17º32’54.37”N 98º52’53.4”O, 1846 m, 27 April 2013 (fr, fl), *J.G. González-G. et al. 1508* (IBUG).

Salvia lophanthoides is similar to *S. glabra*. The differences between them are treated in the description of the previous one.

Between the species of *Salvia* section *Membranaceae*, this is the least collected (fig. 13A) and known. It is possible that more thorough botanical exploration in the border region between Guerrero and Oaxaca, Mexico, reveals new insights on the morphology and distribution of this species.

8. *Salvia mexiae* Epling (1939: 153). Type: MEXICO. Jalisco: west of San Sebastián, Hacienda del Ototal, arroyo de los Hornos, Sierra Madre Occidental, 1500 m, 4 March 1927 (fl), *Y.E.J. Mexia 1801* (holotype UC, isotypes A, BM, CAS, GH, MICH, MIN, MO, NY, UC, US). (figs. 3A, 4H, 14).

Shrub, erect, (0.8–)1.2–2.5(–4) m tall; stems pilose and covered with appressed and retrorse hairs. Leaves with petioles generally absent or sometimes 2–3.3 mm long, pilose; blades narrow lanceolate, 6–15 cm × 1–2.3 cm, acuminate to acute at apex, attenuated at base, margin finely serrate, both surfaces covered with appressed hairs to pilose. Inflorescence in racemes, floral axis 5–12 cm long, pilose, with (3–)5–7 verticillasters, each one 10–16-flowered, crowded together or up to 1.6 cm apart but with calyces and floral bracts overlapping. Floral bracts ovate to ovate-lanceolate, 1.8–2.8 cm × 1.4–2.2 cm, persistent, magenta and green tinged, sparsely pilose and covered with appressed hairs, acuminate at apex, cordate at base, margin entire to serrate. Pedicel (1–)2–4.5 mm long, pilose. Calyx (5–)6.4–8.7 mm × 2.9–4.5(–5.1) mm, dark magenta and green tinged toward the base, covered with glandular-capitate hairs, internally with some tiny conical hairs, lips acute, 2.5–4.3 mm long, upper lip 7-veined. Corolla with the tube and upper lip white to sky blue, and the lower lip dark blue and without white nectar guides, or if present, poor developed and restricted to corolla throat, upper lip pilose and bordered with tiny glandular-capitate hairs; tube (4.9–)6–7 mm × 2.1–3.5(–5) mm, ventricose, invaginated at base and internally ornate with a pair of papillae; upper lip 2.7–4.4 mm long, lower lip 4.8–8(–10.5) mm × 5–8 mm long. Stamens included; filament 1.8–2.9 mm long; connective 3–4 mm long, ventrally ornate with a rounded to truncate tooth at midportion; theca 1.6–1.8 mm long; a pair of staminodes present above and behind the insertion of the filament to the corolla tube. Gynobasic horn 0.6–0.8 mm long; style 4.7–10 mm long, glabrous, lower branch acute. Mericarp ovoid, 1–1.4 mm × 0.7–0.9 mm, light brown and irregularly dark brown marbled, smooth and glabrous.

Distribution, habitat and phenology: *Salvia mexia* is an endemic species restricted to westernmost Trans-Mexican Volcanic Belt and Sierra Madre del Sur in Jalisco, Mexico (fig. 13B). It grows in pine-oak, oak and montane cloud forests, from 800–1720 m elevation. It shares habitat with *Abies flinckii* Rushforth, *Bejaria mexicana* Benth., *Carpinus caroliniana* Walter, *Clethra rosei* Britton, *Clusia salvinii* Donn.Sm., *Juniperus jaliscana* Martínez, *Oreopanax xalapensis* (Kunth) Decne. & Planch., *Myrica cerifera* L., *Pinus devoniana* Lindl., *P. oocarpa*, *Quercus cualensis* L.M.González, *Q. eduardi* Trel., *Q. magnoliifolia*, *Sapium macrocarpum* Müll.Arg., *Styrax argenteus* C.Presl., *Microspermum gonzalezii* Rzed., *Pavonia pleuranthera* (DC.) Fryxell, *Salvia cualensis* J.G.González, *S. helianthemifolia* Kunth, and *S. manantlanensis* Ramamoorthy. It flowers and fructifies from December to middle May.

Etymology: The name of this *Salvia* honors Ynes E. J. Mexia (1870–1938), the earliest and prollific botanical collector (Rzedowski et al. 2009).

Specimens examined: MEXICO. Jalisco: steep mountains 10–12 miles S of Talpa de Allende, in the headwaters of an E branch of Río de Talpa, 3 miles above Los Sauces, 1400 m, 26 November 1960 (fl), *R. McVaugh 21468* (MICH); steep mountains 20–22 km, south of Talpa de Allende, in the headwaters of a W branch of Río Talpa, barranca above a rapid clear stream, 1200 m, 30 March 1965 (fl), *R. McVaugh 23318* (ENCB); entre la

Cumbre de Tejamanil y Cuale,1610 m, 3 March 1971 (fl, fr), *R. González-T. 81* (ENCB, IBUG); steep mountainsides 3–10 km generally E on the road to Mina del Cuale, from the junction 5 km NW of El Tuito, 850–1150 m, 16 February 1975 (fl), *R. McVaugh 26360* (MICH); Sierra del Cuale, entre Talpa y Cuale, 11 May 1976 (fr), *L.M. Villarreal de Puga 8851* (GUADA); Sierra de Cuale, entre Cuale y Talpa, 11 May 1976 (fl, fr), *L.M. Villarreal de Puga 8403* (CHAPA, ENCB, IBUG); entre el Tuito y Pto. Vallarta, a 20 km al S de Pto. Vallarta, carr. a Barra de Navidad-Pto. Vallarta, 800 m, 27 January 1977 (fl), *A. Delgado-S.* et al. *487* (ENCB); km 17 brecha Zimapan-El Cuale, 1585 m, 12 December 1981 (fl), *L.M. González-V. 1091* (IBUG); km 24 carretera No. 200 al S de Puerto Vallarta,800 m, 4 February 1989 (fl), *L.M. González-V.* et al. *3514* (IBUG); km 19 camino a Cuale,1100 m, 20 February 1990 (fl), *R. Ramírez-D.* et al. *1966* (IBUG); camino de La Estancia de Landeros a La Bulera, 28 March 1996 (fl, fr), *J.J. Reynoso-D.* et al. *3094* (IBUG); La Bulera, 9.2 km al OSO de La Estancia, 20º44'30"N, 104º59'43"W, 910 m, 2 April 2002 (fl), *P. Carrillo-R.* et al. *3137* (IBUG, IEB, GUADA); arroyo Paso Hondo, 16 km al SE de Talpa de Allende por el camino a La Cuesta (Sierra de Cacoma), 20º14"N, 104º47"W, 1450 m, 9 February 2002 (fl), *P. Carrillo-R. 2796 & J.A. Lomelí-S.* (GUADA); Villas de Cacoma, 19º49'45"N, 104º33'30"W, 1230 m, 27 January 2010 (fl), *J.G. Morales et al 196* (ZEA); La Peña del Cuervo-La Cumbre, 1263 m, 29 January 2010 (fl), *J.A. Vázquez-G. 8954 & M. Muñiz-C.* (IBUG); 3–3.1 km al S del poblado de El Cuale por la brecha rumbo a Talpa de Allende, 20º22'44.3"N, 105º3'17.07"W, 1720 m, 30 December 2010 (fl), *J.G. González-G.* et al. *802* (IBUG); 1.6–1.7 km por la brecha de El Cuale a La Mina de Zimapan, 20º23'14"N, 105º4'44.2"W, 1580 m, 13 February 2011 (fl), *J.G. González-G.* et al. *882* (IBUG).

Salvia mexiae is immediately recognizable from the other species of the section by its sessile to subsessile and narrow-lanceolate leaves, and usually crowded inflorescences with floral bracts and calyces hiding floral axis.

Epling (1939) and the specimen *McVaugh 23318* (ENCB) recorded a height of 3 m and 4 m, respectively, for *Salvia mexiae*; though, plants higher than 2.5 m tall were not observed at the field.

9. *Salvia mocinoi* Benth. (1833: 271). Type: MEXICO. Hab. in Novo Hispania, *M. Sessé y Lacasta 226 & J.M. Mociño* (lectotype OXF, isolectotypes F, G, MA; designated in Epling 1939: 151). (figs. 3H, 4I, 15).

Salvia lophantha Benth. in DC (1848: 301). Type: GUATEMALA. Barranca del Incensio [Incienso], 1842 (fl, fr), *G.U. Skinner s.n.* (lectotype K-248001, isolectotypesK-248002, UC; designated in Epling 1939: 151).

Salvia rubiginosa Benth. in DC. (1848: 301). Type: MEXICO. Chiapas: forêts de pins de Pueblo Nuevo, 1840 (fl, fr), *J.J. Linden 130* (lectotype K-248004, isolectotypesBR-511479, BR-511484, K-248005; designated in Epling 1939: 151).

Salvia rubiginosa var. *hebephylla* Fernald (1900: 496). Type: MEXICO. Chiapas: 1864–1870 (fl, fr), *A.B. Ghiesbreght 745* (lectotype GH, isolectotypes BM, MO; designated in Epling 1939: 152).

Salvia saltuensis Fernald (1900: 497). Type: MEXICO. Morelos: in woods of Sierra de Tepoxtlan, 7500 ft (2286 m), 8 February 1899 (fl), *C.G. Pringle 8035* (lectotype GH, isolectotypes BM, F, K-2480031, L, MEXU-28349, MEXU-28845, NY, P-714928, P-714929, P-714930, PH, US; designated in Epling 1939: 151).

Salvia zacuapanensis Brandegee (1908: 255). Type: MEXICO. Veracruz: Zacuapan, barranca de Tenampa, May–September 1906 (fl, fr), *C.A. Purpus 1932* (lectotypeUC, isolectotypes MO, NY, US; designated in Epling 1939: 151).

Subshrub to shrub, erect, rarely subscandent, (0.5–)1–2(–3) m tall; stems pilose and covered with appressed hairs concentrated in the ribs but also between them, hairs whitish or ferrugineous. Leaves with petioles (0.2–)1–2.5(–6.3) cm long, softly to coarsely pilose; blades ovate, ovate-lanceolate, ovate-elliptic to rhombic-ovate, (1–)4–9.5 cm × (0.5–)2–5.5(–8.8) cm, acuminate to acute at apex, rounded, cuneate to long attenuated at base, sometimes subcordate or oblique, margin serrate,both surfaces sparsely to moderately pilose and sometimes with some glandular-capitate hairs, the upper one sometimes bullate. Inflorescence in racemes, floral axis (3–)5–16(–29) cm long, pilose and usually with glandular-capitate hairs, wtih 4–15 verticillasters, each one 6–10(–18)-flowered, 0.5–4.8 cm gradually apart toward the base. Floral bracts ovate to reniform, (5.3–)12–20 mm × (3–)14–17 mm, persistent, rose, magenta, dark magenta, reddish or purple, often green toward the base, and less frequently green throughout, glabrous or with the outer surface pilose and ocassionally with glandular-capitate hairs, acuminate to caudate at apex (cauda length less than, or a third of floral bract length), cordate at base or slightly attenuated and then truncate, margin entire to serrate and ciliated. Pedicel 1–3.4 mm long (up to 4 mm long in fruit), pilose and sometimes with glandular-capitate hairs. Calyx 5–7.5 mm × (1.8–)2–3.2(–4) mm, green, magenta to dark-magenta or purplish, pilose to hispidulous and often with glandular-capitate-hairs, internally glabrous to covered wtih tiny conical hairs, lips acute and ciliated at the margin, (1–)1.5–2.2(–2.7) mm long, up to 3 mm in fruit, the upper lip 5- or rarely 7-veined. Corolla sky blue and with white nectar guides in the lower lip, glabrous except for the upper lip which is pilose and ventrally bordered with short glandular-capitate hairs; tube (4.4–)5–6.6(–7.5) mm × (1.7–)2–3(–5.4) mm, slightly to clearly ventricose, not invaginated at base and internally ornate with a pair of papillae; upper lip (1.5–)2.5–4 mm long, lower lip (4–)5–9.3 mm × (3.6–)8–9 mm. Stamens included; filament (0.9–)1.3–2.6 mm long; connective 2.4–3.6(–4.5)mm long, ornate at ventral midportion with an acute or truncate tooth; theca (0.7–)1–1.5(–2.6) mm long; a pair of staminodes present above and behind filament insertion to the corolla, rarely absent. Gynobasic horn (0.4–)0.8–0.9 mm long; style 5.4–9.3 mm long, lower branch acute, glabrous. Mericarp ovoid, 1.2–2 mm × 1–1.2 mm, light brown and irregularly dark brown marbled, smooth and glabrous.

Distribution, habitat and phenology: *Salvia mocinoi* is the second most widely distributed species in the section. It can be found from central Mexico to central Nicaragua (fig. 16A). It grows in oak, pine-oak, pine, montane cloud forests, and in a lesser degree in tropical deciduous, subdeciduous and evergreen forests, mainly from 1700–2850 m elevation, though in southern Mexico and Central America can flourish in lower elevations (30–1950 m elevation). *Salvia mocinoi* shares habitat with the trees *Abies guatemalensis*, *Carpinus caroliniana*, *Chiranthodendron pentadactylon, Clehtra galeottiana*, *Cleyera integrifolia*, *Cornus disciflora* DC., *Magnolia pacifica* A.Vázquez, *Pinus ayacahuite*, *P. oocarpa*, *Quercus aristata* Hook. & Arn., *Q. castanea*, *Q. magnoliifolia*, *Q. peduncularis* Née, *Symplocos citrea* Lex. ex La Llave & Lex., *Zinowiewia concinna* Lundell and the shrubs and herbs *Pinguicula moranensis*, *Salvia cinnabarina*, *S. lasiocephala*,*S. lavanduloides* Kunth, *S. longispicata* M. Martens & Galeotti, *S. longystila* Benth., *S. mexicana, S. misella*, *S. polystachya, S. protracta*, *S. roscida*, *S. rostellata* Epling, *S. tiliifolia* Vahl, *S. tubifera, S. vitifolia*, among others. It flowers and fructifies during the year, but mainly from September to April.

Etimology: The name of *Salvia mocinoi* was devoted to José M. Mociño (1757–1820), one of the first and most important Mexican botanists (Rzedowski et al. 2009).

Selected specimens examined: EL SALVADOR. Chalatenango: E slope of Los Esesmiles, 2160 m, 12 March 1942 (fl), *J.M. Tucker 1014* (MO, UC). Morazán: S side of montes de Cacaguatique, directly S of finca of general J.T. Calderón, 1030 m, 8 January 1942 (fl), *J.M. Tucker 756* (UC). Santa Ana: El Mosco, entre el Cerro Yupe y el Cerro Peña del Cuervo, ca. 3 km al SSO de Tierra Blanca y 3 km al NNO de Candelaria de la Frontera, 14º8"N, 89º41"W, 1120 m, 30 January 2000 (fl), *J.L. Linares 4884* (MEXU). GUATEMALA. Amatitlán: along slopes of Lago de Amatitlán, below Morán, 1300 m, 18 October 1942 (fl), *J.A. Steyermark 52154* (UC). Guatemala: 4 miles NE of Guatemala city, road to Chinautla, 1341 m, 30 November 1943 (fl), *S.S. White 5140* (MICH Baja Verapaz: Union, 13 March 1972 (fl), *E. Contreras 11258* (MEXU). Chiquimula: upper slopes of Volcán de Ipala, 1200 m, January 1907 (fr), *H. Pitcher 1882* (NY). Jalapa: near Jalapa, 1360 m, 7 January 1908 (fl), *W.A. Kellerman 7959, 7974* (NY). El Quiché: Nebaj, 1828 m, 19 November 1934 (fl), *A.F. Skutch 1728* (UC). HONDURAS. Comayagua: vicinity caserio El Limón & Calán river, 1300 m, 2 January 1990 (fl, fr), *A. Molina-R. 34240 & A.R. Molina* (MEXU). Francisco Morazán: along the roadside 3–8 km W of Escuela Agrícola Panamericana, 853–914 m, 12 January 1944 (fl), *J. Vera-S. 2718* (MICH); Ocotepeque: aldea El Portín, Agua Caliente (Guatemalan border)-Santa Rosa de Copán, 18.1 mi E of Santa Fe, 26.8 mi SW of bridge over Rio Higuito (or Río Grande), near village of Cucuyagua Copán, 14º28"N, 89º15"W, 1800 m, 28 January 1987 (fl), *T.B. Croat 63802 & D. P. Hannon* (MEXU). MEXICO. Chiapas: Talquián, 8 km al NE, 1600 m, 25 November 1986 (fl), *E. Ventura 4175 & E. López* (IEB, OAX, XAL); en el camino de Talquián a Chiquihuite, 1700 m, 3 February 1987 (fl, fr), *E. M. Martínez-S.* et al. *19341* (HEM, XAL); entrada a Pueblo Nuevo, extremo E de la población sobre la carretera Jitotol-Pueblo Nuevo, 17º9'23.42"N, 92º53'25.27"W, 1700 m, 15 November 2009 (fl), *J.G. González-G. et* al. *449* (IBUG); 13 km al NE de San Pedro Chenalhó, 1457 m, 31 December 2009 (fl), *V. Ramírez-C 1234* (IBUG). Distrito Federal: cerca de Xicalco, delegación Tlalpan, 2600 m, 20 April 1974 (fl), *J. Rzedowski 31872* (ENCB); Santa Cecilia, delegación de Milpalta, 2600 m, 6 January 1976 (fl), *A. Ventura-A. 790* (ENCB). Estado de México: 14.5 km NE of Temascaltepec on hwy 130, 1900 m, 10 November 1985 (fl), *S.A. Reisfield 1254* (WIS); km 18 de la carretera Ocuilán-Cuernavaca, 2200 m, 12 January 1986 (fl), *Castillo* et al. *4* (HUAA). Guerrero: Cerro de la Cruz (Sierra Manuel Díaz), 19º34'0"N, 96º27'0"W, 700 m, 8 October 1985 (fl), *R. Acosta-P. 902 & J.I. Calzada* (IBUG, XAL, XALU); ejido de Yextla, 4 km al SW de Filo de Caballo, aprox. 2 km al W de Carrizal de Bravo, 17º37'15.1"N, 99º51'36.6"W, 2673 m, 31 January 2010 (fl), *J.G. González-G. 590* (IBUG); paraje de Pazclar, sobre la brecha que va de Chichihualco a Carrizal de Bravo, 17º35'39.2"N, 99º47'21.1"W, 2037 m, 31 January 2010 (fl), *J.G. González-G. 578* (IBUG). Jalisco: camino de San Sebastián del Oeste a la Bufa, segundo arroyo, 20º45'19"N, 104º50'18"W, 1455 m, 7 March 2009 (fl), *J. G. González-G.305* (IBUG). Michoacán: Cerro Pico Azul, 2600 m, 3 December 1988 (fl), *C. Medina-G. 1527* (IEB, XAL); Volcano of Tancítaro, near town of Tancítaro, 19º22'9.05"N, 102º13'5.49"W, 2421 m, 23 November 1999 (fl), *J. Cahill 3002* (CIMI); al oeste del Cerro la Cantera, por la brecha de Tancítaro a el Jazmín, 19º22'32.6"N, 102º22'3"W, 2267 m, 2 May 2010 (fl, fr), *J.G. González-G. 602 & J.A. Vázquez-G.* (IBUG). Morelos: antiguo camino de la colonia del Bosque a Mexicapa, 18º59'26"N, 99º18'33"W, 2540 m, 26 February 1999 (fl), *J. Ceja* et al. *800* (ENCB, IEB). Nayarit: en la base del Cerro Sanganguey, 20 km al SE de Tepic, 21º28”N, 104º43”W, 17 June 1987 (fl), *O. Téllez-V.* et al. 10388 (IEB). Oaxaca: 2 km al SE de San Juan Juquila Mixes, sobre la brecha que va hacia San Pedro Ocotepec, 16º55'47”N, 95º54'21.3”W, 1505 m, 24 January 2010 (fl, fr), *J.G. González-G. 552* (IBUG). Puebla: San Pedro B. J., 2050 m, 27 February 1987 (fl), *Dorado et al. 509* (IEB). Veracruz: 13 km N of Hwy 140 on Hwy 136 (the Misantla road), 1500 m, 5 January 1982 (fl, fr), *K. Elliot 35a* (XAL); San Andrés Tuxtla, March 1982 (fl, fr), *T.P. Ramamoorthy 3445* (IBUG); Cerro Tres Picos, Sierra de Manuel Díaz, 700 m, 18 November 1984 (fr), *R. Acosta-P. 82 & N. Acosta-B.* (IBUG, IEB, XAL); Comapa , 450 m, 14 June 1985 (fl, fr), *A. Espíritu-S. 336 & J.L. Martínez-P*. (XAL); Cerro de la Mesa (Sierra Manuel Díaz), 460 m, 15 August 1985 (fl), *R. Acosta-P. 805 & F. Vázquez-B.* (XAL); barranca de Panoaya, 2.5 km al NE de El Coyol, 450 m, 26 September 1985 (fl, fr), *M.E. Medina-A. 524 & F. Vázquez-B*. (IEB, XAL, XALU); 1 km al NO de El Coyol, 500 m, 28 June 1985 (fl), *M.E. Medina-A. 174 & R. Acosta-P.* (MEXU, XAL). NICARAGUA. Jinotega: Santa Lastenia, between Matagalpa and Jinotega, 13º2”N, 85º57”W, 1450 m, 31 October 1982 (fl, fr), *W. Douglas-S. 21897* (MEXU).

Salvia mocinoi is the second morphologically most variable and most widely distributed species within section *Membranaceae*. Its wide variation let to the description of 4 additional species and a variety (*Salvia lophantha* Benth., *S. rubiginosa* Benth., *S. rubiginosa* var. *hebephylla* Fernald, *S. saltuensis* Fernald, and *S. zacuapanensis*). These were recognized by Epling (1939), excepting *S. rubiginosa* var. *hebephylla* and *S. saltuensis*, in base to petiole length, leaf shape, inflorescence diameter and compactness, floral bract size, calyx length and pubescence, and calyx lip length. The amount of herbarium specimens Epling had available for examination was scarce, such that it might have been easy to identify morphological discontinuities. However, after examining the specimens here cited, it was found a continuous variation gradient between the extremes he recognized as distinct taxa, that it is consistent with the resolution of recognizing only one species.

The way these taxa have been treated in floras developed in areas that embraces part of their distribution or nomenclatural checklists has been variable. In Flora of Guatemala, Standley and Williams (1973) recognize both *S. mocinoi* and *S. rubiginosa* and submerge *S. lophantha* as synonym of the first; they allude *S. rubiginosa* differs from *S. mocinoi* in having glandular-pubescent calyces, whereas *S. mocinoi* does not. Alziar (1992) recognizes *S. lophantha* as synonym of *S. mocinoi*. Pool (2001) in Flora of Nicaragua considers *S. mocinoi* as a very variable species where she submerges *S. lophantha*, *S. rubiginosa* and *S. saltuensis* as synonyms; besides, she declares the posibility that a detailed study could reveal additional taxa. Klitgaard (2012) in Flora Mesoamericana recognizes *S. mocinoi* and *S. rubiginosa*; the first having 14-nerved calyces with 3-nerved upper lip, membranaceous and smooth leaves, and being sparsely pilose, contrasting with the 15-nerved calyces with 7-nerved upper lip, wrinkled and bullate leaves, and densely pilose surfaces of *S. rubiginosa*; she considers *S. lophanta*, *S. lophanthoides* and *S. saltuensis* as synonyms of *S. mocinoi*. Furthermore, in an online world checklist of Lamiaceae (Govaerts et al. 2012) *S. lophantha*, *S. rubiginosa*, *S. rubiginosa* var. *hebephylla*, *S. saltuensis* and *S. zacuapanensis* are treated as synonyms of *S. mocinoi*. The lack of agreement between different authors also reveals that the recognition of these taxa is not straightforward, and conclusive.

There is more coincidence considering *Salvia lophantha* and *S. saltuensis* as synonyms of *S. mocinoi* (Standley & Williams 1973, Alziar 1992, Pool 2001, Govaerts 2012, Klitgaard 2012). Epling (1939) recognized *S. lophantha* by its 7–9 mm (*vs* 6–7 mm) long mature calyces with almost truncate upper lip no more than 1 mm long. But, examining type specimens, mature calyces more than 7 mm long were not found, and in collections of typical *S. mocinoi* upper calyx lip length varies from 1–2.7 mm long; hence, recognition of *S. lophantha* is not justified. *Salvia saltuensis* is identical to typical *S. mocinoi* in every aspect; Fernald (1900) recognized the species because of its pilose branches with spreading hairs; nonetheless, pubescence is very variable within *S. mocinoi* complex as to be used to define taxa, and *S. saltuensis* was not longer recognized from Epling (1939) up to date.

Epling (1939) recognized *Salvia rubiginosa* exclusively in base to a perception of a coarser and sometimes branched pubescence in the stem ribs and between them (*vs* finer, never branched, and restricted to the ribs). In fact, there is a major tendency in possessing coarser pubescence in populations considered by Epling as *S. rubiginosa*, however the hairs are always simple, contrary to what he stated, and pubescence variation is copious in both typical *S. rubiginosa* and *S. mocinoi*, stems sparsely to densely pubescent, the hairs exclusively in the ribs or also between them; hence pubescence is not enough to recognize two different species. The arguments of Standley and Williams (1973) and Klitgaard (2012), exposed above, to accept both species are inadequate. Most of typical populations of *S. mocinoi* also presents glandular-capitate hairs in their calyces, with 12–15 veins in total and 5 (or 7) in the upper lips [*González-G. 578, 590* (IBUG), *González-G. 602 & Vázquez-G.* (IBUG), and *Ramamoorthy 3445* (IBUG), for example]. It should be also noted that veins in *S. rubiginosa* calyces varies from 13–15, and in the upper lip from 5–7 (*González-G.* et al. *449*, *552*, (IBUG), *Méndez-T. 5556* (IBUG), *Ramírez-C. 1234* (IBUG), for example], contrasting with the 14-nerved calyces with 3-nerved upper lip recorded by Klitgaard (2012). Consequently, recognition of *S. rubiginosa* as a distinct taxon is not supported.

Salvia zacuapanens is not recognized here, because no diagnostic characters were found to distinguish it from *S. mocinoi s.l.* Epling (1939) recognized this species in base to its glabrous and 10–11 mm long (*vs* 7–9 mm long) calyces with 2.5 mm long (*vs* 2 mm long) upper lip; but, some specimens examined present pilose calyces [*Medina-A. 174 & Acosta-P.* (XAL) and *Medina-A. 524 & Vázquez-B.* (XAL)], and (6.5–)7.6–9 mm long calyces with 1.8–2.9 mm long upper lip [*Acosta-P. 82 & Acosta-B.* (IBUG), *Acosta-P. 805 & Vázquez-B.* (XAL), *Acosta-P. 902 & Calzada* (IBUG, XAL), *Espíritu-S. 336 & Martínez P.* (XAL)].

Salvia lophanthoides is resurrected as a different species, after its synonymization to *S. mocinoi* by Klitgaard (2012) without any explanation. The distinction of the former against morphologically similar species is delineated above in the key to the species of *Salvia* section *Membranaceae* and in the description of *Salvia glabra*.

Salvia mocinoi is similar to *S. langlassei* and *S. sanctae-luciae*. However a set of morphological differences supports and warrants its recognition. The distinction from *S. langlassei* is treated in the description of this. *Salvia mocinoi* differs from *S. sanctae-luciae* by its shorter pedicels in fruit [3–4 mm *vs* (4–)5–7.5(–10) mm] that do not usually exceed floral bract length, smaller calyces in fruit [5–7.5 mm × 2–3.2(–4) mm *vs* 9–10 mm × 6.5–7.1 mm], and lobes of the lower one distinct (*vs* connate ⅔ to ¾ of their length), well developed nectar guides in lower corolla lip (*vs* absent or por developed), not invaginated corolla tubes (*vs* invaginated), and glabrous styles (*vs* dorsally pilose at apex).

10. *Salvia nitida* (M.Martens & Galeotti) Benth. (1848: 300).

Basionym: *Hyptis nitida* M.Martens & Galeotti (1844: 189). Type: MEXICO. Oaxaca: near Santa Catarina Juquila y San Marcos Zacatepec, gneiss rocks near the Pacific, 3000 ft (915 m), November 1840 (fl, fr), *H.G. Galeotti 658* (holotype BR-5113910, isotypes BR-5114566, G, K-248038, K-248039). (figs. 3K, 4J, 17).

Subshrub, erect, 0.7–1.5 m tall; stems glabrous or with short dark hairs spread on the ribs. Leaves with petioles 0.1–0.3(–0.7) cm long (in the uppermost leaves the petioles are absent), caniculate, pilose on the ribs; blades ovate to ovate-lanceolate, 2–3(–5.5) cm × (1–)1.5–2.8 cm, acute at apex, rounded, truncate to subcordate at base, margin widely crenate-serrate, tipped with a reddish mucro (0.5–1 mm long), lustrous above, coriaceous, both surfaces glabrous to sparsely covered with short appressed hairs. Inflorescence in racemes, floral axis (9–)14–24 cm long, pilose, with 4–11 verticillasters, each one 5–6-flowered, 2.8–4.8 cm gradually apart toward the base. Floral bracts ovate to reniform, (12–)18–20 mm × 13–15(–24) mm, persistent, magenta and turning into straw color when dried, glabrous, acuminate at apex, cordate at base, margin serrate and ciliated. Pedicel 1.5–2 mm long, pilose. Calyx 4.6–6.5 mm × 2–4.6 mm, green and sometimes dark-blue or purple tinged, covered with glandular-capitate hairs, internally covered with tiny conical hairs, lips acute, 1.5–2 mm long, the upper lip 5–veined. Corolla blue with the tube paler or white and with white nectar guides in the lower lip, glabrous except for the upper lip which is dorsally pilose and ventrally bordered with glandular-capitate hairs, and the ventral portion of the lower lip which is pilose; tube 3.2–5 mm × 3–4 mm, not ventricose, straight at base and internally ornate with two papillae; upper lip 2.6–3.8 mm long, ventrally with a truncate to acute tooth at midportion; lower lip 7–8.6 mm × 6–8.2 mm. Stamens included; filament 0.8–1.8 mm long; connective 2.2–4.1 mm long; theca 0.7–1.2 mm long; a pair of staminodes present above and behind filament insertion to the corolla tube. Gynobasic horn 0.9–1 mm long; style 6–8.5 mm long, glabrous, stylar lower branch truncate. Mericarp ovoid, 1–1.5 mm × 0.4–0.8(–1) mm, uniformly brown to reddish brown, smooth and glabrous.

Distribution, habitat and phenology: *Salvia nitida* is endemic to the western mountais of Guerrero and Oaxaca in Sierra Madre del Sur (fig. 16B). It grows in pine-oak, oak and pine forests, from 490–1900 m elevation. It shares habitat with the trees *Calliandra grandiflora* (L'Hér.) Benth., *Quercus crispifolia* Trel., *Q. glaucoides* M.Martens & Galeotti, *Q. candicans* Née, *Q. magnoliifolia*, *Q. obtusata*, *Pinus devoniana*, *P. oocarpa,* and the herbs and shrubs *Euphorbia fulgens* Karw. ex Klotzsch, *Fleischmannia pycnocephala* (Less.) R.M.King & H.Rob., *Hibiscus uncinellus* DC. and *Lasiacis ruscifolia* (Kunth) Hitchc. It flowers and fructifies from September to beginnings of February, though there are some collections in flower also from May and July.

Etimology: The name of this species derives from the Latin word nitidus (bright), and it is most probably referred to the lustrous leaves of the species.

Specimens examined: MEXICO. Guerrero: Sierrita, distr. Galeana, 950 m, 12 December 1939 (fl), *G.B. Hinton 14997* (ENCB, HUMO); Agua de Obispo, puente El Mosco, 17º18'50"N, 99º28'10"W, 790 m, 18 September 1965 (fl), *H. Kruse 1310* (IEB); 1.5 miles W of logging road off Mexico Hwy 95 (Acapulto to Iguala), 0.2 miles S of km 34 marker, 18.7 miles S of Chilpancingo, 1250 m, 25 October 1973 (fl), *K.M. Peterson 326 & C.R. Broome* (IEB); 46 km al SO de Filo de Caballo (cerca de Paraíso), 19 October 1983 (fl), *J.C. Soto-N. 5807 & E.M. Martínez* (MEXU); 8 km Al SW de Yerbabuena, camino Filo de Caballo-Atoyac, 1900 m, 23 November 1983 (fl), *E. M. Martínez-S. 5685 & F. Barrie* (IEB, MEXU); 33 km al N de Ometepec, camino a Tlacoachistlahuaca-San Isidro, 490 m, 26 November 1983 (fl), *E. M. Martínez-S. 5768* (IBUG, MEXU, XAL); barranca El Toro, 17º17'38"N, 99º30'22"W, 1987 (fl), *L.C. Rodríguez-M. 47* (IEB, MEXU); Malinaltepec, 1600 m, 2 July 1989 (fl), *I. Wagenbreth 46* (MEXU); Malinaltepec, 1600 m, 14 November 1990 (fl), *I. Wagenbreth 444* (MEXU); Malinaltepec, Ojo de Agua de Cuauhtémoc, 17º11'8.9"N 98º39'32.5"O, 2325 m, 3 August 2012 (fl, fr), *B. Nepomuceno-C.* et al. *34* (IBUG, UAGC); Malinaltepec, Ojo de Agua de Cuauhtémoc, 26 December 2012 (fl), *E. Cándido-B. 106 & B. Nepomuceno-C.* (IBUG, UAGC). Oaxaca: 5–6 km NE of Putla, road to Tlaxiaco, 850 m, 6 February 1965 (fl), *R. McVaugh 22270* (MEXU); 10 km al SO del campamento Sto. Domingo, 1790 m, 27 October 1980 (fl), *R. Hernández-M.* et al. *5243* (ENCB, MEXU); 9 km al N de Putla , 850 m, 10 December 1982 (fl), *O. Téllez-V.* et al. *6178* (MEXU); a 17 km al NE de Piedra Larga, camino a Miahuatlán, 550 m, 22 November 1982 (fl), *E. M. Martínez-S.* et al. *2736* (HUMO, MEXU); 9 km al SE de Piedra Larga, camino a Miahuatlán, 23 September 1982 (fl), *R. Torres-C. 1377 & R. Cedillo-T.* (IEB, MEXU, OAX); 5–6 km del poblado El Manzanal, carretera a Infiernillo, 17.12ºN, 98.04ºW, 1750 m, 15 December 1985 (fl), *J.I. Calzada 20631* (MEXU); 7 km al S de Cruz de Ocote, 1790 m, 23 May 1986 (fl), *J.C. Soto-N. 12744 & F. Solorzano-G.*(IBUG, MEXU); 14 km de Santiago Juxtlahuaca, entre los poblados de Agua Fría y Hierba Santa, 17.12ºN, 97.58ºW, 1775 m, 3 November 1995 (fl), *J.I. Calzada 20402* (IBUG, IEB, MEXU); 3 km de El Manzanal, carretera a Infiernillo, 17º13'28.6"N, 98º3'48.5"W, 1850 m, 10 March 1998 (fl), *J.I. Calzada 22385* (MEXU); a la orilla de la carretera, 2 km antes de llegar a la comunidad de El Carrizo, sobre la carretera (brecha) de Santa Catarina Juquila a Río Grande, 16º10'19.9"N, 97º19'32.7"W, 1147 m, 27 January 2010 (fl, fr), *J.G. González-G.571* (IBUG).

Salvia nitida is a distinctive species within section *Membranaceae* that can be easily recognized by its sessille to subsessile (petioles 0–0.3 mm, or rarely up to 0.7 mm long), ovate to ovate-lanceolate lustrous leaves, and lax inflorescences (verticillasters 2.8–4.8 cm apart from each other).

11. *Salvia sanctae-luciae* Seem. (1856: 327). Type: MEXICO. Sinaloa: Sierra Madre near the village of Santa Lucía, *B.C. Seemann 2071* (lectotype BM, isolectotypes GH, K-247999, K-248000, UC; designated in Epling 1939: 150). (figs. 3B, 4K, 18).

Salvia cladodes Fernald (1900: 497). Type: MEXICO. Nayarit: Tepic, near Compostela, 5000–6000 ft (1524–1829 m), 7–8 April 1897 (fl, fr), *E.W. Nelson 4171* (lectotype GH, isolectotype US; designated in Epling 1939: 150).

Shrub, erect, 1–2.2(–3) m tall; stems pilose and puberulent. Leaves with petioles (0.8–)1–4.2 cm long, densely pilose and puberulent; blades elliptic to rhombic-ovate, 6–17 cm × (2.1–)3–5.4 cm, acuminate at apex, cuneate to long attenuated at base, margin finely serrate, upper surface bullate and scarcely covered with appressed hairs on the veins, lower surface covered with appressed hairs mainly on the veins. Inflorescences in racemes, floral axis 5.5–21 cm long, pilose and with some glandular-capitate hairs intermixed, with 5–9 verticillasters, each one 8–16(–20)-flowered, 1–3(–3.5) cm gradually apart at base. Floral bracts ovate, (4.9–)6–11(–15) x (4.2–)5.8–9.5(–12.9), dark magenta, outer surface covered with appressed and some glandular-capitate hairs and puberulent, acuminate at apex, truncate at base, margin entire. Pedicel 2.9–3.6 mm long in flower [up to (4–)5–7.5(–10) mm long in fruit], densely pilose and with glandular-capitate hairs intermixed. Calyx (7.2–)8–8.6 mm × 4–4.6 mm, up to 9–10 mm × 6.5–7.1 mm in fruit, dark magenta and green tinged toward the base, pilose in the veins and covered with glandular-capitate hairs, internally covered with short conical hairs, lips long acute, (3.1–)3.7–4.3 mm long, lobes of the lower lip connate ⅔ to ¾ of its length, the upper lip 5–veined. Corolla sky blue with the tube usually paler or white, white nectar guides in the lower lip absent or poor developed and restricted to the throat, glabrous except for the upper lip wich is pilose and ventrally bordered with short glandular-capitate hairs; tube 5.5–6.5 mm × 3.4–3.7 mm, ventricose, invaginated at base and internally ornate with two papillae; upper lip 3–4.5(–6) mm long; lower lip (6.5–)7.5–11 mm × 7.2–11 mm. Stamens included; filament 1.2–1.9 mm long; connective 4.5–5.2 mm long, ventrally ornate with a retrorse acute tooth; thecae 1.9–2 mm long; a pair of staminodes present above and behind filament insertion to the corolla. Gynobasic horn 0.3–0.8 mm long; style 8.3–9.1 mm long, the lower branch acute, flat and slightly curved upward, dorsally hispidulous at apex. Mericarp ovoid, (1.7–)2.2–2.3 mm × 1.2–1.4 mm, light brown and irregularly dark brown marbled, smooth, glabrous.

Distribution, habitat and phenology: *Salvia sanctae-luciae* is an endemic species of northwestern Mexico, it grows in the states of Nayarit and Sinaloa (fig. 19A). It inhabits montane cloud, oak and pine-oak forests, and less frequently in ecotones of these vegetation with tropical subdeciduous forests, from (870–)1000–1550 m elevation. It shares habitat with the trees *Carpinus caroliniana*, *Cecropia obtusifolia*, *Clethra rosei*, *Magnolia pacifica*, *Pinus devoniana*, *P. montezumae* Lamb., *P. oocarpa*, *Quercus acutifolia*, *Q. aristata*, *Q. castanea*, *Q. elliptica* Née, *Styrax argenteus*, and the herbs and shrubs *Barleria oenotheroides*, *Bomarea hirtella* (Kunth) Herb., *Hyptis oblongifolia*Benth., *Oplismenus burmannii* (Retz.) P.Beauv., *Salvia aequidistans* Fernald, *S. mexicana*, and *S. thyrsiflora* Benth. It flowers and fructifies from January to April, though a specimen has been collected in flower in September.

Etimology: The name of this species brings to mind the nearby village where it was collected for the first time, Santa Lucía, Sinaloa; but curiously, this plant is better known in Sierra de San Juan, Nayarit.

Additional material examined: MEXICO. Nayarit: about 10 road-miles E of Jalcocotán, on road to Tepic, 1050 m, 22 April 1951 (fr, fl), *R. McVaugh 12128* (MEXU); El Cuarenteño, 5 km al S de Platanitos, que está en el km 8 de la carretera Tepic Santa Cruz, 5 March 1983 (fl), *P. Magaña-R. 89 & O. Téllez-V.* (MEXU); along dirt road 2.7–3 mi S from hwy 66 (between Tepic and Miramar) to Volcan San Juan, 1370 m, 1 March 1987 (fl, fr), *T.F. Daniel 4754 & B. Bartholomew* (MEXU); km 5 de la terracería que empieza en el km 6 de la carr. Compostela-Las Varas, 3 April 1987 (fl), *O. Téllez-V. 10315 & S. Aguilar* (IEB, MEXU); La Sidra, cañada al SE de El Cuarenteño, 1250 m, 6 September 1988 (fl, fr), *M. Blanco* et al. *s.n.* (MEXU); km 5 camino de terracería al Cuarenteño, que empieza 500 m al W de El Izote, carr. Tepic-Miramar, 21º28'0”N, 104º55'0”W, 2 February 1989 (fl, fr), *O. Téllez-V. 11689 & G. Flores-F.* (ENCB, MEXU); Las Tierritas, 2 km al NE del Izote, Cerro de San Juan, al W de Tepic, 21º31”N, 104º59”W, 1200 m, 23 March 1989 (fl, fr), *P. Tenorio-L.* et al. *15596* (MEXU); km 11 sobre la desviación a El Cuarenteño, carretera Tepic-Miramar, 1550 m, 31 January 1989 (fl), *E. González-R. 671 & S. Aguilar* (IEB); km 3.5 de la Terracería al Cuarenteño, que empieza a 500 m al O de El Izote, camino a Jalcocotán, 21º29'10”N, 104º59'0”W, 1360 m, 29 January 1990 (fl), *O. Téllez-V. 12561* (MEXU); 11 km al E de Jalcocotán, carr. a Tepic, 21º31”N, 105º2”W, 1000 m, 13 March 1991 (fl), *G. Flores-F. 2499 & R. Ramírez-R.* (MEXU); 10 km al E de la desviación para el poblado El Cuarenteño, Cerro San Juan, 21º28'15”N, 105º0'18”W, 1400 m, 6 April 1994 (fl), *J.I. Calzada* et al. *19240* (MEXU); 10 km al E de la desviación para el poblado El Cuarenteño, Cerro de San Juan, 21º28'15”N, 105º0'18”W, 1400 m, 6 April 1994 (fr), *J.I. Calzada* et al. *9240* (XAL); 11 km al SW de la carr. el Izote-V. Carranza, camino al Cuarenteño, cañada La Capilla, 21º28'69"N, 105º0'8.4"W, 1325 m, 20 January 1994 (fl, fr), *J.I. Calzada* et al. *19088* (MEXU); 25 km por la brecha de El Izote a El Cuarenteño, 1 km después de El Cuarenteño, Sierra de San Juan, 21º27'7.6"N, 105º2'29.3"W, 872 m, 12 March 2011 (fl, fr), *J.G. González-G.* et al. *931* (IBUG); 11–11.2 km por la brecha del Izote a El Cuarenteño (carr Tepic-Jalcocotán), 2.8–2.9 km al SO de La Noria, Sierra de San Juan, 21º28'15"N, 105º0'10.8"W, 1404 m, 12 March 2011 (fl, fr), *J.G. González-G.* et al. *923* (IBUG); km 4.5–4.6 de la brecha del Izote (carr. Tepic a Jalcocotán) rumbo a La Noria, Sierra de San Juan, 21º30'21.2"N, 104º58'57.4"W, 1349 m, 12 March 2011 (fl, fr), *J.G. González-G.* et al. *917* (IBUG). SINALOA. Concordia: Potrerillos, a 2 km al SE rumbo a la Petaca, 23º26'31"N, 105º49'27"W, 1550 m, 16 February 1999 (fl), *A. Rito-V. 9720 & H. Aguilar-H.* (MEXU).

Salvia sanctae-luciae is morphologically similar to *S. mocinoi* and *S. langlassei*. The features that ensure their recognition are highlighted in the discussion of the two latter. The distribution of *S. sanctae-luciae* does not overlap with that of *S. langlassei* and *S. mocinoi* (compare figs. 19A *vs* 10A and 16A). *S. sanctae-luciae* grows in northwestern Trans-mexican Volcanic Belt in Nayarit, and Sierra Madre Occidental in Sinaloa; whilst *S. langlassei* is endemic of Sierra Madre del Sur in Guerrero, and although, *S. mocinoi* has a wide distribution and has been collected as far north as Nayarit (*Téllez-V. 10388*, IEB), it does not grow in the same localities than *S. sanctae-luciae.*

12. *Salvia verecunda* Epling ex Jones (1933: 53). Type: MEXICO. Chihuahua: Guayanopa Canyon, 5000 ft (1524 m), 13 September 1903 (fl, fr), *M.E. Jones s.n.* (holotype RSA, isotype UC). (figs. 3I, 4L).

Perennial herb, erect, (20–)30–50(–70) cm tall; stems pilose. Leaves with petioles (0.5–)1.2–2.2(–4.6) cm long, pilose; blades ovate to ovate-deltoid, 2–3.5(–5.2) cm × 1.5–2.5(–3) cm, acuminate at apex, subtruncate, oblique to cuneate at base, margin crenate to serrate, both surfaces covered with appressed hairs. Inflorescences in racemes, floral axis 9.5–20 cm long, pilose, with 4–8 verticillasters, each one 8–16-flowered, 1–3 cm gradually apart toward the base. Floral bracts reniform, 7.7–12 mm × 10–14 mm, persistent, magenta to reddish or green, sparsely pilose in the outer surface, acuminate at apex, cordate at base, margin entire and ciliated. Pedicel 1.8–2.1 mm long, pilose. Calyx 4.5–5.5(–6) mm × 3–3.3 mm, magenta to dark magenta and green toward the base, pilose mainly on the veins and rarely covered with short glandular-capitate hairs at base, covered with short conical hairs in the inner surface to glabrous, lips acute, 1.7–2 mm long, upper lip 7–veined. Corolla sky blue with white nectar guides in the lower lip, glabrous except for the upper lip, which is pilose and ventrally bordered with short glandular-capitate hairs; tube 4–4.3 mm × 2.3–2.5 mm, not ventricose, not invaginated at base and internally naked (epapillate); upper lip (1.5–)2.5–2.8 mm long, lower lip 4.7–5.8 mm × 4–5.6 mm long. Stamens included; filament 0.8–1 mm long; connective 2–2.3 mm long, ventrally ornate with a short acute tooth at midportion; theca 0.7–1 mm long; a pair of staminodes present above and behind the filament insertion to the corolla. Gynobasic horn 0.6–0.8 mm long; style 5.5–5.8 mm long, glabrous, lower branch acute. Mericarp ovoid, 1–1.1 × 0.7–0.8 mm long, light brown and irregularly dark brown marbled, smooth, glabrous.

Distribution, habitat and phenology: *Salvia verecunda* is endemic to northwestern Mexico, growing in Sierra Madre Occidental in the states of Chihuahua, Durango and

Sonora (fig. 19). It inhabits open oak forests, from 1200–1700(–2120) m elevation. It shares habitat with the trees *Prunus gentryi* Standl., *Quercus albocincta* Trel., *Q. acutifolia*, *Q. chihuahuensis*, *Q. coccolobifolia*, *Salix* sp. and the shrubs and herbs *Achimenes* sp., *Begonia* sp., *Commelina erecta* L., *Kosteletzkya thurberi* A.Gray, *Muhlenbergia dumosa, Phacelia platycarpa* (Cav.) Spreng, *Pleopeltis polylepis* var. *erythrolepis* (Weath.) T.Wendt. It flowers and fructifies from September to November.

Etymology: The name of this species derives from the Latin word verecundus (bashful, modest); it is not clear what Epling (1939) meant assigning such name, probably, he referred to the un-conspicuity of the plant.

Additional material examined: MEXICO. Chihuahua**:** Gambusero settlement and adjacent Rio La Haciendita of La Bataria, 1700 m, 29 August 1986 (fl, fr), *P.S. Martin* et al. *s.n.* (ARIZ); Nabogame, 28º30'N, 108º30'W, 1800 m, 7 September 1987 (fl), *J.E. Laferrièrre1035* (MEXU); Nabogame, 28º30'N, 108º30'W, 1800 m, 19 August 1988 (fl), *J.E. Laferrièrre1696* (CHAPA); Nabogame, 28º30"N, 108º30"W, 1761 m, 5 September 1988 (fl), *J.E. Leferrièrre 1932* (ARIZ). Durango: Reserva de la Biósfera La Michilía, El Sorruedo, 750 m al N, al SE de la reserva, 23º18'5"N, 104º18'5"W, 2120 m, 22 October 1985 (fl, fr), *S. González-E. 3615 & S. Acevedo* (CIIDIR, IBUG); 1 km al NW de El Sorruedo, 27 November 1985 (fl, fr), *S. González-E.* et al. *3691* (CHAPA, CIIDIR, IEB, ENCB). Sonora: Tierra de Chabacan, above Río Durazno, 28º17"N, 108º20"W, 1700 m, 3 November 1989 (fr), *G. Ferguson* et al. *254* (ARIZ); arroyo Los Pilares, about 2 km of Los Pilares, 13.4 mi E of Yécora, 1260 m, 8 September 1995 (fl), *M.E. Fishbein* et al. *2557* (MEXU, USON); Río Maycoba at Mex. 16 (20.5 km W of Maycoba, 28.6 km E of Yécora), 28º22'15"N, 108º45'30"W, 1220 m, 15 September 1998 (fl), *W. Taruba s.n.* (USON); Yécora, Cañada La Ventana (arroyo El Otro Lado), 2.5 km (by air) ESE of Yécora, 1520 m, 18 September 1998 (fl, fr), *T.R. Van Devender* et al. *s.n.* (ARIZ).

Salvia verecunda is morphological similar to *S. lasiocephala*. It can be differentiated by its perennial habit (*vs* annual), wider calyx [3–3.3 mm *vs* 1.5–1.9(–2.3) mm wide], slightly longer corolla tube [4–4.3 mm *vs* (2.5–)3–3.5 mm long] and style [5.5–5.8 mm *vs* (3.6–)5–5.5 mm long], acute stylar branch (*vs* truncate), ovoid (*vs* lenticular), slightly longer [1–1.1 mm *vs* 0.5–0.7(–1) mm long], and brown and irregularly dark brown marbled mericarps (*vs* entirely bright black). *Salvia verecunda* also resembles *S. mocinoi* but can be distinguished by its always 7-veined upper calyx lip (*vs* 5–7-veined), shorter [4–4.3 mm *vs* (4.4–)5–7 mm long] and not ventricose (*vs* ventricose) corolla tube and internally epapillate at base (vs ornate with two papillae), shorter filament (0.8–1 mm *vs* 1.3–2.6 mm long), shorter connective [2–2.3 mm *vs* 2.4–3.6(–4.5) mm long], and shorter mericarp (1–1.1 mm *vs* 1.3–2 mm long).

Discussion

This is the first phylogenetic analysis attempting to uncovered phylogenetic status and internal relationships between the species of *Salvia* section *Membranaceae*. None of the members of this group have been included in the four previousely published phylogenetic analyses with representative samples of New World sages, and that were carried out in base to the analyses of DNA sequences (Jenks et al. 2011, Jenks et al. 2012, Walker & Sytsma 2007, Walker et al. 2004). In two of these, (Jenks et al. 2012, Walker & Sytsma 2007) the specimen *Crone 15/9/00* (MJG) was included as *Salvia mocinoi*; however, this was erroneously identified. The specimen was corrected to *S. setulosa* Fernald, a morphologically similar species to *S. prunelloides* Kunth, which appears as the sister species to this in the phylogenetic analyses performed.

The phylogenetic analyses here conducted resulted in 893 most parsimonious trees, with low Bootstrap supporting the clades and low Consistency and Retention Indeces (0.22 and 0.58, respectively; figure 1). Similar low values have been reported in other analyses based on morpohological characters (Roalson et al. 2002, Henderson 2011); these reflect a considerable amount of homoplasious characters that prevents to build robust phylogenetic conclusions. However, the results show a broad overview and conform hypothesis that can be tested by means of evidence provided by other type of characters or analyses. This ultimately will be useful in terms of designing new investigations.

Salvia section *Membranaceae* is recovered as a monophyletic group supported by one synapomorphy, the consistence of floral bracts —these are membranaceous consisting of semi-translucid structures with reticulated evident veins— but with poor boostrap support. Internal relationships are partially resolved; those species belonging to subsection *Elscholtzioideae* conform the most internal clade within the section, and are nested within subsection *Lophanthoideae* Epling, making the previous group paraphyletic. Therefore, the phylogenetic tree does not sustain Epling's proposal for subsectional classification (1939). There are two possible solutions to deal with this: 1) to define as many subsections as needed in order to keep recognizing subsectional classification, including *Elscholtzioideae*, or 2) to stop recognizing subsectional classification. If the first option is followed, it would be necessary to described and validate at least 7 new subsections, 6 of them comprising only one species and not strongly delineated. The second option is more adequate in terms of not generating unecessary and meaningless names. Besides, those characters used by Epling (1939) to defined subsections within *Membranaceae* are not clear, sometimes the species could be intermediate between both subsections. *Elscholtzioideae* was defined by its annual lifespan, generally interrupted inflorescences, corolla tubes 2.5–4 mm long and internally naked, and rounded mericarps (equivalent to what here is named as lenticular); contrasting with the perennial lifespan, generally crowded inflorescences, corolla tubes 5–7.5 mm long and internally ornate with 2 or 4 pairs of papillae, and ovoid mericarps. From the species of *Elscholtzioideae* here considered as distinct, *S. bupleuroides* and *S. lasiocephala* exhibit clearly those characters of the subsection, they also share entirely black mericarps; but, *S. verecunda* exhibit corolla tubes up to 4.3 mm long, and ovoid mericarps, these are dark brown and irregularly dark brown marbled as in subsection *Lophanthoideae*. Epling (1939) also stated the intermediate condition of this species. *Salvia compsostachys* is into a similar situation since its corolla tubes are naked, but the other characters concide with those that defined *Lophanthoideae*; Epling described this species after his revision of *Salvia* subgenus *Calosphace*, and he did not assigned it to any subsection (Epling 1939, 1940). In conclusion Epling's subsectional classification was not recognized here.

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FIGURE LEGENDS

FIGURE 1. One of the 893 most parsimonious trees obtained of the Parsimony analyses of morphological characters of *Salvia*, CI: 0.38, RI: 0.61. Black bars through the branches represent synapomorphic characters, the upper number indicating the character and the lower the state. Bootstrap values when higher than 50% are shown above each branch in boldface (* Botstrap of 100%). *Salvia* sect. *Membranaceae* is highlighted within a black rectangle.

FIGURE 2. *Salvia bupleuroides.* A) lateral view of monocephalous inflorescence; B) frontal view of the flower showing white nectar guides; C) pubescence of the stem (taken by J.G. González-G.).

FIGURE 3. Leaf shape comparison between *Membranaceae* species. A) *Salvia mexiae*; B) *S. sanctae-luciae*; C) *S. lophanthoides*; D) *S. glabra*; E) *S. langlassei*; F) *S. compsostachys*; G) *S. lasiocephala*; H) *S. mocinoi*; I) *S. verecunda*; J) *S. confertispicata*; K) *S. nitida*, and L) *S. bupleuroides* [A–J drawn by J.G. González-G.; illustrations based on A *J.G. González-G. et al. 882* (IBUG), B *J.G. González-G. et al. 923* (IBUG), C *J.G. González-G.1508* (IBUG), D *L.M. Villarreal de Puga 779* (IBUG), E *J.G. González-G. 1517* (IBUG), F *J.G. González-G. 654* (IBUG) and *656* (IBUG), G *E. M. Martínez-S. 5260* (IBUG) and *J.G. González-G. 510* (IBUG), H *J.G. González-G. 1449* (IBUG), *R. Acosta-P 805 & F. Vázquez-B.* (XAL), *M.E. Medina-A. 174 & R. Acosta-P.* (XAL), and *J.G. González-G. 1368* (IBUG), I *S. González 3615 & S. Acevedo* (IBUG), J *J.G. González-G. 1438 & J.H. Zárate-J.* (IBUG), *J.G. González-G. 1184* (IBUG), and *P. Tenorio-L. et al. 2658* (IBUG), K *J.G. González-G.571* (IBUG), and L based on *E. M. Martínez-S. 5744* (IBUG].

FIGURE 4 (a & b). Comparison of floral bracts, calyces, corollas, connectives, and apical portion of the styles of the species of section *Membranaceae*. A) *Salvia bupleuroides*; B) *S. compsostachys*; C) *S. confertispicata*; D) *S. glabra*; E) *S. langlassei*, F) *S. lasiocephala*; G) *S. lophanthoides*; H) *S. mexiae*; I) *S. mocinoi*; J) *S. nitida*; K) *S. sanctae-luciae*; and L) *S. verecunda*. In C) and H) three floral bracts of the same species are shown to properly represent shape variation [A–J drawn by J.G. González-G.; illustrations based on A *E. M. Martínez-S. 5744* (IBUG) and *J.G. González-G. 594* (IBUG), B *J.G. González-G. 656* (IBUG), C *J.G. González-G. 589, 1184* (IBUG), and *J.G. González-G. 1438 & J.H. Zárate-J.* (IBUG), D *H. Rubio 1283* (IBUG), E *J.G. González-G. 1517* (IBUG), F *J.G. González-G. 1164 & D. Juárez* (IBUG), G *J.G. González-G.1508* (IBUG), H *J.G. González-G. 882* (IBUG), I *M. Martínez-M. 84* (HEM), and *J.G. González-G. 602 & J.A. Vázquez-García* (IBUG), J *E. M. Martínez-S. 5768* (IBUG), K *J.G. González-G. et al. 923*, L *S. González 3615 & S. Acevedo* (IBUG)].

FIGURE 5. Distribution maps of A) *Salvia bupleuroides* and B) *S. compsostachys*.

FIGURE 6. *Salvia compsostachys.* A) detail of the verticillaster; B) leaf blade; C) inflorescence (taken by J.G. González-G.).

FIGURE 7. *Salvia confertispicata.* A) hanging down branches along the walls of a ravine; B) leaf blade; C) inflorescence; D) frontal view of the flowers; and E) lateral view of the uppermost flower (taken by J.G. González-G.).

Figura 8. Distribution maps of A) *Salvia confertispicata* and B) *S. glabra*.

FIGURE 9. *Salvia langlassei.* A) leaves; B) verticillasters; and C) detail of the flower (taken by J.G. González-G.).

FIGURE 10. Distribution maps of A) *Salvia langlassei* and B) *S. lasiocephala*.

FIGURE 11. *Salvia lasiocephala.* A) leaves; B–C) variation in inflorescence appearance (taken by J.G. González-G.).

FIGURE 12. *Salvia lophanthoides.* A) inflorescence in fruit; B) inflorescence in flower; C) mature leaf; and D) immature leaves (taken by J.G. González-G.).
FIGURE 13. Distribution maps of A) *Salvia lophanthoides* and B) *S. mexiae*.
FIGURE 14. *Salvia mexiae*. A) leaves; B) inflorescence (taken by J.G. González-G.).
FIGURE 15. *Salvia mocinoi*. A–D variation in inflorescence appearance (taken by J.G. González-G.).
FIGURE 16. Distribution maps of A) *Salvia mocinoi* and B) *S. nitida*.
FIGURE 17. *Salvia nitida*. A) leaves; B) frontal view of the flower; C) lateral view of the flower (taken by J.G. González-G.).
FIGURE 18. *Salvia sanctae-luciae*. A) leaf blade; B) calyces; C) floral bracts; D) flowers (taken by J.G. González-G.).
FIGURE 19. Distribution maps of A) *Salvia sanctae-luciae*, B) *Salvia verecunda*.

TABLE

Table 1. Chronological summary of the classification schemes of the *Salvia* species of section *Membranaceae*.

Bentham (1833, 1848)	Briquet (1897)	Fernald (1900)	Epling (1939, 1940[a])	Present study
	subg. *Jungia*		subg. *Calosphace*	subg. *Calosphace*
sect. *Calosphace*	sect. *Calosphace*	sect. *Calosphace*	sect. *Membranaceae*	sect. *Membranaceae*
§ *Membranaceae*	§ *Membranaceae*	§ *Membranaceae*	§ *Elscholtzioideae*	
S. bupleuroides	*S. bupleuroides*	*S. bupleuroides*	*S. galinsogifolia*	*S. bupleuroides*
S. hyptoides	*S. hyptoides*	*S. cladodes*	*S. hyptoides*	*S. compsostachys*
S. lasiocephala	*S. lasiocephala*	*S. galinsogifolia*	*S. lasiocephala*	*S. confertispicata*
S. lophantha	*S. lophanta*	*S. hyptoides*	*S. verecunda*	*S. glabra*
S. Mocinoi	*S. mocinoi*	*S. lophantha*		*S. langlassei*
S. nitida	*S. nitida*	*S. lophanthoides*	§ *Lophanthoideae*	*S. lasiocephala*
S. rubiginosa	*S. rubiginosa*	*S. mocinoi*	*S. glabra*	*S. lophanthoides*
		S. rubiginosa	*S. Langlassei*	*S. mexiae*
		S. saltuensis	*S. lophantha*	*S. mocinoi*
			S. lophanthoides	*S. nitida*
		§ *Brachyanthea*	*S. Mexiae*	*S. sanctae-luciaee*
		S. sanctae-luciae	*S. Mocinoi*	*S. verecunda*
			S. nitida	
			S. rubiginosa	
			S. Sanctae-Luciae	
			S. zacuapanensis	
			Incertae sedis	
			S. compsostachys	

[a] Epling (1940) did not assigned *Salvia compsostachy* to any of the subsections within *Membranaceae* that he recognized before (Epling 1939).

§subsection.

Table 2. First part of morphological coding matrix for phylogenetic analyses. Characters and character states are shown in appendix 1 and can be related to this matrix by the numbers showed here [? = missing data; polymorphic characters codified as follows: 01 (a), 02 (b), 12 (c), 23 (d), 24 (e), 25 (f),), 012 (g), 014 (h)].

Species					c	h	a	r	a	c	t	e	r						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
S. munzii	1	1	0	0	4	1	2	2	0	0	1	0	0	1	1	1	0	0	0	1
S. axillaris	1	0	1	0	4	1	2	a	0	0	0	1	0	1	0	1	0	0	0	0
S. acerifolia	1	0	0	1	0	0	0	c	0	0	1	1	1	1	0	1	0	0	0	0
S. aequidistans	1	0	0	1	0	0	1	2	1	1	1	1	1	1	0	1	0	b	0	0
S. albicalyx	1	1	0	0	e	0	a	2	1	0	1	0	1	a	1	1	0	0	0	0
S. albo-caerulea	1	a	0	0	c	0	d	1	0	0	1	1	1	a	1	1	0	0	0	0
S. bupleuroides	0	0	0	0	a	0	2	1	0	0	1	1	1	1	0	0	a	0	1	1
S. chalarothyrsa	1	0	0	0	0	0	0	1	0	0	2	1	1	0	0	1	0	2	0	0
S. cinnabarina	1	0	a	0	1	0	b	1	0	0	1	a	1	a	a	1	0	a	0	0
S. compsostachys	1	0	0	0	1	0	1	1	0	0	1	0	1	1	1	1	0	2	1	1
S. confertispicata	1	1	2	0	g	0	1	1	0	0	1	a	1	1	0	a	0	1	1	1
S. decora	1	a	0	0	a	0	1	1	0	0	1	0	1	0	1	1	0	0	0	0
S. fulgens	1	1	0	0	c	0	a	c	0	0	1	a	1	0	1	1	0	1	0	0
S. gesneriflora	1	0	0	1	a	0	h	1	0	a	1	1	1	a	a	1	0	a	0	0
S. glabra	1	0	0	0	1	0	a	1	0	0	1	1	1	1	1	1	0	1	1	1
S. iodantha	1	1	0	0	1	0	c	1	0	0	1	0	1	2	a	1	0	0	0	0
S. langlassei	1	1	2	0	2	0	2	1	0	0	1	1	1	0	1	1	0	0	1	1
S. lasiocephala	0	0	0	0	0	0	2	1	1	0	1	1	1	1	0	0	1	0	1	1
S. lavanduloides	a	0	0	0	f	0	2	1	0	0	1	0	1	0	1	1	0	0	0	0
S. longistyla	1	0	0	1	0	0	1	1	0	0	0	1	1	0	3	1	0	0	2	?
S. lophanthoides	1	1	0	0	1	0	a	1	0	0	1	1	1	a	1	1	0	0	1	1
S. meera	1	0	0	0	2	0	3	1	0	0	1	0	1	0	1	1	0	0	0	0
S. mexiae	1	1	0	0	2	0	d	1	a	0	1	1	1	1	0	0	a	1	1	1

Species																				
						c	h	a	r	a	c	t	e	r						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
S. mexicana	1	1	a	0	a	0	2	1	0	0	1	a	1	1	1	1	0	a	0	0
S. microphylla	1	1	0	1	1	0	c	c	1	0	1	1	1	1	1	1	0	0	0	0
S. mocinoi	1	1	0	0	b	0	2	1	0	0	1	a	1	1	0	a	a	c	1	1
S. nitida	1	1	0	0	c	0	1	1	0	0	1	1	1	1	0	0	0	1	1	1
S. patens	1	0	0	1	0	0	0	1	0	0	1	1	1	0	1	1	0	0	0	1
S. polystachya	1	0	0	0	a	0	1	1	0	0	1	0	1	1	1	1	0	0	0	0
S. purpurea	1	1	0	0	1	0	2	1	0	0	1	0	1	2	1	1	0	0	0	0
S. rogersiana	1	0	0	0	0	0	2	1	1	0	1	0	1	1	0	1	0	0	0	0
S. sanctae-luciae	1	1	0	0	5	0	2	1	0	0	1	1	1	1	0	1	0	1	1	1
S. santanae	1	0	0	0	0	0	3	1	0	0	1	0	1	0	1	1	0	0	0	1
S. subpatens	1	0	0	1	6	0	1	1	0	0	1	a	1	0	1	1	0	0	0	1
S. verecunda	1	0	0	0	2	0	1	1	0	0	1	0	1	1	0	0	1	1	1	1

Table 2. Second part of morphological coding matrix for phylogenetic analyses. Character and character states are shown in appendix 1 and can be related to this matrix by the numbers showed here [? = missing data; polymorphic characters codified as follows: 01 (a), 02 (b), 12 (c), 23 (d), 24 (e), 25 (f),), 012 (g), 014 (h)].

Species					c	h	a	r	a	c	t	e	r				
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
S. munzii	1	0	3	1	1	1	1	0	1	1	0	1	?	1	0	0	0
S. axillaris	1	0	2	0	0	1	1	0	1	1	0	1	?	1	0	0	0
S. acerifolia	1	a	2	1	0	1	0	0	1	1	1	2	0	1	0	1	0
S. aequidistans	1	0	3	1	0	a	0	0	1	0	1	?	1	1	0	0	0
S. albicalyx	1	0	1	1	1	1	0	0	1	1	1	2	0	1	0	0	2
S. albo-caerulea	1	0	d	1	0	1	0	0	1	a	1	3	0	1	0	0	0
S. bupleuroides	1	0	2	1	0	a	a	0	0	a	1	3	0	1	1	0	1
S. chalarothyrsa	0	0	3	1	0	1	0	0	0	2	1	?	1	1	0	0	0
S. cinnabarina	1	0	13	a	a	a	a	0	a	0	1	?	a	a	0	a	0
S. compsostachys	1	0	d	1	0	1	1	0	0	0	1	2	1	1	0	0	0
S. confertispicata	1	0	3	1	a	a	0	1	0	0	1	2	0	1	0	0	0
S. decora	1	1	1	1	2	1	0	a	1	0	1	2	0	1	0	0	2
S. fulgens	1	0	3	1	1	1	0	c	1	0	1	2	a	1	0	0	0
S. gesneriflora	1	0	d	1	1	1	0	0	1	0	1	1	0	1	0	?	?
S. glabra	1	0	2	1	0	1	0	1	0	1	1	2	1	1	0	0	0
S. iodantha	1	a	1	1	1	1	1	2	0	1	1	3	?	0	0	0	0
S. langlassei	1	0	3	1	0	0	0	1	0	0	1	2	0	1	0	0	0
S. lasiocephala	1	0	3	1	0	0	0	0	0	1	1	3	?	1	1	0	1
S. lavanduloides	1	a	1	1	0	1	1	0	1	1	1	c	0	1	0	0	1
S. longistyla	1	0	1	1	1	1	1	0	a	0	1	1	0	0	0	0	0
S. lophanthoides	1	0	2	1	0	1	0	1	0	0	1	2	0	1	0	0	0
S. meera	1	0	1	1	2	1	0	0	1	1	1	2	1	1	0	0	3
S. mexiae	1	0	3	1	0	0	0	a	0	1	1	3	0	1	0	0	0

S. mexicana	1	0	3	1	0	0	0	0	1	0	1	3	0	1	0	0	0
S. microphylla	1	0	3	1	1	1	0	1	1	0	1	2	0	1	0	0	?
S. mocinoi	1	0	d	1	a	0	0	1	0	a	1	3	0	1	0	0	0
S. nitida	1	0	2	1	a	1	0	1	0	1	1	?	a	1	0	0	0
S. patens	1	0	2	0	0	0	0	0	0	0	1	1	0	1	0	0	0
S. polystachya	1	0	1	1	0	1	1	1	0	0	1	2	0	1	0	0	0
S. purpurea	1	0	1	1	1	1	1	2	1	1	1	3	?	1	0	0	0
S. rogersiana	1	0	1	1	0	1	0	0	1	0	1	2	0	1	0	0	0
S. sanctae-luciae	1	0	2	1	0	0	0	1	1	0	1	2	0	1	0	0	0
S. santanae	1	0	1	1	0	0	0	0	1	0	1	2	0	1	0	0	2
S. subpatens	1	0	2	0	0	0	0	0	0	0	1	1	0	0	0	0	0
S. verecunda	1	0	2	1	0	0	0	0	0	0	1	2	0	1	0	0	1

Appendix 1. Voucher information of taxa surveyed for phylogenetic analyses. The herbaria acronyms are accord to Index Herbariorum (provided in parenteheses). The name of the section for each species is written in uppercase letters at the end.

Salvia acerifolia B.L.Turner, *González-G. 1086* (IBUG), INCERTA SEDIS
Salvia albicalyx J.G.González, *Solís 957* (IBUG), INCERTAE SEDIS
Salvia albo-caerulea Linden, *González-G. 838* (IBUG), *Hinton 17464* (IBUG), *Iltis 2495* (IBUG), *Medina-G. 3686* (IBUG), *Pérez-C. 890* (IBUG), *Rzedowski 39464, 42350* (IBUG), FERNALDIA
Salvia axillaris Moc. & Sessé, *Arreola-N. 650* (IBUG), *Ornelas-U. 884* (IBUG), *Villarreal de Puga 8770* (IBUG), AXILLARES
Salvia bupleuroides J.Presl. ex Benth., *González-G. 594* (IBUG), *Martínez-S. 5744* (IBUG), MEMBRANACEAE
Salvia chalarothyrsa Fernald, *Villarreal de Puga 15014* (IBUG), SIGMOIDEA
Salvia chazaroi B.L.Turner, *Carrillo-R. 5444* (IBUG), ULIGINOSAE
Salvia cinnabarina M.Martens & Galeotti, *González-G. 244, 245* (IBUG), INCARNATAE
Salvia compsostachys Epling, *González-G. 656*, MEMBRANACEA
Salvia confertispicata I.Fragoso & Martínez-Gordillos, *González-G. 589* (IBUG), *Martínez-S. 6155* (IBUG), *Soto-N. s.n. & Aureoles-C.* (IBUG), MEMBRANACEAE
Salvia decora Epling, *Castro-C. 2299* (IBUG), *González-G. 439* (IBUG), POLYSTACHYAE
Salvia fulgens Cav., *González-G. 731* (IBUG), *López 2850* (IBUG), FULGENTES
Salvia gesneriflora Lindl. ex Paxton, *Cornejo 165* (IBUG), *Díaz-L. 1955* (IBUG), *González-G. 818* (IBUG), NOBILES
Salvia glabra M.Martens & Galeotti, *Rubio 1283*, *2095* (IBUG), *Rzedowski 48069* (IEB), MEMBRANACEAE
Salvia lophanthoides Fernald, *Torres-C. 1920* (XAL), MEMBRANACEAE
Salvia iodantha Fernald, *Diggs 2235 & Corcoran* (IBUG), *Fuentes-0. 818* (IBUG), *Guerrero-C. 1460* (IBUG), *Mendoza et al. 3796,3830* (IBUG), *Soto-N. 12259* (IBUG), *Villarreal de Puga 11661 & Limón* (IBUG), IODANTHAE
Salvia langlassei Fernald, *González-G. 1518* (IBUG), MEMBRANACEAE
Salvia lasiocephala Hook. & Arn., *Arriaga 27* (IBUG), *Sánchez-S. 167* (IBUG), *Arriaga 27* (IBUG), *Sánchez-S. 167* (IBUG), *Santana-M. 923* (IBUG), *Villarreal de Puga 1456 & Hidalgo* (IBUG), *Villarreal de Puga 2370* (IBUG), MEMBRANACEAE
Salvia lavanduloides Cav., *Machuca-N. 7940* (IBUG), *Reynoso-D. 2439* (IBUG), *Vigueras-G. 74* (IBUG), *Villa-C. 159* (IBUG), LAVANDULOIDEAE
Salvia longistyla Benth., *González-G. 827* (IBUG), CURTIFLORAE
Salvia meera Ramamoorthy ex J.G.González & Santana Michel, *Calzada 9545 & Nieves-H.* (XAL), INCERTAE SEDIS
Salvia mexiae Epling, *Carrillo-R.* et al. *3137* (IBUG), *González-T. 81* (IBUG), *González-V. 1091*, *3514* (IBUG), *Ramírez-D. 1966* (IBUG), *Villarreal de Puga 8403* (IBUG), MEMBRANACEAE
Salvia mexicana L., *González-G. 374* (IBUG), BRIQUETIA
Salvia microphylla Kunth, *González-G. 634* (IBUG), FULGENTES
Salvia mocinoi Benth., *Acosta-P. 82 & Acosta-B.* (XALU), *Acosta-P. 902 & Calzada* (XAL), *Díaz-B. 2273* (IBUG), *González-G. 602 & Vázquez-G.* (IBUG), *Hernández-N. 1609 & Méndez-M.* (HEM), *Martínez-M. 222, 627*, *652*, *746*

(HEM), *Martínez-S. s.n. & Barrie* (IBUG), *Medina-A. 174 & Acsota-P.* (XAL); *Pérez-F. 2657* (HEM), *Reynoso-D. 1251*, *2397* (IBUG), *Rzedowski 39512* (IBUG), *Santos-M. 1906* (IBUG), *Urbina-R. 11* (HEM), *Vázquez-G. 1161* (IBUG), *Villarreal de Puga 17752* (IBUG), MEMBRANACEAE

Salvia munzii Epling, *Tenorio-L. 13349 & Romero* (IBUG), AUDIBERTIA

Salvia nitida (M.Martens & Galeotti) Benth., *González-G. 571* (IBUG), *Martínez-S. 5768* (IBUG), MEMBRANACEAE

Salvia patens Cav., *González-G. 1128* (IBUG), *Zamudio-R. 4097* (IBUG), BLAKEA

Salvia polystachya Ortega, *Ramírez-D. 2813* (IBUG), POLYSTACHYAE

Salvia purpurea Cav., *Cortés 399* (IBUG), *Villarreal de Puga 11865* (IBUG), PURPUREA

Salvia rogersiana Ramamoorthy ex J.G.González & Cuevas, *González-G. 781* (IBUG), BRIQUETIA

Salvia sanctae-luciae Seem., *Calzada 19240* (IBUG), *González-G. 917* (IBUG), MEMBRANACEAE

Salvia santanae Ramamoorthy ex J.G.González & Guzmán-Hernández, *1091 & Cuevas-G.* (IBUG), ANGULATAE

Salvia subpatens Epling, *Sánchez-S. 295* (IBUG), *Vázquez-G. 549 & Nieves-H.* (IBUG), BLAKEA

Salvia verecunda Epling, *González 3615 & Acevedo* (IBUG), MEMBRANACE

Appendix 2. Characters and character states. The number of each character matches those from table 2. The states of the characters are scored as (0), (1), (2), etc., and these correspond also with the states in table 2.

1. Lifespan of the species: (0) annual, (1) perennial.
2. Habit: (0) herb, (1) subshrub to shrub.
3. Stem orientation: (0) erect, (1) decumbent, (2) subscandent to scandent.
4. Presence/absence of glandular-capitate hairs in the stems: (0) absent, (1) present.
5. Shape of the blade: (0) ovate to ovate-deltoid, (1) ovate-lanceolate, (2) linear, (3) oblanceolate, (4) rhomboid, (5) oblong-lanceolate.
6. Shape of blade apex: (0) acute to acuminate, (1) rounded
7. Shape of blade base: (0) cordate to subcordate, (1) truncate to rounded, (2) acute to cuneate, (3) long-attenuated, (4) unequal.
8. Shape of blade margin: (0) entire, (1) serrate, (2) crenate.
9. Relief of the blade: (0) smooth, (1) bullate to wrinkled
10. Presence/absence of glandular-capitate hairs in the leaf blade: (0) absent, (1) present.
11. Inflorescence architecture: (0) solitary flower, (1) flowers arranged in simple verticillasters, (2) flowers arranged in thyrsoid verticillasters.
12. Presence/absence of glandular-capitate hairs in the inflorescence (floral axis, floral bract, pedicel, and/or calyx): (0) absent, (1) present.
13. Number of floral bracts per verticillaster: (0) 1 floral bract per flower, (1) 1 floral bract per verticillaster.
14. Shape of floral bract: (0) lanceolate, (1) ovate.
15. Shape of floral bract apex: (0) acuminate, (1) acute-attenuate (caudate).
16. Shape of floral bract base: (0) cordate, (1) truncate.
17. Shape of floral bract margin: (0) entire, (1) serrate, (2) crenate.
18. Color of floral bract: (0) yellowish green, (1) red to magenta, (2) blue to violet.
19. Concistence of floral bract: (0) dull, with secondary veins not visible to the naked eye, (1) semi-translucid, with reticulate veins visible to the naked eye.
20. Lifespan of floral bract: (0) deciduous, (1) persistent.
21. Presence/absence of bracteoles: (0) present, (1) absent.
22. Shape of calyx lips: (0) acute, (1) truncate to rounded
23. Number of veins in the supper calyx lip: (0) 1, (1) 3, (2) 5, (3) 7, (4), 9.
24. Shape of the upper calyx lip: (0) tricuspidate to trimucronate, (1) entire.
25. Color of the corolla: (0) blue to violet, (1) red, rose to magenta, (2) entirely white.
26. Shape of the corolla base: (0) invaginated, (1) straight.
27. Shape of corolla tube: (0) ventricose, (1) straight.
28. Number of papillae pairs inside corolla tube base: (0) 0, (1) 1, (2) 2.
29. Absence/presence of pubescence on the style: (0) glabrous, (1) pubescent.
30. Shape of lower stylar branch: (0) acute, (1) truncate, (2) sigmoid.
31. Number of fertile thecae per flower: (0) 4, (1) 2.
32. Shape of the connective: (0) shorter than the thecae and not ornate, (1) longer than the thecae and not ornate, (2) longer than the thecae and ornate with a ventral acute tooth, (3) longer than the thecae and ornate with a ventral rounded, truncate to sublobate tooth, (4) longer than the thecae and ornate with a retrorse acute tooth.
33. Presence/absences of staminodes: (0) present, (1) absent.

34. Position of the stamens in relation to upper corolla lip: (0) exserted, (1) inserted
35. Shape of the mericarp: (0) ovate, (1) lenticular.
36. Surface of the mericarp: (0) smooth, (1) verrucose.
37. Color of the mericarps: (0) brown and irregularly dark brown marbled, (1) entirely black

Figure 1

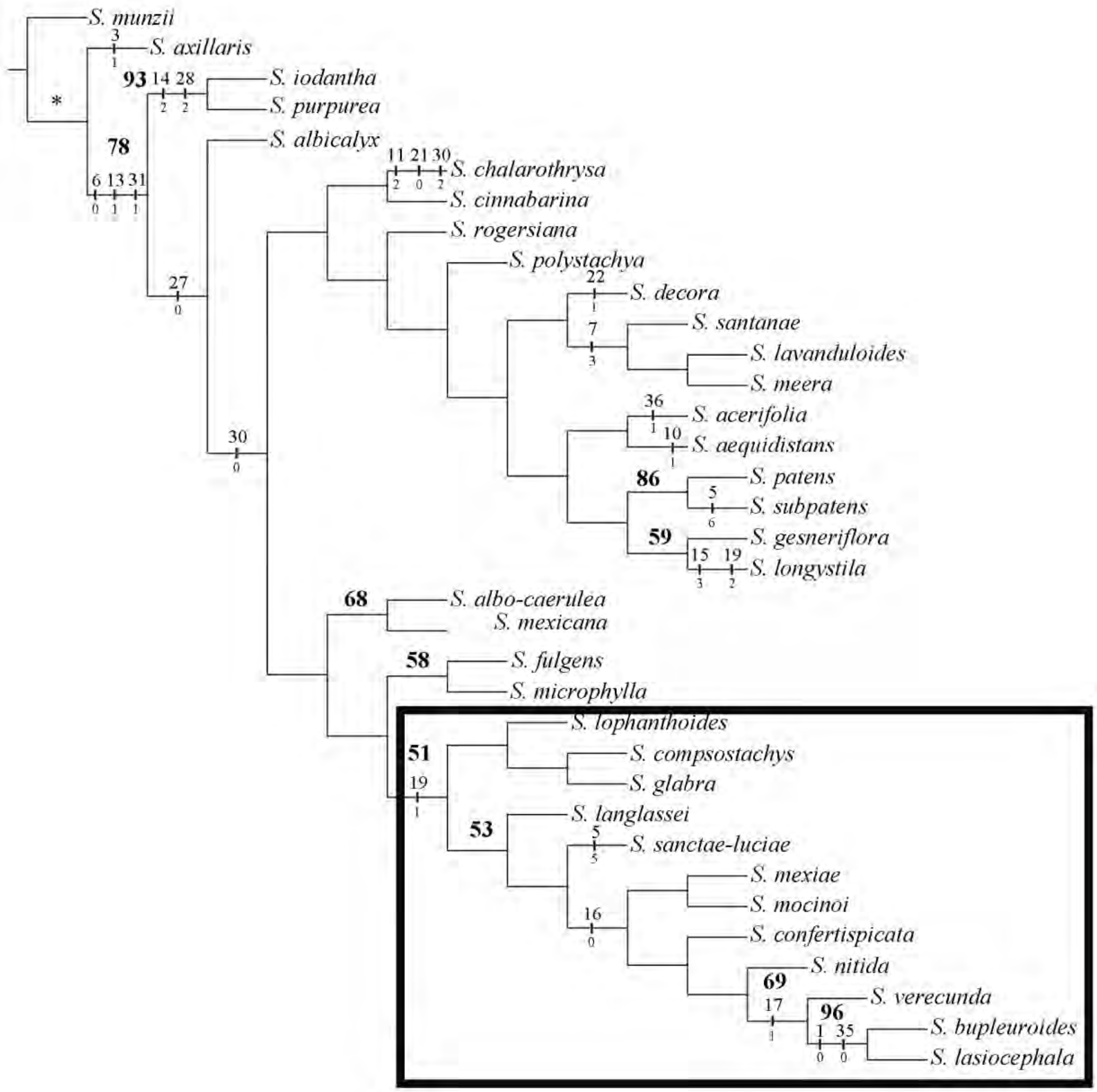

S. munzii
S. axillaris
S. iodantha
S. purpurea
S. albicalyx
S. chalarothrysa
S. cinnabarina
S. rogersiana
S. polystachya
S. decora
S. santanae
S. lavanduloides
S. meera
S. acerifolia
S. aequidistans
S. patens
S. subpatens
S. gesneriflora
S. longystila
S. albo-caerulea
S. mexicana
S. fulgens
S. microphylla
S. lophanthoides
S. compsostachys
S. glabra
S. langlassei
S. sanctae-luciae
S. mexiae
S. mocinoi
S. confertispicata
S. nitida
S. verecunda
S. bupleuroides
S. lasiocephala

Figure 2

Figure 3

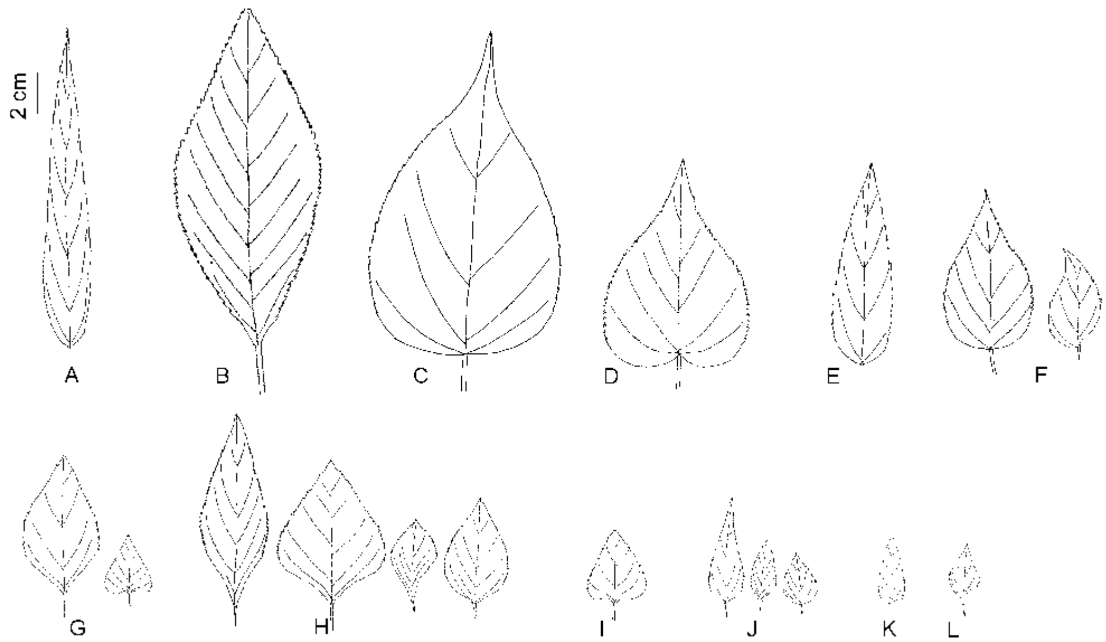


Figure 4 (a)

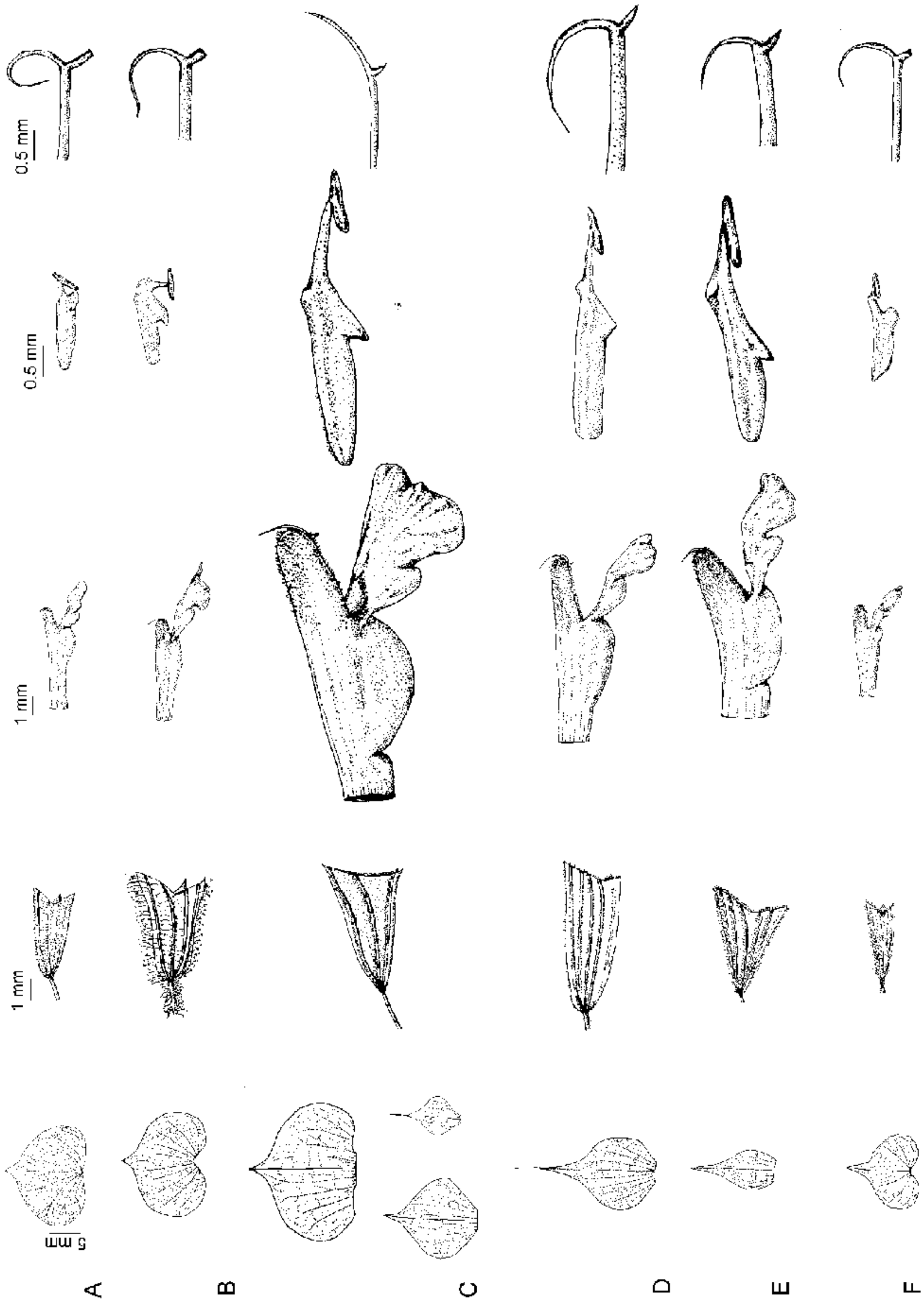


Figure 4 (b)

Figure 5

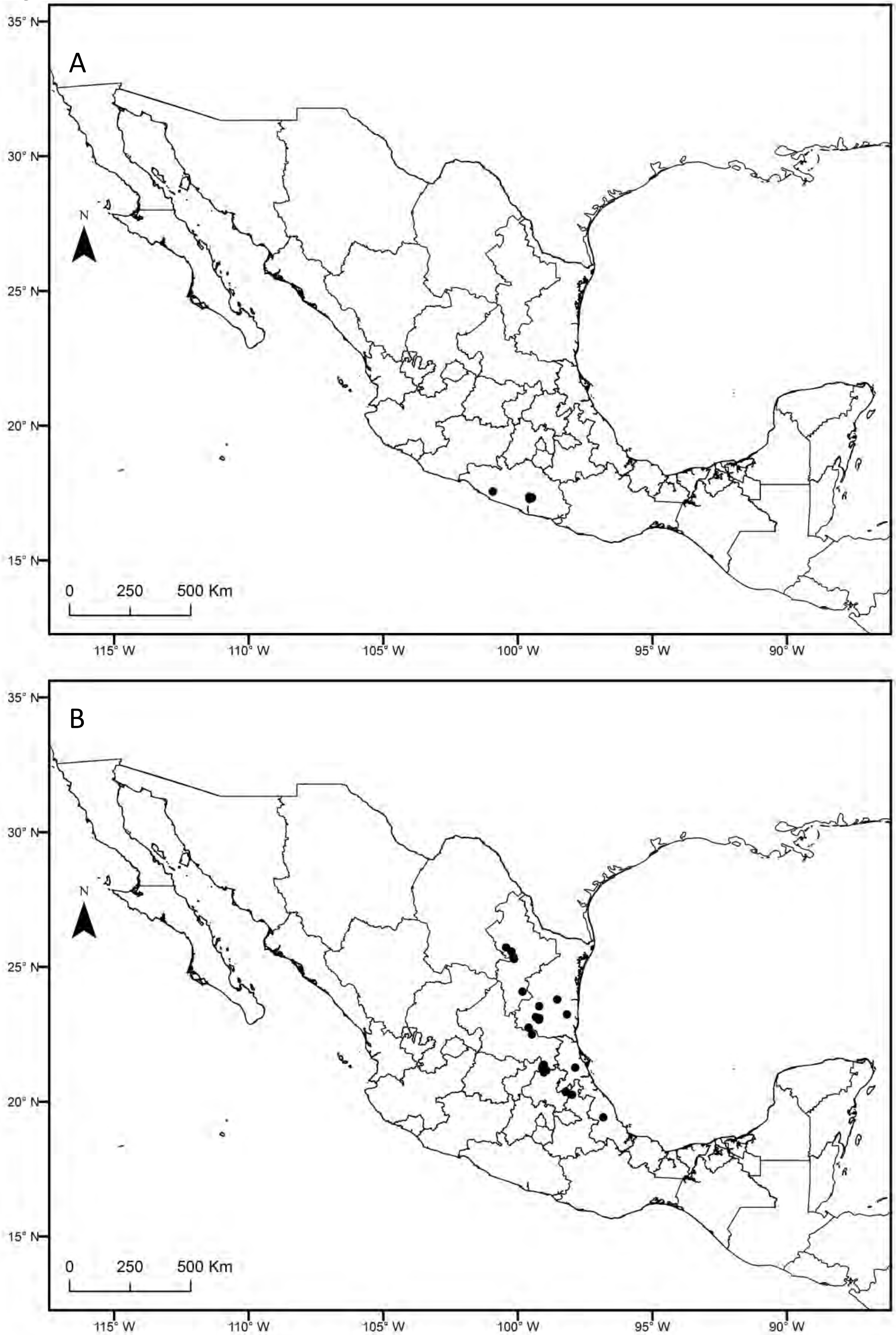

A
35° N
30° N
25° N
20° N
15° N
N
0
250
500 Km
115° W
110° W
105° W
100° W
95° W
90° W
B
35° N
30° N
25° N
20° N
15° N
N
0
250
500 Km
115° W
110° W
105° W
100° W
95° W
90° W

Figure 6

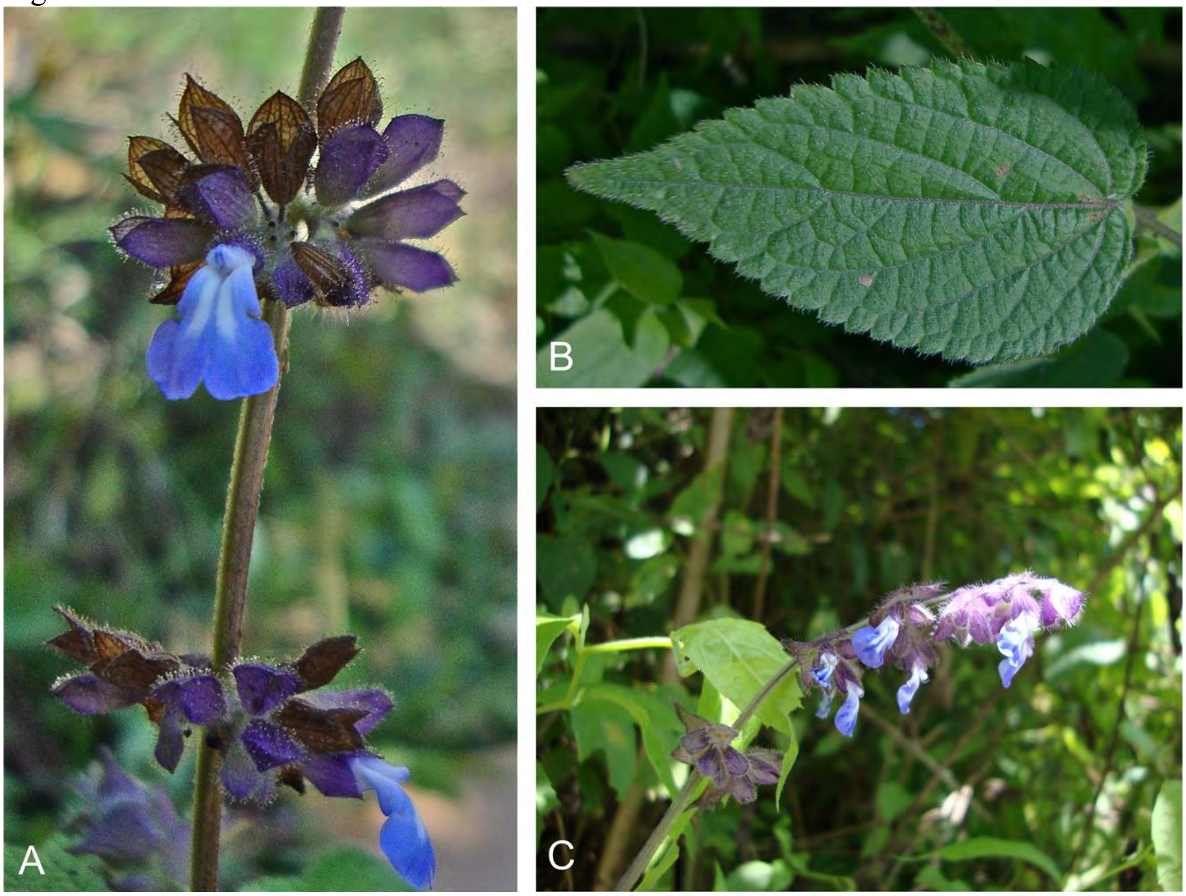


Figure 7

Figure 8

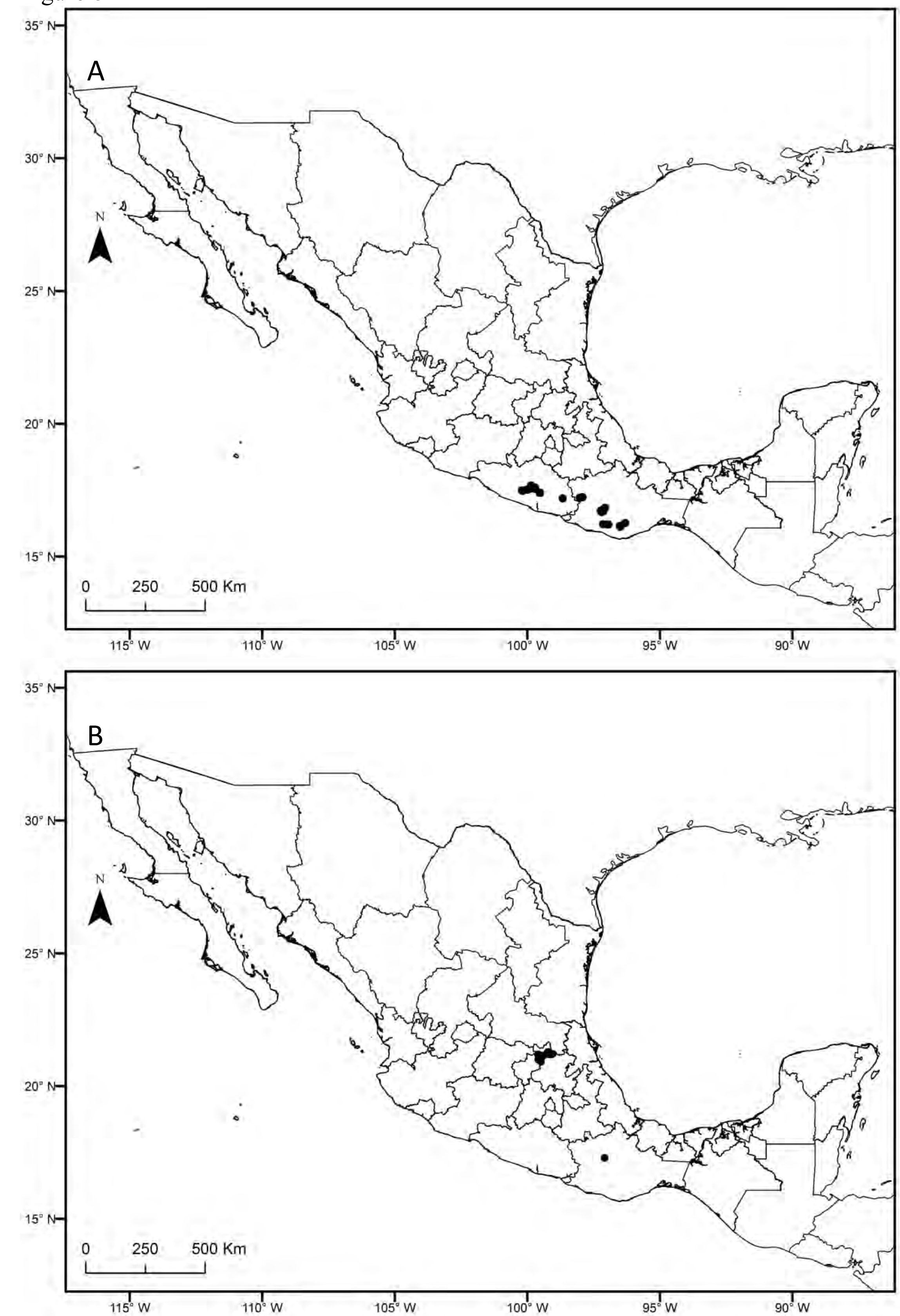
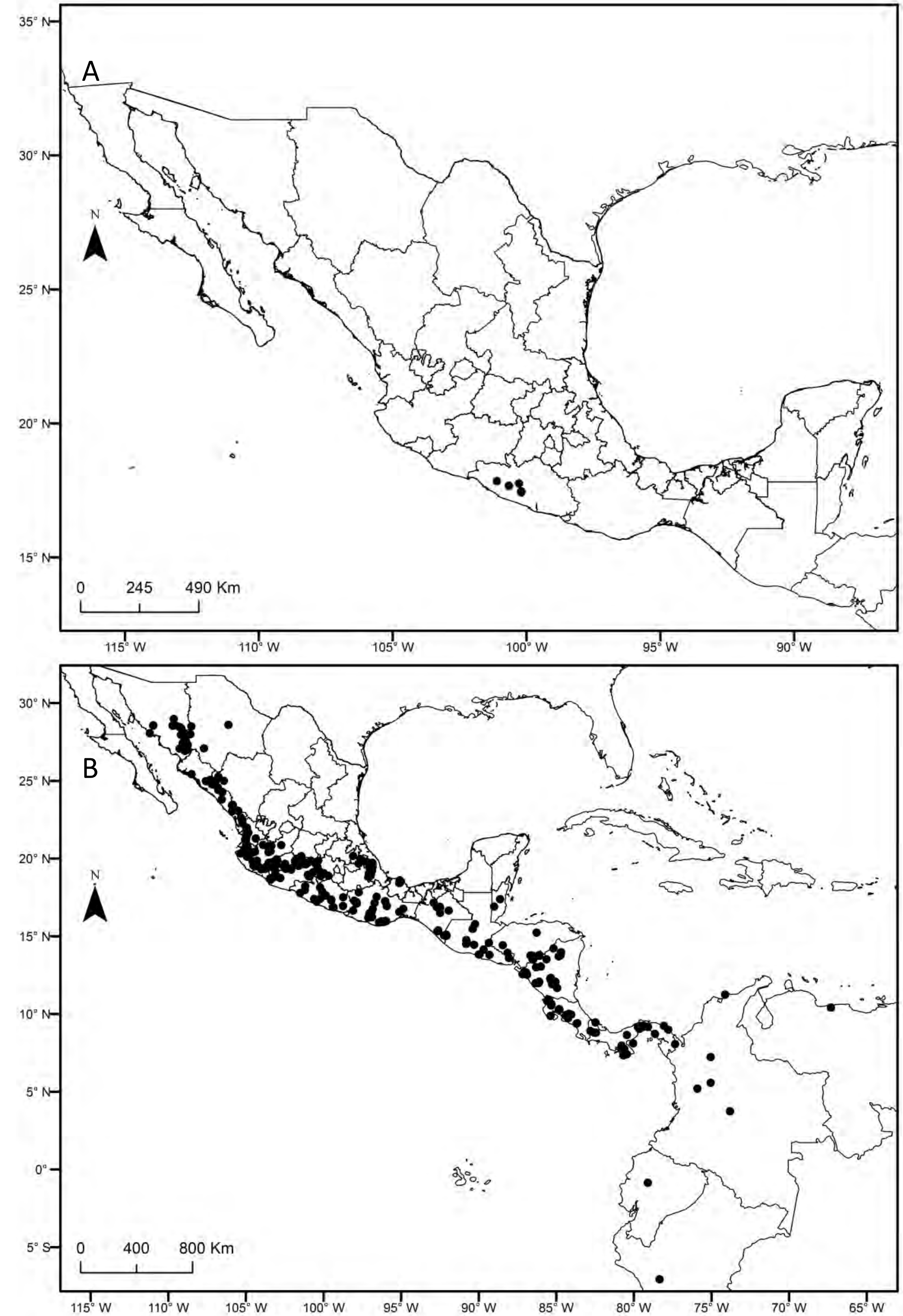


Figure 9

Figure 10



A
35° N
30° N
25° N
20° N
15° N
N
0 245 490 Km
115° W
110° W
105° W
100° W
95° W
90° W
B
30° N
25° N
20° N
15° N
10° N
5° N
0°
5° S
N
0 400 800 Km
115° W
110° W
105° W
100° W
95° W
90° W
85° W
80° W
75° W
70° W
65° W

Figure 11

Figure 12

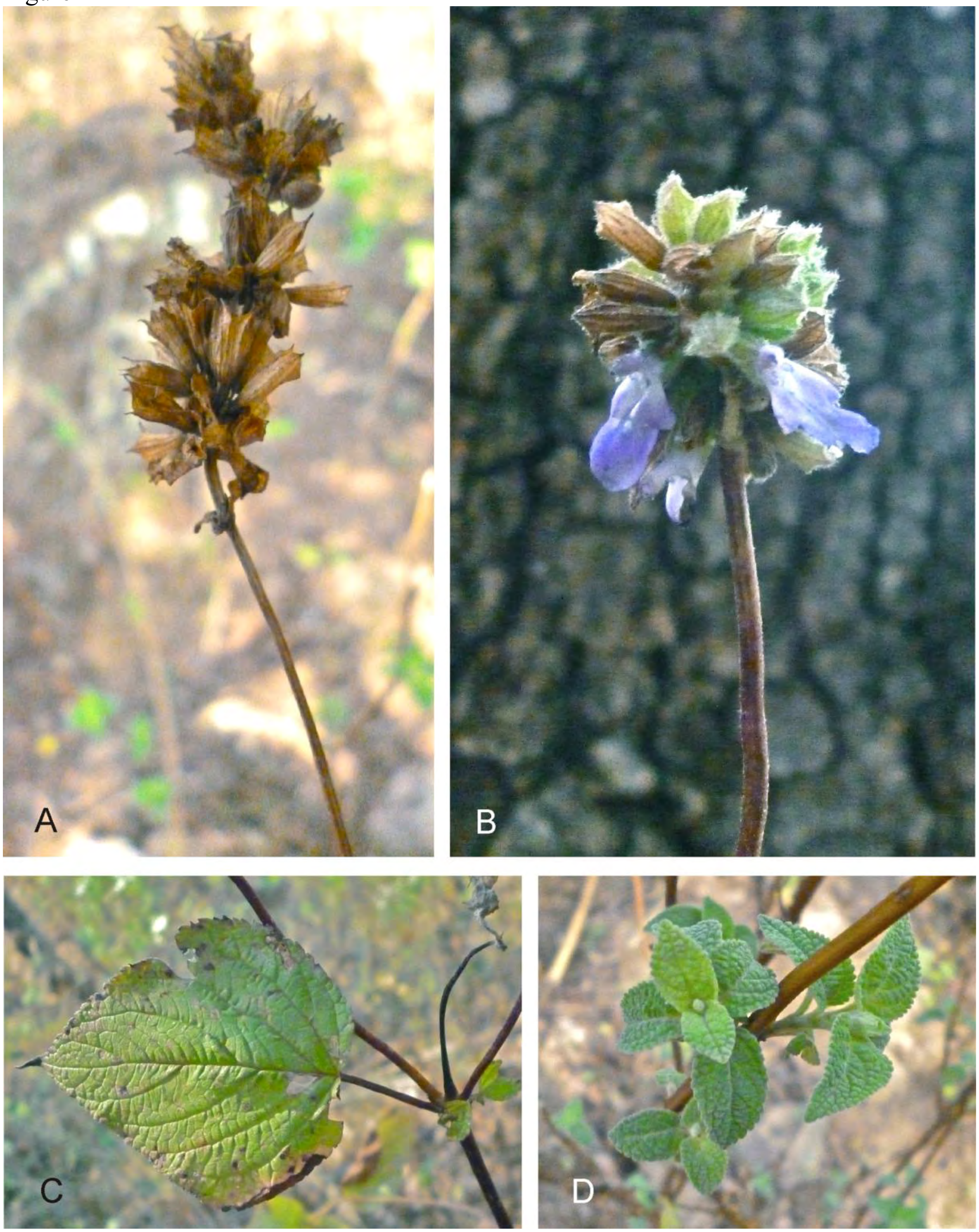


Figure 13

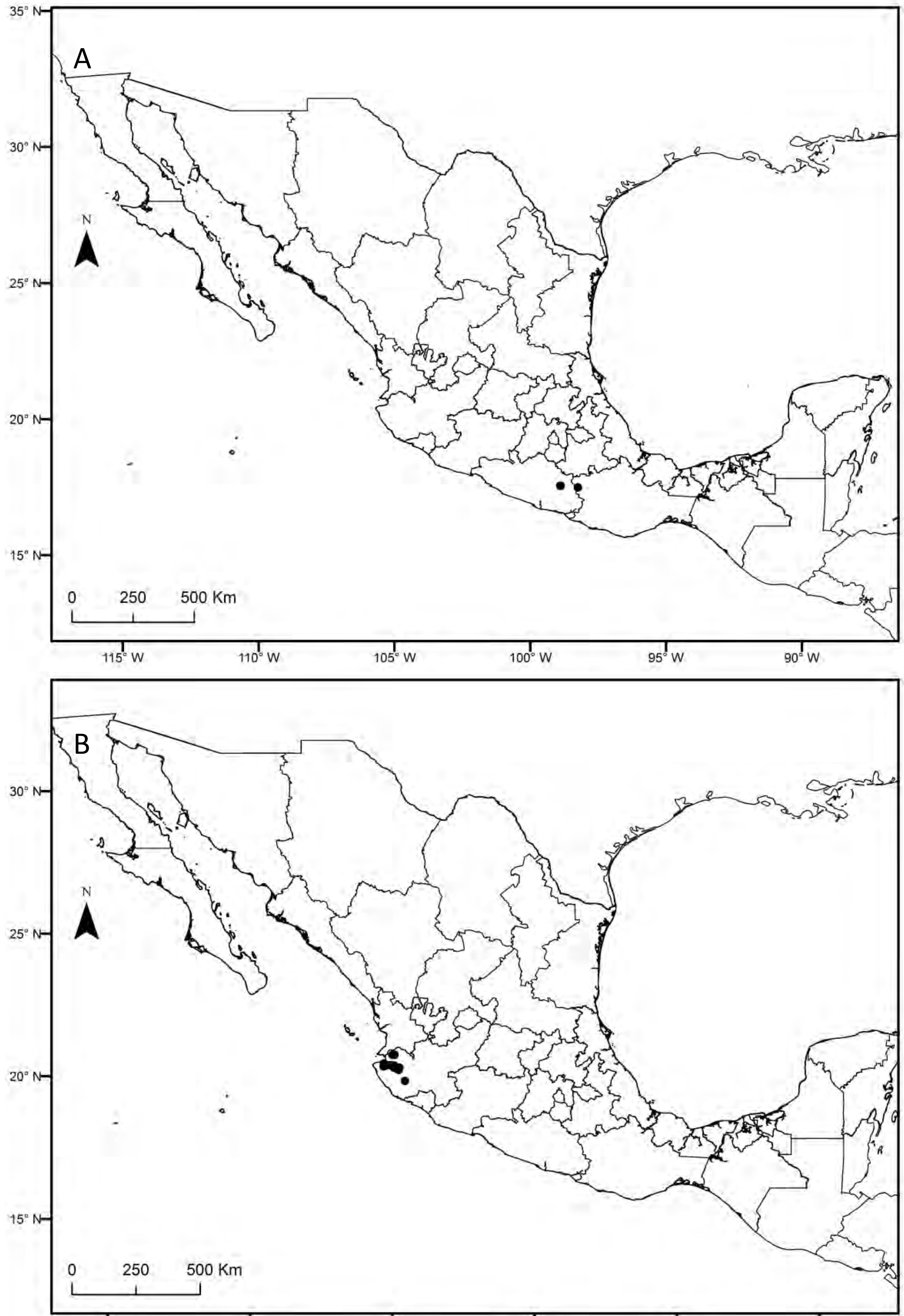


Figure 14

Figure 15

Figure 16

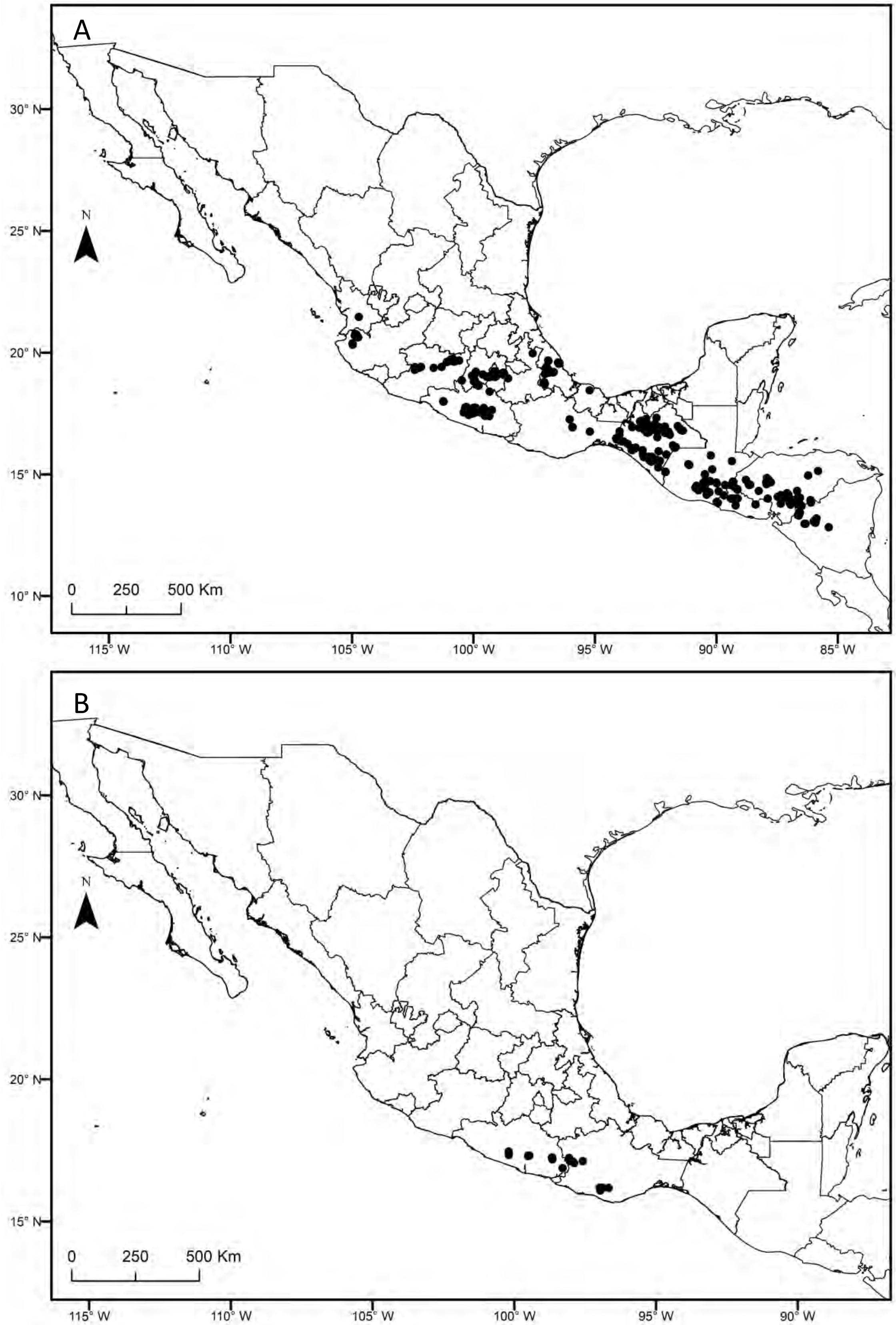

A
30° N
25° N
20° N
15° N
10° N
N
0 250 500 Km
115° W
110° W
105° W
100° W
95° W
90° W
85° W
B
30° N
25° N
20° N
15° N
N
0 250 500 Km
115° W
110° W
105° W
100° W
95° W
90° W

Figure 17

Figure 18

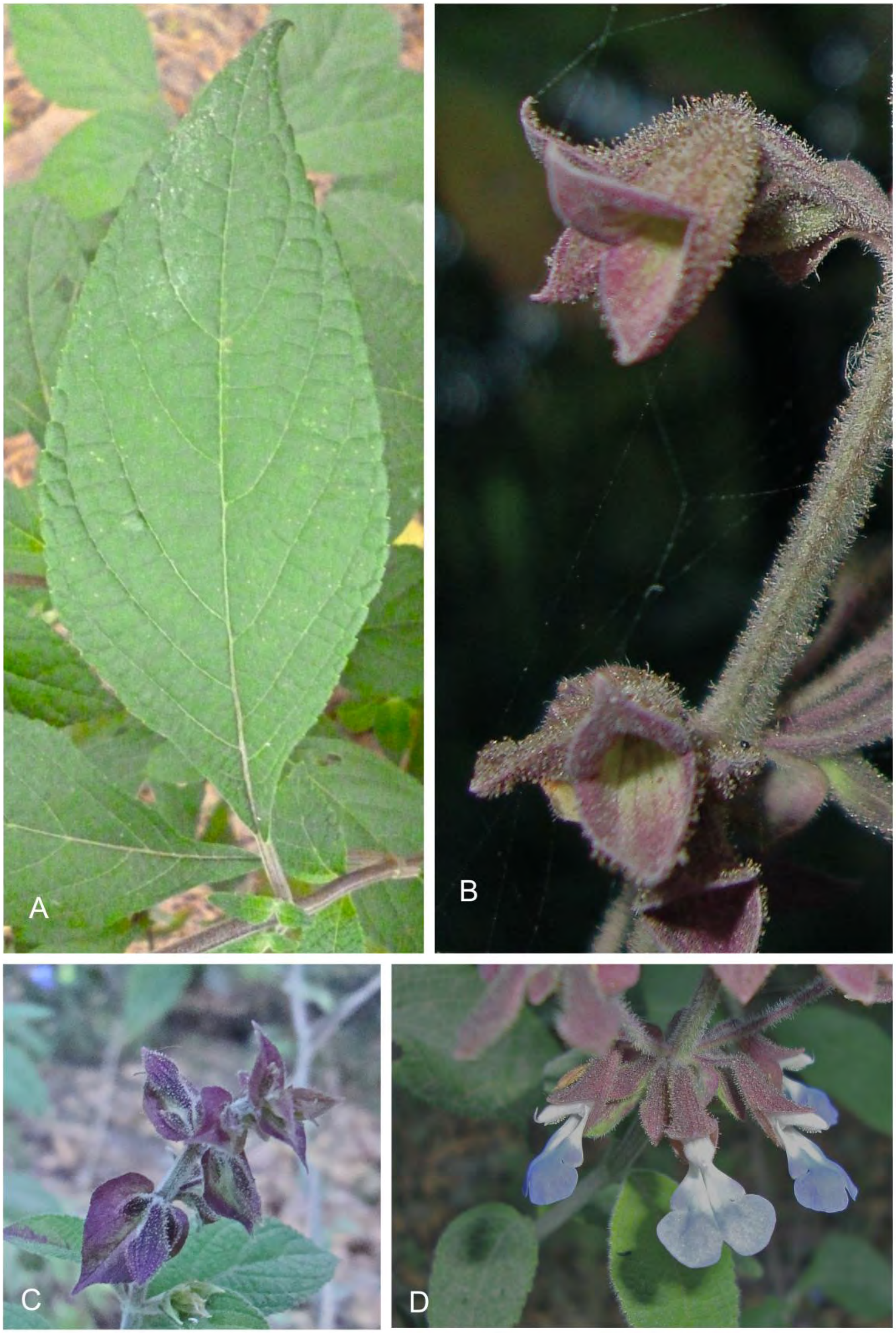
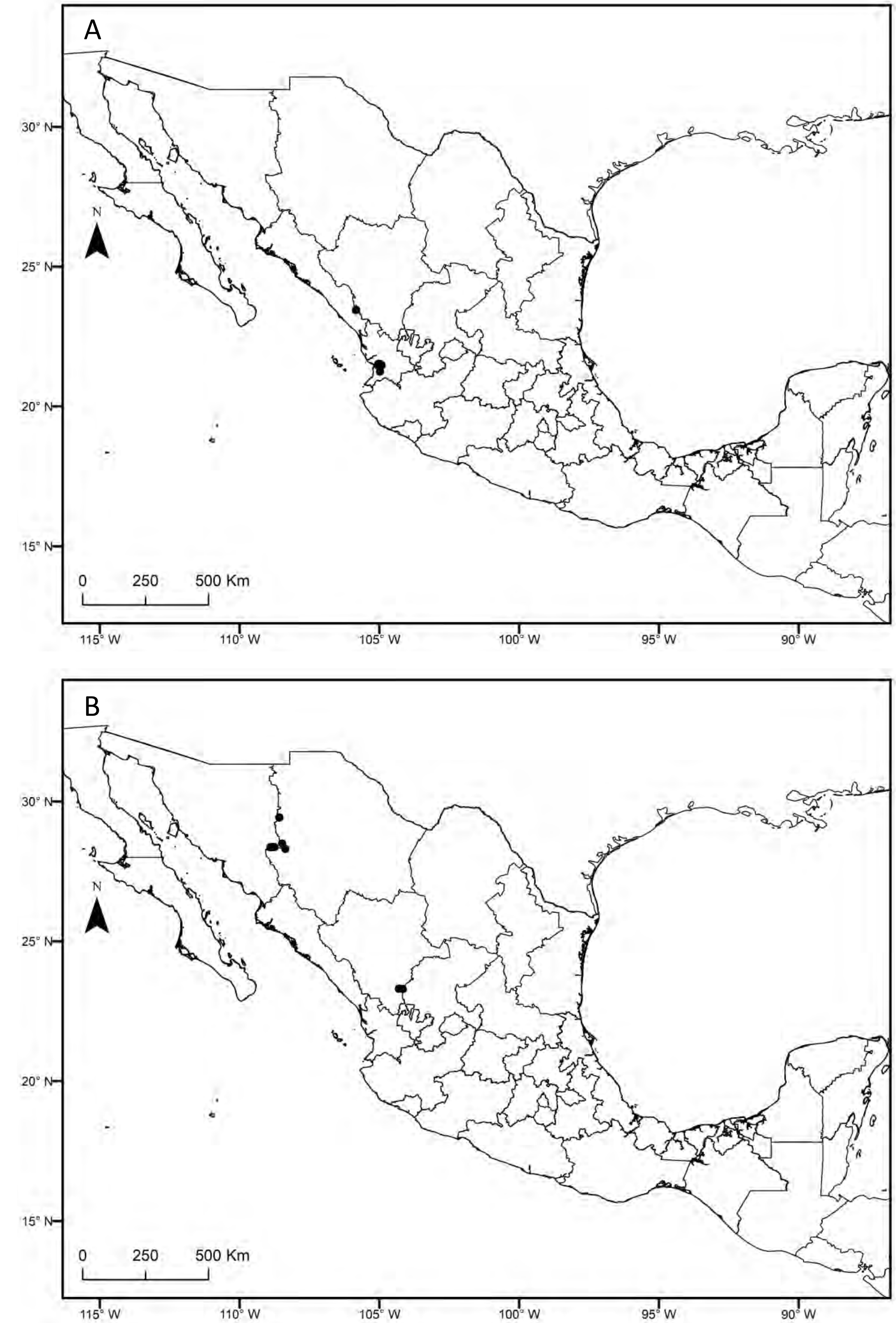


Figure 19



A
30° N
25° N
20° N
15° N
N
0
250
500 Km
115° W
110° W
105° W
100° W
95° W
90° W
B
30° N
25° N
20° N
15° N
N
0
250
500 Km
115° W
110° W
105° W
100° W
95° W
90° W

2.2 González-Gallegos, J. G. 201X. Phylogenetic analysis of *Salvia* section *Membranaceae* and new insights on the phylogeny of *Salvia* subgenus *Calosphace* based on ITS, ETS and trn*L-F* sequences. *Systematic Botany*

Phylogenetic analysis of *Salvia* section *Membranaceae* (Lamiaceae) and new insights on the phylogeny of subgenus *Calosphace* based on ITS, ETS and *trnL*-trn*F* sequences

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Abstract
A phylogenetic analysis is provided focused in testing the monophyly and internal relationships of *Salvia* section *Membranaceae* based on nrDNA ITS, ETS and chloroplast spacer *trnL-F* sequences data. This section belongs to subgenus *Calosphace*, it embraces 12 species, all present in Mexico, one extending to Central America, and other to north South America. None species of this section has been previously sampled and included in phylogenetic studies. Taxon sampling was restricted to Mexican species, mainly from sections *Angulatae*, *Membranaceae*, *Sigmoideae*, and *Uliginosae*. A total of 206 sequences of 71 species were obtained and analyzed for this study, together with those available at GenBank database. Parsimony and Maximum Likelihood analyses were implemented with separate and concatenated regions. In all analyses *Dorystaechas hastata* served was used to root the group. Section *Membranaceae* was recovered as a monophyletic group; the internal relationships obtained did not support the infra-sectional classification, which concides with previous analyses and with the decision of discarding infra-sectrional classification. The topology did not provide a clear sister group. More sampling in terms of species and DNA regions are still needed to strengthen the phylogeny and to get the tools for constructing a new and more stable classification for *Calosphace*.

Keywords: Epling's classification, *Salvia* section *Sigmoideae*

Introduction
The genus *Salvia* L. is the most diversified within the family Lamiaceae in terms of species richness, and one of the most widely distributed (Standley & Williams, 1973; Hedge, 1992; Harley *et al.*, 2004; Klitgaard, 2012). The particular and derived morphology of its stamens (Hedge, 1992) led to conceive it as a cohesive and presumable natural group (Ramamoorthy & Elliott, 1998; Walker *et al*., 2004). However, recent phylogenetic analyses based on DNA sequences have questioned the monophyly of this genus as traditionally defined. The genera *Dorystaechas* Boiss. & Heldr. ex Benth., *Meriandra* Benth., *Perovskia* Kar., *Rosmarinus* L. and *Zhumeria* Rech. f. & Wendelbo are nested within *Salvia* lineages, making untenable the delimitation of the genus and a new circumscription needed. There are two alternatives to translate phylogenetic results into a new taxonomic approach: a) splitting *Salvia* into three different genera matching the clades recovered in the analysis and submerging the other intermixed genera within them, b) recognizing only one genera and submerging those that are intercalated within *Salvia* (Walker *et al.,* 2004). The second option seems more conservative and plausible since it

would not cause excessive taxonomic transfers and nomenclatural changes. Though, no one has formalized one of those alternatives, and hence the changes remain required.

Under the shade of the broad scenario, relevant progress has been reached in the understanding of the internal relationships of the richest *Salvia* clade, subgenus *Calosphace* (Benth.) Epling plus section *Audibertia* (Benth.) Epling (Walker *et al.*, 2004; Walker & Sytsma, 2007; Jenks *et al.*, 2012). These advances have evidenced what had been obvious since several decades ago: the sectional classification proposed by Epling and coworkers (Epling, 1939, 1940, 1941, 1944, 1947, 1951, 1960; Epling & Mathias, 1957; Epling & Játiva, 1963, 1966, 1968) for *Calosphace* is far from being natural (Standley & Williams, 1973; dos Santos, 1991, 1994). Several of the sections in *Calosphace* propose by Epling should be merged; others should be dismembered almost entirely. Despite this, it should not be got out of mind that Epling's work was titanic, especially when we consider the logistic and technological limitations he has to face in his time. This is clear since his treatment remains as the most relevant reference for students of New World sages. Though, phylogenetic analysis and the use of DNA sequences as evidence can provide new insights toward a more robust and stable classification for this group. Because of the numerous species, restricted distribution, taxonomic uncertainty and low representation of some species at the herbaria, the task of resolving phylogenetic relationships within *Calosphace* is a true challenge. One strategy is analyzing small groups and then filling information gaps. In this order of ideas, it is treated here one of the moderately rich sections, *Membranaceae* (Benth.) Epling. This section is composed by 12 species (González-Gallegos, in press) that can be distinguished because of their translucent, conspicuous reticulate veined, and persistent floral bracts, and usually small (less than 1 cm long) and sky blue corollas. These species are all distributed in Mexico, one extends (*S. mocinoi* Benth.) to Central America, and other to north South America (*S. lasiocephala* Hook. & Arn.). Epling (1939) accommodated these species in two subsections *Elscholtzioideae* Epling (*Salvia bupleuroides* J.Presl. ex Benth., *S. lasiocephala* and *S. verecunda* Epling) and *Lophanthoideae* Epling (*S. glabra* M.Martens & Galeotti, *S. langlassei* Fernald, *S. lophantha* Benth., *S. lophanthoides* M.Martens & Galeotti, *S. mexiae* Epling, *S. mocinoi*, *S. nitida* M.Martens & Galeotti, *S. rubiginosa* Benth., *S. sanctae-luciae* Seem. and *S. zacuapanensis* Brandegee). The first including the annual species, with corolla tubes no longer than 4 mm and internally epapillate, and rounded (lenticular) mericarps; and the other, perennial species, with corolla tubes of 5 mm or longer and internally ornate with 2 or 4 papillae, and ovoid mericarps. None of the published phylogenetic analyses on *Salvia* subgenus *Calosphace* (Jenks *et al.,* 2011, 2012; Walker *et al.*, 2004; Walker & Sytsma, 2007) has included a sample of any species of this section; the specimen that was used by some researches as *S. mocinoi* (*Crone 15/9/00*, MJG), it was wrong determined, actually belonging to *S. setulosa* Fernald (González-Gallegos, in press). Besides, a recent morphological survey and cladistic analysis in base to morphological characters has supported the monophyly of the section (González-Gallegos, in press), and contradicted the infra-sectional classification. *Lophanthoideae* was recovered as a paraphyletic group where species from *Elscholtzioideae* are nested as a clade. Thus, this current contribution will test the monophyly of the section and applicability of the infra-sectional classification analyzing DNA sequences (ITS, ETS and *trnL-F*) as new evidence to that provided by morphological characters. New insights about *Calosphace* phylogeny derived from the new sampled species will be also provided.

Materials and Methods

Taxon sampling and outgroups. The analyses were done with a different set of taxa depending on the loci used and DNA sequences available in GenBank. The ITS analysis involved 140 species (13 from section *Audibertia*), those of ETS 73 species (2 from *Audibertia*), and *trnL-F* 123 species (11 from *Audibertia*). Two combined analyses were carried out, one with ITS and ETS (154 species), and the other with the three loci (158 species). In all cases *Dorystaechas hastata* served to root the tree, based on the results of previous phylogenetic analyses on the genus (Walker *et al.,* 2004; Walker & Sytsma, 2007; Jenks *et al.,* 2012). In this study, ITS was sequenced for 71 species, ETS for 68, and *trnL-F* for 67; the sequences of the remaining species analyzed for each loci were obtained from GenBank. Voucher information and GenBank accession numbers are summarized in Appendix 1. The main and more diverse sections proposed by Epling (1939) were represented. All but one of the species conforming section *Membranaceae* were surveyed, since samples of *Salvia verecunda* Epling did not amplified for the different DNA loci processed.

DNA extraction, amplification, and sequencing. DNA was extracted form silica-dried leaves and recent herbarium specimens using DNeasy^{TM} plant mini kit (Qiagen, Valencia, California) according to manufacturer's specifications. The PCR procedures were standard and similar to those described in Sytsma *et al.* (2002). The chloroplast region *trnL-F* was amplified using the C and F primers (Taberlet *et al.,* 1991), the rDNA sequences ITS and ETS were amplified using the primers Leu1 (Baldwin 1992) and ITS4 (White *et al.,* 1990), 18S and IGS (Baldwin & Markos, 1998), respectively.

The PCR products obtained with TaKaRa Ex Taq (Otsu, Shiga, Japan), were diluted 30 x in water prior to cycle sequencing and subsequently cleaned using Agencourt magnetic beads (Agencourt, Beverly, Massachusetts). Cycle sequencing reactions used the ABI PRISM BigDye terminator Cycle Sequencing Ready Reaction Kit (Applied Biosystems, Foster City, California) and same primers than in PCR reactions. Samples were electrophoresed on an Applied Biosystems 3730xl automated DNA sequencing instrument, using 50 cm capillary arrays and POP-y polymer. Data were anaylized using PE-Biosystems version 3.7 of Sequencing Analysis at the Universtiy Wisconsin-Madison Biotechnology Center.

Phylogenetic Analyses. Sequences of ITS, ETS and *trnL-F* were manually edited in Sequencher 4.7 and 5.1 (Gene Codes, Ann Arbor, Michigan) and the resulting sequences were manually aligned in McClade 4.08 (Maddison and Maddison 2005). Parsimony (P) analyses were conducted in NONA (Goloboff, 1997) by means of Winclada framework (Nixon, 2002). The searches were unconstrained, retaining 10 000 trees as a maximum (hold), 1 000 replicates (mult*N), starting with one tree (hold/), and with performance of TBR +TBR branch swapping. The matrix of the combined three loci was analyzed with unconstrained searches, retaining 1 000 trees as maximum (hold), 500 replicates (mult*N), one starting tree, and with performance of TBR + TBR branch swapping. Bootstrap (Felsenstein, 1985) values were obtained by performing 1 000 heuristic searches using all characters, with 10 TBR branch swapping replicates per bootstrap, and saving no more than 100 trees per replicate. Maximum likelihood (ML) analysis was conducted in the online platform Phylogeny.fr by PhyML using default parameters and GTR GAMMA as the model of evolution, which was deduced through JModelTest; BS was calculated with 100 replicates using same parameters. Gaps were treated as missing data in all analyses and indels were not codified. Analyses were conducted with independent and concatenated regions.

Results

An overview of general features of the MP analyses results is summarized in table 1. The ITS analyses recovered 10000 more parsimonious trees. In the strict consensus tree two major clades were obtained (fig. 1), 1) section *Audibertia* excluding *Salvia californica* Brandegee and *S. greatae* Brandegee (bootstrap support, BS, 100%) and 2) subgenus *Calosphace* including the later two species (BS 98%; fig. 1). A clade consisting of *S. axillaris, S. californica* and *S. greatae* (BS 98%) was sister to the remaining species of *Calosphace* (BS 99%). Then, the next clade was the one enclosing the species from section *Blakea* Epling, *Hastatae* Epling and *Standleyana* Epling (BS 99%). Other major clades were Microsphace (with species of sections *Corrugatae* Epling, *Cucullatae* Epling, *Fernaldia* Epling, *Microsphace* (Benth.) Epling, and *Uliginosae* (Epling) Epling; BS 86%), Fulgentes (with species of sections *Cardinales* Epling, *Flocculosae* (Epling) Epling, *Fulgentes* Epling, and *Nobiles* Epling; BS 99%), Membranaceae (species only from the homonym section; BS 96%), Sigmoidea (with one species from *Scorodonia* Epling and the rest from *Sigmoidea* Epling), and Briquetia (with species recently described and tentatively assigned to section *Briquetia* Epling, as well as traditional species of the section and some from *Albolanatae* (Epling) Epling and *Angulatae* (Epling) Epling). The section *Membranaceae*, as stated above, was recovered as monophyletic in the strict consensus tree; the section was nested in a polytomy, so no sister group was recovered, though, *Salvia madrensis* Seem. appeared as its sister in most of the trees. *Membranaceae* was integrated by two clades, the first including *Salvia mexiae* and *S. mocinoi*, and *S. langlassei* with *S. sanctae-luciae*, as sisters, respectively; and the second with a clade assembling the species from subsection *Elsholtzioideae* (*S. bupleuroides* and *S. lasiocephala*) plus *S. compsostachys* Epling, other with *S. confertispicata* I.Fragoso & Mart.Gord., *S. glabra* and *S. lophanthoides*, and *S. nitida* as sister of the previous two clades.

In the ETS strict consensus tree (fig. 2) similar clades were shown as those from ITS analyses and with BS above 60% (Hastatae, Membranaceae, and Sigmoideae). Microsphace clade was split into two clades, Fulgentes into three, and Briquetia was not clearly defined. Section *Membranaceae* was recovered also as monophyletic (BS 80%) and with *S. albiterrarum* and *S. platyphylla* as the sister group, but poorly supported (BS 56%). The internal relationships differed in several aspects, *S. compsostachys* was sister to the other species, *S. mocinoi* was more related to *S. confertispicata*, *S. glabra* and *S. lophanthoides*, than to *S. langlassei*, *S. mexiae* and *S. sanctae-luciae*.

The *trnL-F* analyses produced the poorest resolution (fig. 3); most of the species were arranged in a polytomy in the strict consensus tree (fig. 3). However, section *Audibertia* was recovered as a monophyletic group (BS 98%) and sister to all subgenus *Calosphace*; species from sections *Blakea*, *Hastatae* and Standleyana formed again a supported clade (BS 98%) at base of *Calosphace* diversity; Microsphace clade was split into two different clades; Membranaceae was recovered as a monophyletic group. The internal relationships of the former differ from those obtained with the analyses of ITS and ETS. *Salvia glabra*, *S. langlassei*, *S. lophanthoides* and *S. mocinoi* are together in a polytomy with strong support (BS 96%), then, *S. bupleuroides*, *S. compsostachys* and *S. confertispicata* are in monospecific branches toward the base of the clade.

In the analyses of the combined ITS and ETS sequences (cladograms not shown here), the relationships recovered were closer to those of ITS analyses. The clades obtained were: Microsphace (BS 93%), Membranaceae (99%), Fulgentes (BS 98%), Sigmoideae (BS 99%), Cylindriflorae (BS 94 %), Biflorae (BS 91 %), Briquetia (BS 91%), and Potiles (92%). Cylindriflorae was composed of only South American species, from the sections *Coerulea* Epling, *Cylindriflorae* (Epling) Epling, *Exiles* Epling, *Charantia* (Epling) Eplig, *Hoehneana* (Epling) Epling, *Longiflorae* (Benth.) Epling, *Malacophyllae* Epling, *Secundae* (Benth.) Epling, and *Tuberosae* (Epling) Epling; Biflorae by species from *Biflorae* (Benth.) Epling, *Farinaceae* (Epling) Epling, *Flocculosae*, and *Phoeniceae* (Epling) Epling; and Potiles by species of sections *Angulatae* (Epling) Epling, *Carneae* (Epling) Epling, *Curtiflorae* Epling, *Farinaceae*, *Iodanthae* Epling, *Potiles* Epling, *Tubiflorae* (Epling) Epling. In Membranaceae clade, there were two more inclusive groups; the first composed by *S. langlassei* and *S. sanctae-luciae* as sisters, and then *S. mexiae,* and the other by two subclades, one with *S. mocinoi* and *S. nitida* as sisters, and the other with *S. confertispicata* as sister of both *S. glabra* and *S. lophanthoides*. Outside these, there was a clade assembling *S. bupleuroides* and *S. lasiocephala*. And finally, *S. compsostachys* was sister to the remaining species of *Membranaceae*.

The analyses of the combined three DNA regions produced a strict consensus tree with a topology most similar to that of ITS (fig. 4). Similar clades were recovered with more than 70% of BS. The recovered clades were a non monophyletic *Audibertia* (because *s. greatae* and *S. californica* were nested in as sisters of *S. axillaris* at base of *Calosphace* diversity), Hastatae, Microsphace (including also species from sections *Caducae* Epling, *Tomentellae* (Epling) Epling and the recently described and unplaced *S. acerifolia* B.L.Turner), Fulgentes (including also a species from sections *Brandegeia* Epling and *Micranthae*), Membranaceae, Sigmoideae, and Briquetia (including one species from section *Polystachyae* Epling). The internal relationships of the clade of section *Membranaceae* were also close similar to those obtained by the analysis of ITS, the conspicuous difference is that *S. mocinoi* did not form a clade together with *S. langlassei*, *S. mexiae* and *S. sanctae-luciae*; instead, it was located as sister of a clade that included *S. confertispicata*, *S. glabra* and *S. lophanthoides*, and *S. nitida*, in addition to the aforementioned three species.

The ML analyses of the combined three regions resulted in a topology also similar to the one derived form MP analyses of ITS (fig. 5). *Audibertia* was not recoverd as monophyletic because *S. calfornica*, *S. columbariae* Benth. and *S. greatae* were nested in a polytomy together with *S. axillaris* and the other species of *Calosphace*. The major clades within *Calosphace* were Hastatae, Microsphace, Membranaceae (nested in a polytomy with *S. discolor* Kunth and *S. madrensis* as sister groups), Fulgentes, Sigmoideae, and Cylindriflorae. The most external species in the clade of *Membranaceae* was *S. compsostachys*, then a clade composed by *S. lasiocephala* and *S. bupleuroides* (though poor supported) was sister to the rest of the section. In the core *Membranaceae*, *S. langlassei* and *S. sanctae-luciae* are sisters, and form a polytomy with *S. mexiae* and a more inclusive clade which embraces another polytomy of *S. nitida*, *S. mocinoi* and a clade where *S. glabra* and *S. lophanthoides* are sisters to *S. confertispicata*.

Discussion

Phylogenetic relationships within *Salvia* subgenus *Calosphace* were consistent with those obtained in previous phylogenetic analysis. Similar major clades are recovered to those of the analysis of Jenks *et al.* (2012): Hastatae, Uliginosae (here named as Microsphace), Fulgentes, and Sigmoideae, Clades Briquetia and Angulatae are not always clearly defined.

In the clade Hastatae we analyzed a species not previously included, *S. subpatens* Epling, which is placed as sister to a clade embracing *S. patens* Cav. and *S. vitifolia* Benth. The above contradicts the proposal of Klitgaard (2012) of considering the two later as valid species, whereas *S. subpatens* was reduced to synonymy of *S. patens*; hence, favor the González and Gama (2013) approach of recognizing *S. subpatens* as a distinct species.

We added several new sequences of species from sections *Uliginosae* and *Micranthae* that were nested in Microsphace clade. Until now all analyzed species from these sections have been placed in the same clade, so they should be probably fused in a unique section in the near future, together with the monospecific sections *Cucullatae* (*S. clinopodioides* Kunth) and *Fernaldia* (*S. albo-caerulea* Linden), and portions of sections *Brandegeia, Caducae*, *Corrugatae* and *Tomentellae*.

The sampling of section *Sigmoideae* is almost complete on this analysis; it is still necessary to include sequences of *S. crucis* Epling, *S. dyrophylla* Epling, and the recently described *S. pugana* J.G.González & Art.Castro. The section is recovered as monophyletic and sister to a clade made by *S. aequidistans* Fernald [as *S. tepicensis* Fernald in Jenks *et al.* (2012), which is treated here as synonym of the former] and *S. lycioides* A.Gray. However, the position of *S. lycioides* is unexpected and does not make sense in morphological terms; this should be reanalyzed more thoroughly. It is probable that *S. aequidistans* should be transfer to section *Sigmoideae* since even when it does not possess the sigmoid lower branch of the style, it does share the presence of bracteoles at base of the pedicels, character that is ubiquitous in the section (González-Gallegos & Castro-Castro, 2013). The position of *S. albiterrarum* J.G.González & Art.Castro is also interesting since its corollas are much larger, magenta instead of blue or sky blue, lower lip without clear nectar guides, and the occlusion of the corolla tube by the stamens is retracted almost till corolla base; that is, it exhibit morphological characters of an ornithophilous pollination syndrome, rather than melitophilous as the other species of the section; hence, the study of the relation between *S. albiterrarum* and *S. platyphylla* Briq. could be a good model for understanding the evolutionary pathway of a shift of pollinator syndrome in *Salvia* as stated by González-Gallegos and Castro-Castro (2013). Besides, the infra-sectional classification of *Sigmoideae* is not sustained. Epling (1939) and Espejo & Ramamoorthy (1993) recognized two internal groups within the section*, Eusigmoideae* (species with flowers in verticillasters, the pedicels inserted directly to inflorescence axis) and *Cymulosae* (inflorescences with dichotomous cymules at each node of main axis, so the flowers are not directly attached to this). However, the two species of *Cymulosae* (*S. chalarothyrsa* Fernald and *S. thrysiflora* Benth.) are not sisters in our cladograms, they are instead nested within lineages of *Eusigmoideae*, such the particular architecture of the inflorescences was originated twice in the section, and these subgroups should not be recognized. Finally, in relation to this section, Espejo and Ramamoorthy (1993) described *S. ramamoorthyana* Espejo in base to specimens from Tequila Volcano [*Breedlove 39269* (CAS, ENCB!, MEXU!, UC), *Reveal & Harley 4106* (CAS, F!, MEXU-297645!, MEXU-297646, MICH!, NY!, TEX!)], Sierra de Manantlán [*Iltis et al. 2403* (ENCB!, IBUG!, MEXU!, WIS!), *29382* (CHAPA!, IEB!, MEXU!, MICH!, WIS!); *McVaugh 10288* (MEXU!, MICH!, TEX, UC!), *13837* (MEXU!, MICH!, US); *Sorensen 7925* (ENCB!, MEXU!), *7935* (ENCB!, IBUG!, MEXU!, WIS!), *7988* (MEXU!, WIS!); and *Waller et al. 7* (ENCB!, IBUG!, MEXU, WIS!)] both localities in Jalisco, and Michoacán [*Ripley & Barneby 14844* (CAS, UC!, NY)], Mexico. They highlighted the cuneate leaves and glandular-capitate hairs in the calyces as the distinctive characters of the species. However, they selected the specimen of Tequila Volcano as the holotype [*Reveal & Harley 4106* (MEXU-297645!)], though this had rounded leaves at base. Furthermore, glandular-capitate hairs in the calyces are also present in other member of *Sigmoideae*, S. *nepetoides* in which the hairs are distributed in the calyces, pedicels and floral axes. The morphological variation of the specimens from Tequila and Michoacán and one from Manantlán (*Sorensen 7925*) match well within the circumscription of *S. nepetoides*, whereas the remaining specimens from Manantlán are consistent in presenting cuneate leaves and glandular-capitate hairs restricted to the calyces. For the purposes of our analyses we treated as *S. nepetoides* a specimen with truncate to rounded or cordate leaves and glandular-capitate hairs throughout the inflorescence [*González & Castro 817* (IBUG)), and as *S. ramamoorthyana* a specimen from Manantlán and with cuneate leaves and glandular-capitate hairs restricted to the calyces [*González & Santana 846* (IBUG)]. In the cladograms these species are not sisters, so they are truly different taxonomic entities. After this result, it is clear that Espejo and Ramamoorthy (1993) mixed two different species under their description of *S. ramamoorthyana*; thus, *S. ramamoorthyana* must be reduced to synonymy since the holotype is a specimen of *S. nepetoides*, and a new name should be coined for the distinctive populations of Manantlán, a task that is actually in process.

Salvia section *Membranaceae* is also recovered as supported clade but with no clear sister group. The monophyly of the section was previously documented by means of a cladistics analysis based on morphological characters (González-Gallegos, in press). However, not clear morphological synapomorphy has been found for the section. Persistent and showy floral bracts are distinctive, but not exclusive. For example, they are also present in *S. clinopodioides*, *S. gravida* Epling, *S. hispanica* L., S. *vazquezii* Iltis & Ramamoorthy, for mentioning only a few examples. What results more particular about floral bracts is the delicate texture and complex reticulate pattern of venation. In the same reference the infra-sectional classification was questioned since the recognition of subsection *Elscholtzioideae* would leave *Lophanthoideae* as a paraphyletic group. In our present analyses, similar results are derived. *Salvia bupleuroides* and *S. lasiocephala* (species from *Elscholtzioideae*) are sisters but originated from a *Lophanthoideae* lineage. *Salvia verecunda*, the other species of *Elscholtzioideae*, was not surveyed; however, in one side, the perennial habit and ovoid mericarps related it more to *Lophanthoideae*, and in the other, in the morphological analyses cited, it was recovered as part of the *Elsholtzioideae* clade. Either one way or another, if *S. verecunda* was nested between *Lophanthoidea* or *Elscholtzioideae* species, the infra-sectional classification should not be recognized, since subsections would not be monophyletic, or they would not have clear characters defining them. Hence, infra-sectional classification is discarded. In the internal relationships, *S. compsostachys* is the most external species, and a strong relation between *S. bupleuroides* and *S. lasiocephala*, *Salvia langlassei* and *S. sanctae-luciae*, and *S. coferticspicata*, *S. glabra* and *S. lophanthoides*, and these with *S. mocinoi* and *S. nitida* are supported.

This analysis manifests some troubles. The instability of the position of *S. axillaris* is in discordance with the stable result of previous analyses where this species is the evident more basal species of *Calosphace* and *Audibertia* a monophyletic group. In the ML analysis *Salvia vazquezii* subsp. *vazquezii* and *S. vazquezii* subsp. *tancitaroensis* appear located very distantly, and in MP analysis subsp. *tancitaroensis* form a clade together with *S. gravida*, what open the question if such subspecies should be transfer.

It is critical to continue increasing the *Calosphace* species and DNA regions surveyed to reach a better understanding of the relationships within the subgenus, and to draft a new classification proposal. However, against the difficulties and information gaps, some new groups are being outlined, and which probably will shape the new classification framework.

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Table 1. Summary of general features of the MP analyses conducted.

Loci	Number of nucleotides	Number of parsimony informative characters and percentage	Number of trees	Number of steps	CI	RI	Collapsed branches in the strict consensus tree
ITS	820	275 (33.54%)	10000	1538	33	71	54
ETS	540	238 (44.07%)	144	2859	48	72	13
trnL-F	1091	123 (11.27%)	10000	256	60	88	103
ITS & ETS	1360	513 (37.72%)	10000	2859	43	71	70
ITS, ETS & *trnL-F*	1551	636 (41.01%)	10000	247	60	80	90

Appendix 1. Vocher information and GenBank accession numbers (ITS, ETS and *trnL-F*) for taxa used in this study. The sections are assigned according to Epling's proposal (Epling, 1939, 1940, 1941, 1944, 1947, 1951, 1960; Epling & Mathias, 1957; Epling & Játiva, 1963, 1966, 1968), and species described before are not assigned or assigned to the section suggested by the authorities of the taxon. Meaning of herbarium acronyms are as follows: IBUG (Herbario del Instituto de Botánica, Universidad de Guadalajara, Mexico), RBG (Royal Botanic Gardens, Edinburgh, Great Britain), MJG (Institut für Spezielle Botanik und Botanischer Garten, Mainz, Germany), MO (Missouri Botanical Garden, St. Louis, U.S.A.), UCR (University of California, Riverside, U.S.A.), UCRBG (University of California, Riverside, Botanic Gardens, U.S.A.), WIS (University of Wisconsin-Madison, U.S.A.)In the columns of GenBank accession numbers, p means pending number assignation, and na not amplified sequence.

Species	**Section according to Epling's classification**	**Voucher**	**ITS**	**ETS**	***trnL-F***
Dorystaechas hastata Boiss. & Heldr. ex Benth.		cultivated RBG (E-19720177)	DQ667252	p	AY570454
Salvia acerifolia B.L.Turner	Not assigned	*González 788* (IBUG)	p	p	p
Salvia aequidistans Fernald	Scorodonia	*González 491* (IBUG)	p	p	p
Salvia alamosana Rose	Sigmoideae	*González et al. 660* (IBUG)	p	p	p
Salvia albiterrarum J.G.González & Art.Castro	Sigmoideae	*González et al. 1246* (IBUG)	p	p	p
Salvia albo-caerulea Benth.	Fernaldia	*González & Santana 838* (IBUG)	p	p	p
Salvia angustiarum Epling	Brandegeia	*González 358* (IBUG)	na	p	p
Salvia apiana Jeps.	Audibertia	*Walker 2509* (WIS)	DQ667214	na	na
Salvia aspera M.Martens & Galeotti	Conzattiana	*Walker 3021*	HQ418847	na	na
Salvia atrocyanea Epling	Coerulea	*Wester 3*	DQ667270	na	na
Salvia axillaris Moc. & Sessé	Axillares	*Walker 3038* (WIS)	DQ667294	JF301330	na
Salvia azurea Michx. ex Vahl	Farinaceae	*Walker 3222* (WIS)	DQ667317	na	na
Salvia ballotiflora Benth.	Tomentellae	*Walker 2547*	HQ418849	na	na
Salvia bangii Rusby	Tomentellae	*Wester 10*	DQ667263	na	na
Salvia betulifolia Epling	Erythrostachys	*González 349* (IBUG)	p	p	na
Salvia blepharophylla Brandegee	Brandegeia	*cultivated* (UCRBG)	HQ418850	na	na
Salvia bupleuroides J.Presl. ex Benth.	Membranaceae	*González 594* (IBUG)	p	p	p
Salvia cacaliifolia Benth.	Standleyana	cultivated RBG (E-1959-9358A)	DQ667259	na	na
Salvia californica Brandegee	Audibertia	*Walker 2520* (WIS)	HQ418852	na	na
Salvia cacomensis J.G.González, J.Morales et J.Rodríguez	Not assigned	*Rodríguez et al. 340* (IBUG)	p	p	p
Salvia candicans M.Martens & Galeotti	Tomentellae	*Walker 3001* (WIS)	DQ667299	na	na
Salvia carnea Kunth	Carnea	*González 582* (IBUG)	p	p	p
Salvia carreyesii J.G.González	Briquetia	*González 798* (IBUG)	p	p	p
Salvia cedrosensis Greene	Flocculosae	*Walker 2539* (WIS)	DQ667228	na	na
Salvia chalarothyrsa Fernald	Sigmoideae	*González et al. 539* (IBUG)	p	p	p

Salvia chamaedryoides Cav.	Flocculosae	*Walker 2009* (WIS)	HQ418855	na	na
Salvia chazarona	Uliginosae	*Carrillo 5444* (IBUG)	na	p	p
Salvia chionopeplica Epling	Flocculosae	*Walker 2545* (WIS)	DQ667227	na	na
Salvia cinnabarina M.Martens & Galeotti	Incarnatae	*Walker 3030* (WIS)	HQ418856	na	HQ418959
Salvia clevelandii (A.Gray) Greene	Audibertia	*Walker 2508* (WIS)	DQ667219	na	AY570473
Salvia clinopodioides Kunth	Cucullatae	*Iltis 28770* (WIS)	HQ418857	na	HQ418960
Salvia coccinea Buc'hoz ex Etl.	Subrotundae	*González 589* (IBUG)	p	p	p
Salvia columbariae Benth.	Audibertia	*Walker 1300*	na	na	AY570475
Salvia compsostachys Epling	Membranaceae	*González 656* (IBUG)	p	p	p
Salvia concolor Lamb. ex Benth.	Dusenostachys	*González & Machuca 1182* (IBUG)	p	p	p
Salvia confertiflora Pohl	Secundae	*cultivated 1959-916A* (WIS)	na	na	HQ418962
Salvia confertispicata I.Fragoso & Mart.Gord.	Membranaceae	*González 589* (IBUG)	p	p	p
Salvia corrugata Vahl	Corrugatae	*Walker 2531*	na	na	AY570476
Salvia cryptodonta Fernald	Lavanduloideae	*González et al. 1266* (IBUG)	p	p	p
Salvia cualensis var. *perezii* J.G.González	Farinaceae	*González 1085* (IBUG)	p	p	na
Salvia discolor Kunth	Discolores	*Walker 2546* (WIS)	HQ418860	na	na
Salvia divinorum Epling	Dusenostachys	*Walker 3230* (WIS)	DQ667249	na	HQ418964
Salvia dombeyi Epling	Longifloae	*Jenks 237* (UCR)	HQ418862	na	HQ418965
Salvia dorisiana Standl.	Cardinales	*2000-1632* (WIS)	HQ418863	na	HQ418966
Salvia dorrii (Kellogg) Abrams	Audibertia	*Walker 2541* (WIS)	AF538904	na	DQ667430
Salvia dugesii Fernald	Scorodonia		FJ883508	na	na
Salvia farinaceae Benth.	Farinaceae	*Walker 2525*	EU169483	na	AY570479
Salvia flaccidifolia Fernald	Angulatae	*Reisfield & Sundberg 1212* (MO)	HQ418865	na	HQ418865
Salvia fulgens Cav.	Fulgentes	*González et al. 731* (IBUG)	p	p	na
Salvia fruticulosa Benth.	Tomentellae	*Crone 1/8/00* (MJG)	na	na	HQ418969
Salvia gesneriflora Lindl. ex J.Paxton	Nobiles	*González et al. 291* (IBUG)	p	p	p
Salvia glabra M.Martens & Galeotti	Membranaceae	*Pérez & Zamudio 3283* (IBUG)	p	p	p
Salvia graciliramulosa Epling & Játiva	Exiles	*Wester 14* (MJG)	DQ667276	na	DQ667461
Salvia gravida Epling	Skeptostachys	*González et al. 464* (IBUG)	p	p	p
Salvia greatae Brandegee	Audivertia	*Walker 2511* (WIS)	DQ667215	JF301337	AY570481
Salvia greggii A.Gray	Flocculosae	*cultivated* (UCRBG)	na	na	JQ888144
Salvia grewifolia S.Moore	Hoehneana	*Wester 15* (MJG)	HQ418871	na	na
Salvia guaranitica A.St.-Hill. ex Benth.	Coerulea		KC473237	na	AJ5055549
Salvia haenkei Benth.	Cylindriflorae	*Wester 71* (MJG)	DQ667271	na	DQ667457
Salvia hamulus Epling	Uliginosae	*González 727* (IBUG)	p	p	p

Salvia helianthemifolia Benth.	Lavanduloideae	*González et al. 1273* (IBUG)	na	p	na
Salvia helianthemifolia Benth. (quila)	Lavanduloideae	*Paizanii 84* (IBUG)	na	p	p
Salvia hintonii Epling	Uliginosae	*González 441* (IBUG)	p	p	p
Salvia hispanica L.	Potiles	González 576 (IBUG)	p	na	na
Salvia holwayi S.F.Blake	Cardinales	*González 462* (IBUG)	p	p	p
Salvia ibugana J.G.González	Angulatae	*González et al. 939* (IBUG)	p	na	p
Salvia iodantha Fernald	Iodantheae	*González 281* (IBUG)	p	p	na
Salvia jaimehintoniana B.L.Turner	Farinaceae	*González 491* (IBUG)	p	na	p
Salvia karwinskii Benth.	Cardinales	*González & Zárate 1436* (IBUG)	p	p	p
Salvia langlassei Fernald	Membranaceae	*González 1517* (IBUG)	p	p	p
Salvia languidula Fernald	Angulatae	*González 747* (IBUG)	na	p	p
Salvia lasiantha Benth.	Mitratae	*Walker 3009* (WIS)	DG667300	na	HQ418976
Salvia lasiocephala Hook. & Arn.	Membranaceae	*González 485* (IBUG)	p	na	na
Salvia lavanduloides Kunth	Lavanduloideae	*González 450* (IBUG)	p	p	p
Salvia leucantha Cav.	Albolanatae	*Walker 1205* (WIS)	HQ418875	na	na
Salvia leucophylla Greene	Audibertia	*Walker s.n.* (cultivated)	DQ667210	na	na
Salvia longispicata M.Martens & Galeotti	Angulatae	*González 536* (IBUG)	p	p	p
Salvia longistyla Benth.	Curtiflorae	*González 680* (IBUG)	p	p	p
Salvia lophanthoides M.Martens & Galeotti	Membranaceae	*González et al. 1508* (IBUG)	p	p	p
Salvia lycioides A.Gray	Flocculosae	*Walker 2047*	na	na	AY570484
Salvia macellaria Epling	Flocculosae	*González & Pérez 1111* (IBUG)	p	p	p
Salvia macrophylla Benth.	Hastatae	*Riina 1472* (WIS)	HQ418877	na	HQ418979
Salvia madrensis Seem.	Longipes	*Peterson 738* (WIS)	HQ418878	na	HQ418980
Salvia manantlanensis T.P.Ramamoorthy	Uliginosae	*González et al. 1223* (IBUG)	p	p	na
Salvia melissodora Lag.	Scorodonia	*González et al. 688* (IBUG)	p	p	p
Salvia mellifera Greene	Audibertia	*Walker 2550* (WIS)	HQ418879	JF301338	DQ667427
Salvia mexiae Epling	Membranaceae	*González et al. 802* (IBUG)	na	p	na
Salvia mexicana L.	Briquetia	*González 494* (IBUG)	na	p	na
Salvia microphylla Kunth	Fulgentes	*González 1130* (IBUG-ITS & ETS); *Walker 1208* (WIS)-*trnL-F*	p	p	AY570486
Salvia misella Kunth	Microsphace	*González et al. 965* (IBUG)	p	p	p
Salvia mocinoi Benth.	Membranaceae	*González et al. 449* (IBUG)	p	p	p
Salvia mohavensis Greene	Audibertia	*Walker s.n.* (cultivated)	AF538920	na	DQ667423
Salvia monantha Brandegee ex Epling	Microsphace	*González et al. 661* (IBUG)	p	p	p
Salvia nepetoides Kunth	Sigmoideae	*González & Castro 817* (IBUG)	p	p	na
Salvia munzii Epling	Audibertia	*Walker 2507* (WIS)	DQ667224	na	DQ667428
Salvia nitida M.Martens & Galeotti	Membranaceae	*González 571* (IBUG)	p	na	na
Salvia oaxacana Fernald	Conzattiana	*Salinas 2705* (UCR) [I:	HQ418881	na	HQ418983

Salvia occidentalis Sw.	Microsphace	*Walker 612*	na	na	HQ418984
Salvia oppositiflora Ruiz & Pav.	Biflorae	*Riina 1477* (WIS)	HQ418883	na	HQ418985
Salvia orbignaei Benth.	Charantia	*Wester 43* (MJG)	DQ667279	na	DQ667464
Salvia ovalifolia A.St.-Hill.	Rudes	*Sytsma 7226* (WIS)	DQ667315	na	DQ667502
Salvia oxyphora Briq.	Tuberosae	*Wester 16* (MJG)	DQ667262	na	DQ667448
Salvia pachyphylla Epling ex Munz	Audibertia	*Walker 2535* (WIS)	AF538907	na	DQ667431
Salvia patens Briq.	Blakea	*cultivated RBG (E-9197)*	HQ418885	JF301333	HQ418987
Salvia personata Epling	Angulatae	*Wester 17* (MJG)	DQ667277	na	na
Salvia platystoma Epling	Malacophyllae	*Wester 18* (MJG)	na	na	DQ667462
Salvia podadena Fernald	Micranthae	*González et al. 1352* (IBUG)	p	p	p
Salvia polystachya Cav.	Polystachyae	*González 581* (IBUG)	p	p	p
Salvia pringlei B.L.Rob. & Greenm.	Tubiflorae	*González 1138* (IBUG)	p	p	p
Salvia procurrens Benth.	Uliginosae	*Bonif 941*	DQ667304	na	DQ667490
Salvia protracta Benth.	Sigmoideae	*Walker 3045*	DQ667298	na	HQ418975
Salvia prunelloides Benth.	Uliginosae	*Crone 15/9/00*	DQ667275	na	DQ667460
Salvia prunifolia Fernald	Uliginosae	*Gozález et al. 347* (IBUG)	na	p	na
Salvia prunifolia Fernald (*caerulea*)	Uliginosae	*Monroy et al. 95* (IBUG)	p	p	p
Salvia pubescens Benth.	Erythrostachys	*Walker 3043* (WIS)	HQ418887	na	DQ667482
Salvia pulchella DC.	Nobiles	*González 871* (IBUG)	p	p	p
Salvia punicans Epling	Carnea	*González 1439* (IBUG)	p	p	p
Salvia purpurea Cav.	Purpurea	*González et al. 457* (IBUG)	p	na	p
Salvia quercetorum Epling	Sigmoideae	*González et al. 1448* (IBUG)	p	p	na
Salvia ramamoorthyana Espejo	Sigmoideae	*González & Santana 846* (IBUG)	p	p	p
Salvia ramirezii	Sigmoideae	*González et al. 1042* (IBUG)	p	p	p
Salvia regla Cav.	Erythrostachys	*Walker 3019* (WIS)	na	na	DQ667503
Salvia reptans	Farinaceae	*González 362* (IBUG)	p	p	na
Salvia retinervia Briq.	Tomentellae	*Riina 1508a* (WIS)	HQ418888	na	HQ418990
Salvia richardsonii B.L.Turner	Farinaceae	*González 630* (IBUG)	p	p	p
Salvia rogersiana	Briquetia	*González 781* (IBUG)	p	p	na
Salvia rostellata Epling	Uliginosae	*González 504* (IBUG)	na	p	na
Salvia rusbyi Britton ex Rusby	Cylindriflorae	*Wester 31* (MJG)	DQ667278	na	DQ667463
Salvia rypara Briq.	Malacophyllae	*Wester 32* (MJG)	na	na	DQ667452
Salvia sagittata Ruiz & Pav.	Hastatae	*Weigend & Dostert 97/s.n.* (WIS)	DQ667260	na	DQ667446
Salvia sanctae-luciae Seem.	Membranaceae	*González 917* (IBUG)	p	p	na

Figure legends

Figure 1. Strict consensus tree of MP analysis of ITS region. An outline of the complete tree is shown on the right; major clade are highlighted with a colored bar on the left of the outline (AUD= Audibertia, HAS= Hastatae, FUL= Fulgentes, MEM= Membranaceae, MIC= Microsphace, BRI= Briquetia, and SIG= Sigmoideae). Then, upper (A) and lower (B) portions of the tree are amplified; on this, major clades are highlighted with the same color bars than in the general outline. BS values higher than 70% are shown near to the branches; 100% is represented by and asterisk.

Figure 2. Strict consensus tree of MP analysis of ETS region. Major clades are highlighted with colored bars (HAS= Hastatae, MIC= Microsphace, FUL= Fulgentes, SIG= Sigmoideae, MEM= Membranaceae). BS values higher than 70% are shown above each branch; 100% is represented by and asterisk.

Figure 3. Strict consensus tree of MP analysis of *trnL-F* region. Major clades are highlighted with colored bars (AUD= Audibertia, HAS= Hastatae, MEM= Membranaceae). BS values higher than 70% are shown above each branch; 100% is represented by and asterisk.

Figure 4. Strict consensus tree of MP analysis of combined three regions (ITS, ETS and *trnL-F*). An outline of the complete tree is shown on the right; major clade are highlighted with a colored bar on the left of the outline (AUD= Audibertia, HAS= Hastatae, MIC= Microsphace, FUL= Fulgentes, MEM= Membranaceae SIG= Sigmoideae, and BRI= Briquetia). Then, upper (A), middle (B) and lower (C) portions of the tree are amplified on the left; major clades are highlighted with the same color bars than in the general outline. BS values higher than 70% are shown near to the branches; 100% is represented with an asterisk.

Figure 5. Tree of ML analysis of the combined regions (ITS, ETS, *trnL-F*). An outline of the complete tree is shown on the right; major clade are highlighted with a colored bar on the left of the outline (AUD= Audibertia, MIC= Microsphace, MEM= Membranaceae, FUL= Fulgentes, SIG= Sigmoideae, CYL= Cylindriflorae, and HAS= Hastatae). Then, upper (A), middle (B) and lower (C) portions of the tree are amplified on the left; major clades are highlighted with the same color bars than in the general outline. BS values higher than 70% are shown near to the branches; 100% is represented with an asterisk.

Figure 1

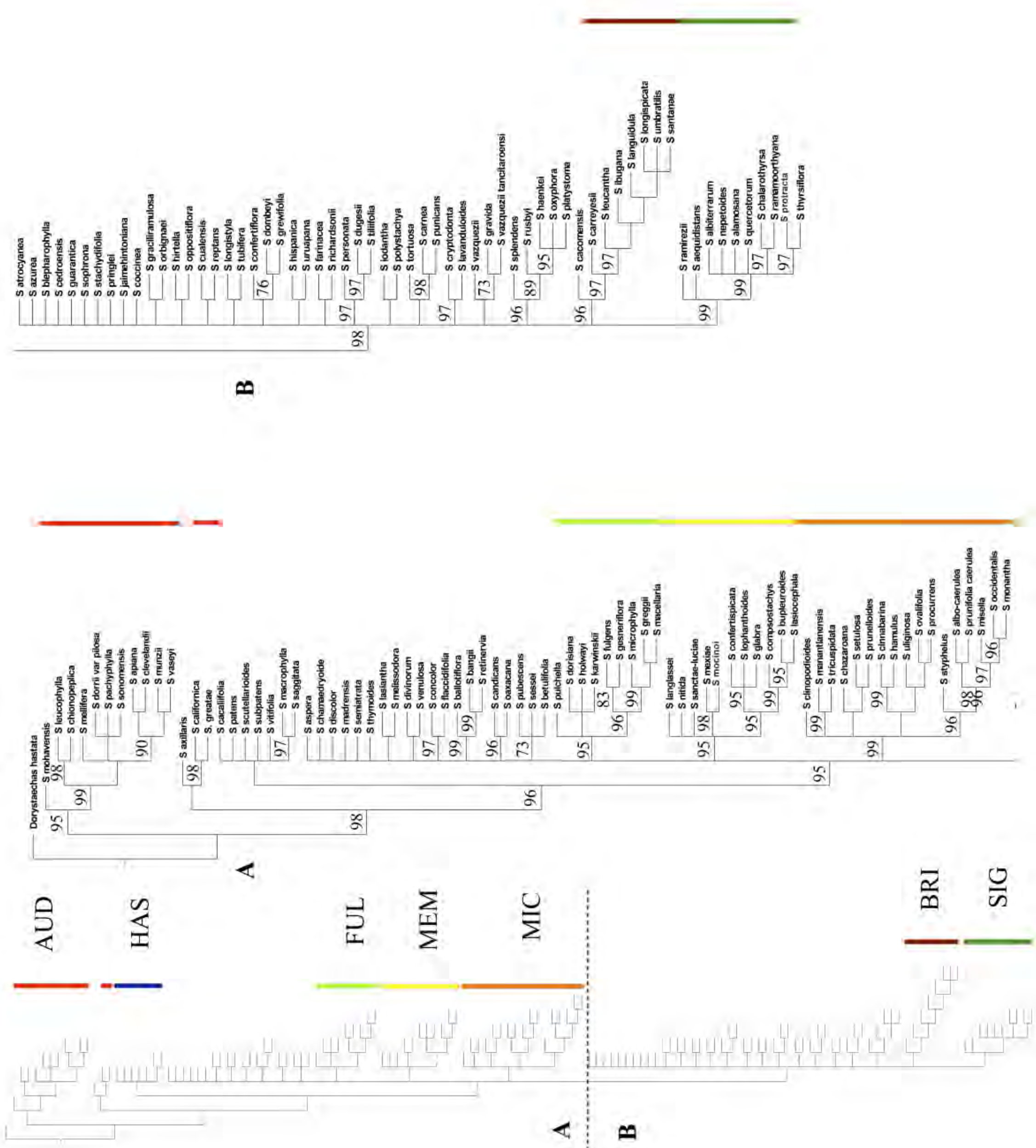

Figure 2

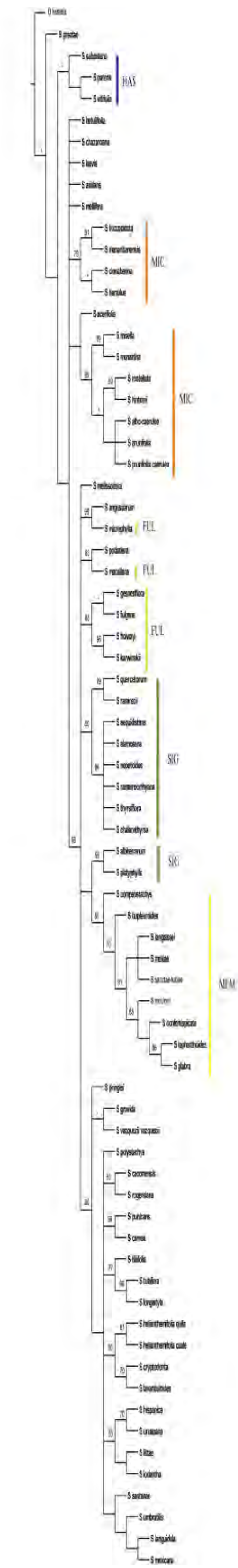

Figure 3


D hastata
S greatae
S columbariae
S mohavensis
S munzii
S spathacea
S sonomensis
S clevelandii
S dorrii
S mellifera
S pachyphylla
S vaseyi
AUD
S vitifolia
S subpatens
S patens
S macrophylla
S sagittata
S scutellarioides
HAS
S carnea
S iodantha
S betulifolia
S melissodora
S podadena
S acerifolia
S heterotricha
S hispanica
S purpurea
S richardsonii
S mexicana
S umbratilis
S uruapana
S aequidistans
S alamosana
S chalarothyrsa
S thyrsiflora
S gravida
S vazquezii tancitaroensi
S punicans
S tubifera
S ibugana
S ramamoorthyana
S albiterrarum
S gesneriflora
S holwayi
S karwinskii
S longispicata
S longistyla
S helianthemifolia quila
S clinopodioides
S confertiflora
S divinorum
S dorisiana
S vazquezii vazquezii
S fruticulosa
S greggii
S guaranitica
S madrensis
S oaxacana
S oppositiflora
S retinervia
S semiatrata
S sessei
S splendens
S styphelus
S tortuosa
S uliginosa
S venulosa
S coccinea
S corrugata
S farinacea
S gracilramulosa
S haenkei
S inconspicua
S lycioides
S orbignaei
S ovalifolia
S platystoma
S polystachya
S procurrens
S pubescens
S regla
S rypara
S sophrona
S stachydifolia
S subincisa
S thymoides
S tricuspidata
S languidula
S cryptodonta
S littae
S lasiantha
S macellaria
S microphylla
S ramirezii
S dombeyi
S concolor
S flaccidifolia
S laevis
S prunelloides
S oxyphora
S rusbyi
S jaimehintoniana
S carreyesii
S lavanduloides
S tiliifolia
S cinnabarina
S hintonii
S hamulus
S angustiarum
S albo-caerulea
S prunifolia caerulea
S rostellata
S monantha
S misella
S occidentalis
S confertispicata
S compsostachys
S bupleuroides
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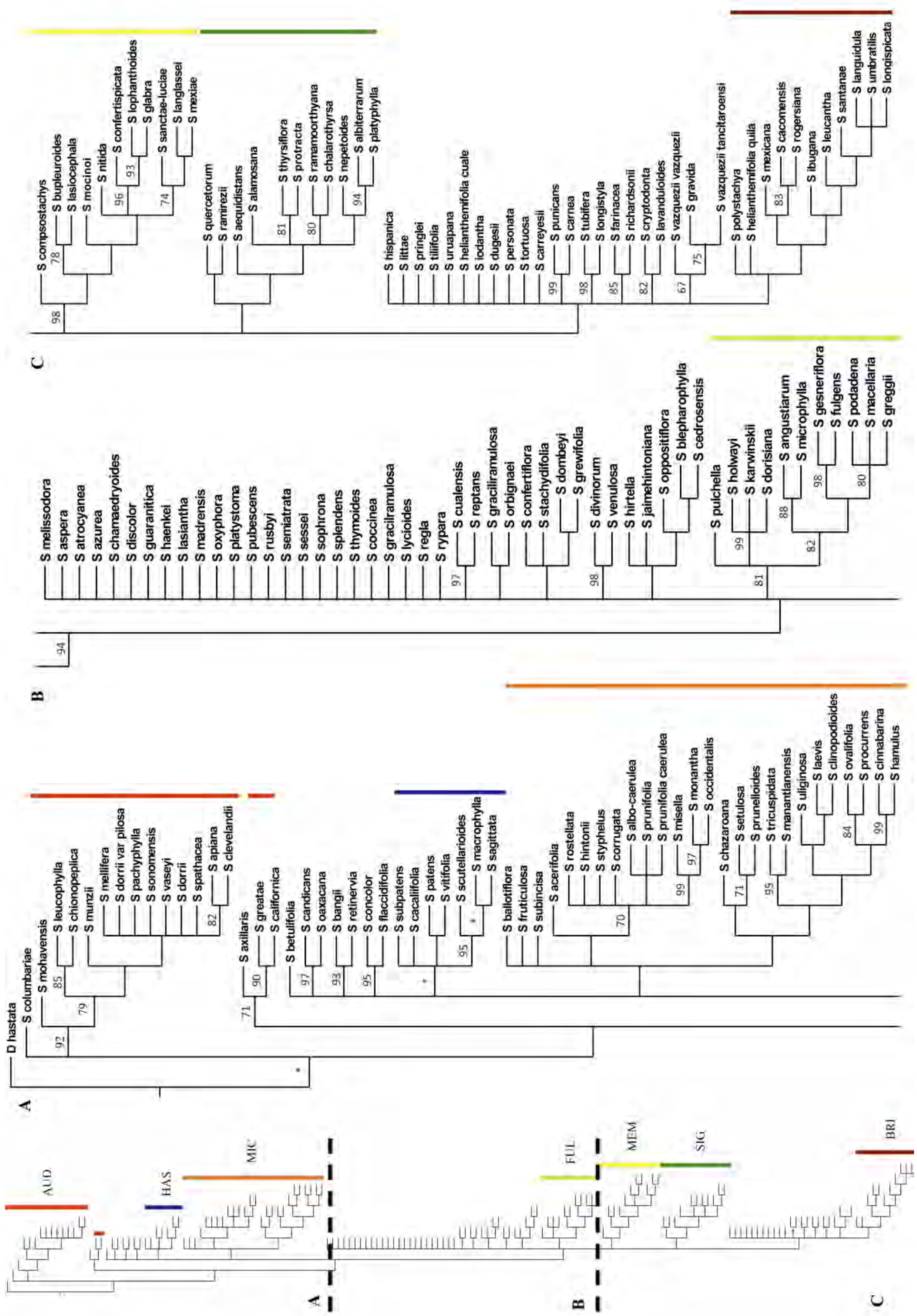
Figure 4



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S spathacea
S apiana
S clevelandii
S axillaris
S greatae
S californica
S betulifolia
S candicans
S oaxacana
S bangii
S retinervia
S concolor
S flaccidifolia
S subpatens
S cacaliifolia
S patens
S vitifolia
S scutellarioides
S macrophylla
S sagittata
S ballotiflora
S fruticulosa
S subincisa
S acerifolia
S rostellata
S hintonii
S stypheius
S corrugata
S albo-caerulea
S prunifolia
S prunifolia caerulea
S misella
S monantha
S occidentalis
S chazaroana
S setulosa
S prunelloides
S tricuspidata
S manantlanensis
S uliginosa
S laevis
S clinopodioides
S ovalifolia
S procurrens
S cinnabarina
S hamulus
S melissodora
S aspera
S atrocyanea
S azurea
S chamaedryoides
S discolor
S guaranitica
S haenkei
S lasiantha
S madrensis
S oxyphora
S platystoma
S pubescens
S rusbyi
S semiatrata
S sessei
S sophrona
S splendens
S thymoides
S coccinea
S graciliramulosa
S lycioides
S regla
S rypara
S cualensis
S reptans
S gracilliramulosa
S orbignaei
S confertiflora
S stachydifolia
S dombeyi
S grewifolia
S divinorum
S venulosa
S hirtella
S jaimehintoniana
S oppositiflora
S blepharophylla
S cedrosensis
S pulchella
S holwayi
S karwinskii
S dorisiana
S angustiarum
S microphylla
S gesneriflora
S fulgens
S podadena
S macellaria
S greggii
S compsostachys
S bupleuroides
S lasiocephala
S mocinoi
S nitida
S confertispicata
S lophanthoides
S glabra
S sanctae-luciae
S langlassei
S mexiae
S quercetorum
S ramirezii
S aequidistans
S alamosana
S thyrsiflora
S protracta
S ramamoorthyana
S chalarothyrsa
S nepetoides
S albiterrarum
S platyphylla
S hispanica
S littae
S pringlei
S tiliifolia
S uruapana
S helianthemifolia cuale
S iodantha
S dugesii
S personata
S tortuosa
S carreyesii
S punicans
S carnea
S tubifera
S longistyla
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S cryptodonta
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S vazquezii vazquezii
S gravida
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S polystachya
S helianthemifolia quila
S mexicana
S cacomensis
S rogersiana
S ibugana
S leucantha
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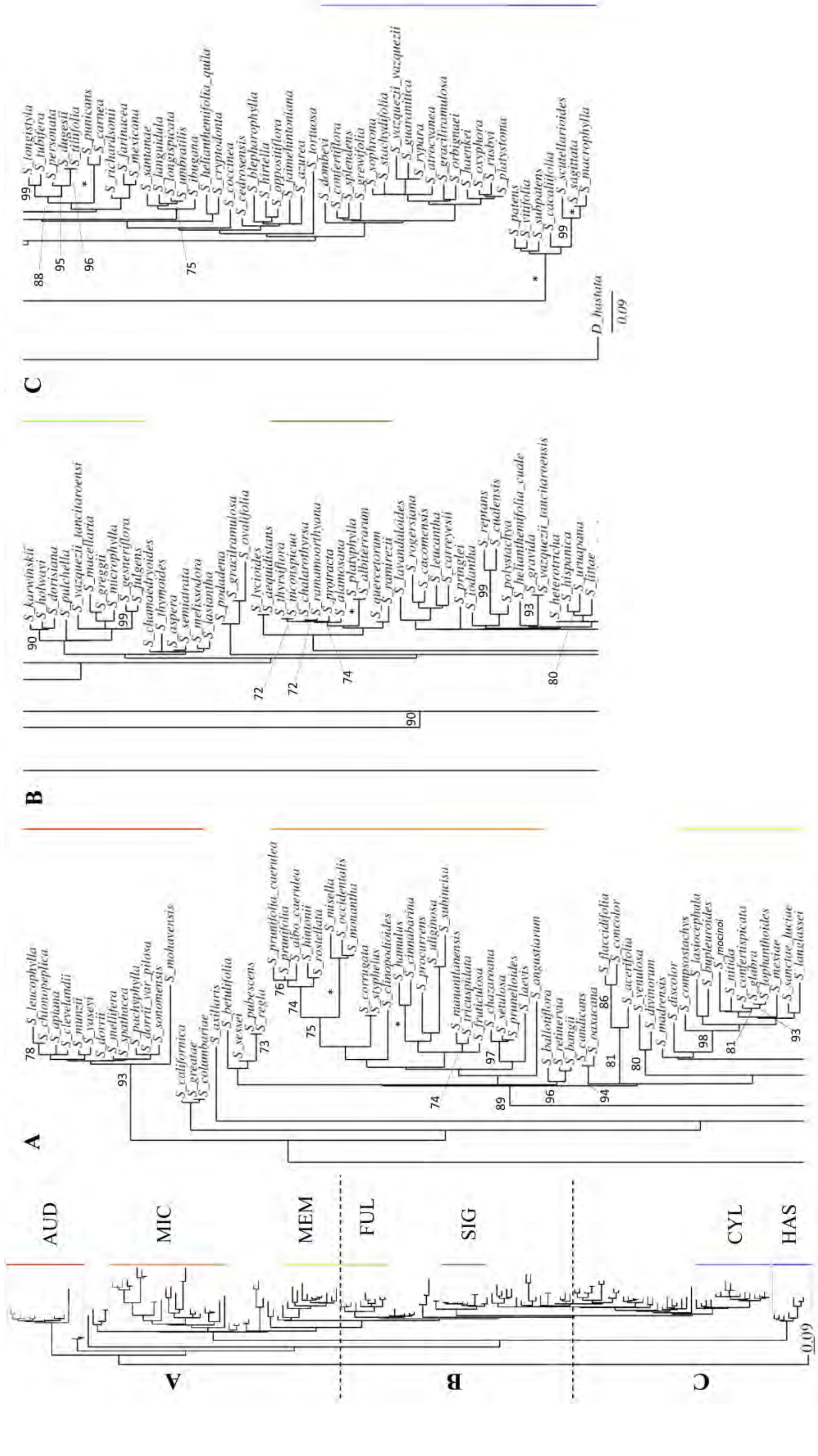
S languidula
S umbratilis
S longispicata

Figure 5



Capítulo 3. González-Gallegos, J. G., G. Vargas-Amado, E. De Castro-Arce, A. Castro-Castro y M. E. Mendoza-López. 201X. Diversidad y distribución de Lamiaceae en el occidente de México. *Botanical Sciences*

Diversidad y distribución de Lamiaceae en el Occidente de México

Diversity and distribution of mint family (Lamiaceae) in Western Mexico

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Resumen. La familia Lamiaceae es una de las que albergan mayor riqueza en México; sin embargo, su conocimiento es todavía incompleto. Este trabajo presenta un análisis de la diversidad y distribución de la familia en el occidente de México como una contribución al conocimiento del grupo. Para ello se hizo una revisión de literatura especializada, se examinaron especímenes de herbario de colecciones pertinentes, se hizo trabajo de campo, se generó una base de datos, se estimaron las coordenadas geográficas para especímenes que carecían de ellas o tenían datos incorrectos, y se realizaron análisis de la diversidad por unidades espaciales. Se conjuntó una base de datos de 6 504 registros, 5 880 de ellos con coordenadas geográficas. De allí se obtuvo una lista de 20 géneros y 163 especies para el área. Los géneros con mayor riqueza fueron *Salvia*, *Hyptis*, *Scutellaria* y *Stachys*. Se encontraron 22 taxones nuevos y novedades de la distribución de algunas especies. La riqueza de Lamiaceae se concentró por diferentes criterios en el estado de Jalisco, los municipios de Cuautitlán, Autlán de Navarro, Mascota y Talpa de Allende (todos de Jalisco), en bosques templados, en la Faja Volcánica Transmexicana, y en una latitud, longitud y altitud intermedias. Las Sierras de Manantlán, El Cuale y San Sebastián del Oeste reunieron la mayor cantidad de sitios de elevada riqueza. La diversidad y endemismo de labiadas en el occidente fue considerable, por lo que se recomienda el diseño e implementación de estrategias para su conservación. También se sugiere la necesidad de dar prioridad a la exploración botánica.

Abstract. Lamiaceae is one of the richest families in Mexico; however, its knowledge remains incomplete. This work focuses on the diversity and distribution of the family in western Mexico, as a contribution to fill the knowledge gaps. We conducted a revision of specialized publications, examination of herbarium specimens of selected herbaria, fieldwork, construction of a database, specimens without or with wrong spatial data were georreferenced, and analyses of diversity by spatial units were made. The resulting database was composed by 6 504 records, 5 880 of them with geographic coordinates. Western Mexico exhibited a diversity of 20 genera and 163 species. *Salvia*, *Hyptis*, *Scutellaria*, and *Stachys* were the richest genera. New taxa (22) and several novelties on species distribution were found. Lamiaceae richness was high in terms of different spatial criteria in Jalisco, municipalities of Cuautitlán, Autlán de Navarro, Mascota and Talpa de Allende (all of Jalisco State), temperate forests, Transmexican Volcanic Belt, and in intermediate latitude, longitude, and altitude. Mountain ranges as Manantlán, El

Cuale and San Sebastián del Oeste exhibited several sites of high diversity. Species richness and endemism grade of mints in western Mexico was appreciable, thus the designed and execution of conservation strategies are recommended. It is also suggested the necessity of giving priority to botanical exploration.

Palabras clave: biogeografía, conservación biológica, endemismo, Nueva Galicia, riqueza de especies

Introducción

La instauración de la sistemática filogenética y el desarrollo de análisis cladísticos han impactado fuerte la circunscripción original de la familia Lamiaceae y el resto de familias que conforman al orden Lamiales, así como las relaciones evolutivas entre ellas (APG, 1998; APG II, 2003; APG III. 2009; Albach et al., 2005; Beardsley & Olmstead, 2002; Bennett & Mathews, 2006; Marx et al., 2010; Olmstead et al., 2001; Shäferhoff et al., 2010; Wagstaff & Olmstead, 1997; Wagstaff et al., 1998). Algunas hipótesis de parentesco, como la supuesta estrecha relación entre las familias Lamiaceae y Verbenaceae (Cronquist, 1981), fue revelada como un artefacto derivado de una asignación errada de algunos géneros a estas familias (Cantino, 1992a, 1992b; Marx et al., 2010). A partir del trabajo de Cantino (1992a, 1992b), 10 tribus y más de 50 géneros de Verbenaceae fueron transferidos a Lamiaceae (Harley et al., 2004). De esta manera Verbenaceae queda casi restringida a la subfamilia Verbenoidae definida por Briquet (1895), y su lugar como grupo hermano de Lamiaceae es ahora sustituido por un clado conformado por Phrymaceae (cuya monofilia es dudosa, ya que las subfamilias Mazoideae y Phrymoideae aparecen como parafiléticas en el análisis de Marx et al., 2010), el género *Rehmannia* Lisbosch ex Fisch & C.A.Mey (asignado a Orobanchaceae en APG III, 2009; no asignado a familia alguna en Marx et al., 2010), Paulowniaceae y Orobanchaceae (APG, 1998; APG II, 2003; APG III, 2009; Marx et al., 2010; Olmstead et al. 2000). La confusión en la asignación tradicional de géneros a Lamiacee y Verbenaceae no es fortuita, la semejanza morfológica entre ellas es elevada aun después de ser recircunscritas. Marx et al. (2010) señalan que se distinguen por la posición de los óvulos respecto a los falsos septos que se forman en cada uno de los dos carpelos. En Verbenaceae los óvulos están sujetos de forma directa a los márgenes de los falsos septos del carpelo, mientras en Lamiaceae, los óvulos se sujetan a los lados de las paredes enrolladas del carpelo.

Otro nivel que se ha visto afectado a raíz del desarrollo de los análisis filogenéticos es el genérico. Se ha descubierto que varios géneros, incluyendo algunos de los de mayor riqueza, no son monofiléticos: *Clerodendrum* (Steane et al., 1997, 1999; Yuan et al., 2010), *Cunila* (Agostini et al. 2012), *Hyptis* Jacq. (Pastore et al. 2011), *Lepechinia* (Drew & Sytsma, 2011, 2013), *Salvia* (Walker et al. 2004; Walker & Sytsma, 2007) y *Stachys* (Lindqvist & Albert, 2002). Por ello, será necesaria una revisión profunda de la delimitación de cada uno de ellos, y es de esperarse cambios nomenclaturales sustanciales en el futuro cercano adicionales de aquellos ya propuestos.

Dicho lo anterior, la familia Lamiaceae en su reciente circunscripción se caracteriza por sus tallos cuadrangulares, presencia frecuente de tricomas glandulares, follaje aromático, ausencia de estípulas, hojas opuestas o verticiladas, simples, inflorescencias cimosas, corola gamopétala y en general bilabiada, estambres 2 ó 4, ovario súpero, sobre un disco nectarífero, con dos carpelos, 4 lóculos por una división secundaria, óvulos solitarios en cada lóculo, y frutos en mericarpios. Consiste de 236 géneros y 7 173 especies (Harley et al., 2004). Su distribución es cosmopolita con excepción de las regiones más frías localizadas en latitudes o altitudes elevadas, sus centros de mayor riqueza se ubican en el Mediterráneo, Asia Central y el sureste de China (Hedge, 1992; Harley et al. 2004). La mitad de las especies corresponden a sólo 10 géneros: *Salvia* (900 spp.), *Clerodendrum* (500 spp.), *Scutellaria* (360 spp.), *Plectranthus* L'Hér. (300 spp.), *Stachys* (300 spp.), *Hyptis* (280 spp.), *Teucrium* (250 spp.), *Vitex* (250 spp.), *Thymus* L. (220 spp.), *Nepeta* L. (200 sp.) y *Premna* L. (200 spp.) (Haley et al., 2004).

En México existen 32 géneros y 591 especies nativas o naturalizadas (Martínez-Gordillo et al., 2013). Lamiaceae ocupa el octavo lugar en número de especies entre las angiospermas de la flora nacional (Villaseñor, 2003). Los géneros en el país que tradicionalmente se habían incluido dentro de Verbenaceae son: *Aegiphila*, *Callicarpa*, *Clerodendrum* (introducido), *Cornutia* L., *Tetraclea*, *Tectona* L. f. (introducido), *Volkameria* L. y *Vitex*. Los que muestran mayor riqueza son *Salvia*, *Scutellaria*, *Hyptis*, *Stachys* y *Hedeoma*.

Algunas de la las especies de esta familia son explotadas con fines culinarios como condimentos o para la extracción de aceites esenciales que son utilizados como complemento de diferentes productos, como perfumes o medicinas. Los géneros que se cultivan con estos fines son: *Hedeoma* (orégano silvestre), *Lavandula* L. (lavanda), *Leonurus* L., *Mentha* L. (menta), *Nepeta*, *Ocimum* (albahacar, en especial *O. basilicum* L.), *Origanum* L. (orégano, mejorana), *Plectranthus* (orégano), *Rosmarinus* L. (romero), *Salvia* (chia, chian, chiante, mirto, salvia) y *Thymus* (tomillo). Además, la familia está representada ampliamente en la medicina vernácula de diferentes culturas (Dweck, 2000; Jenks y Kim, 2013). En México se les utiliza como relajantes y digestivos. Los frutos de algunas plantas se usan como alimento, tal es el caso de los ahuilotes o uvalanes (varios miembros del género *Vitex*) y la chía (*Hyptis suaveolens*, *Salvia hispanica*). Muchas de las especies tienen un elevado potencial ornamental debido a sus flores y/o follaje vistosos y hojas aromáticas. Caso particular es el de la teca (*Tectona grandis*) y la melina (*Gmelina arborea* Roxb. ex Sm.), originarias del sureste asiático, las cuales se introdujeron en zonas tropicales del país con fines de explotar su madera.

A pesar de la riqueza e importancia de la familia en México, no ha sido abordada todavía en ninguna de las floras contemporáneas en curso (*Flora del Bajío y Áreas Adyacentes*, *Flora de Guerrero*, *Flora de Jalisco y Áreas Colindantes*, *Flora de Tehuacán-Cuicatlán*, y *Flora de Veracruz*) a excepción de la *Flora Fanerogámica del Valle de México* (Calderón de Rzedowski & Rzedowski, 2005) y la *Flora Mesoamericana* (Davidse et al., 2012). Una contribución relevante, es la sinopsis genérica que realizaron Martínez-Gordillo et al. (2013) para el país, en la que presentan una panorámica general de su diversidad, distribución y endemismo. Por otra parte, se han descrito varios taxones nuevos de algunos géneros, como en *Salvia* que en las últimas tres décadas se han descrito al menos 40 especies nuevas (González-Gallegos, 2013). En la actualidad existe un interés renovado en las labiadas mexicanas; sin embargo, su conocimiento todavía es escueto y fragmentado. Por lo anterior, aquí presentamos una contribución en el conocimiento de la diversidad de este grupo en el occidente del país, un aporte que podrá estimular o facilitar su estudio. Se pretende generar una lista actualizada de las especies presentes en el área de estudio, documentar la distribución en función a diferentes unidades espaciales de las mismas, y destacar las zonas de mayor concentración de especies.

Materiales y métodos

Área de estudio. El occidente de México se delimitó de manera equivalente a lo que McVaugh (1961) denominó como Nueva Galicia con el fin de desarrollar una flora regional. Los límites se precisaron basados en la propuesta de Carvajal y Acosta-Sotelo (2010), quienes se ciñen a una definición en que se suman unidades políticas (municipios), lo cual da más claridad sobre los límites del área y facilita la búsqueda de información y asignación de localidades dentro del polígono. De esta manera, el occidente de México abarca la superficie continental de los estados de Aguascalientes, Colima y Jalisco en su totalidad; la porción sur del municipio de El Mezquital, Durango; oeste de Guanajuato; oeste y noroeste de Michoacán; ¾ aproximadamente de Nayarit (porción sur); y el sur de Zacatecas (fig. 1). Contiene 241 municipios y se encuentra entre las coordenadas extremas -105.691 a -100.823 de longitud oeste y 23.143 a 18.086 de latitud norte. En conjunto alberga un área de 172 490 km^2, lo que representa 9.31% de la superficie continental de la nación. El polígono es irregular y tiende a una forma ovada, tan largo como ancho en sus puntos extremos. Incluye una variación en altitud de 0 a 4 339 m, siendo la cima del Nevado de Colima el punto más alto; existen también otros macizos montañosos con picos altos como lo son el Volcán de Tancítaro (3 825 m), Volcán de Fuego de Colima (3 820 m), Cerro Patambán (3 500 m), Sierra de Charcos (3 020 m), Cerro Viejo (2 960 m), y Volcán de Tequila (2 940 m). Incluye cuencas importantes como lo son las de los Ríos Ameca, Ayuquila-Armería, Bolaños, Coahuayana, Juchipila, Lerma-Santiago y Verde. En cuanto a provincias biogeográficas de acuerdo a Morrone (2005), incorpora porciones de la Costa Pacífica Mexicana, Cuenca del Balsas, Faja Volcánica Transmexicana, Sierra Madre Occidental y Sierra Madre del Sur. Conforme a la propuesta de tipos de vegetación de Rzedowski y McVaugh (1966) se encuentran el bosque de pino y encino, bosque espinoso, bosque mesófilo de montaña, bosque de oyamel, bosque tropical deciduo (caducifolio), bosque tropical subdeciduo (subcaducifolio), manglar, matorral subtropical, palmar, vegetación acuática y subacuática, vegetación sabanoide y zacatal (pastizal).

Base de datos. La base de datos se alimentó con registros derivados de la consulta de publicaciones, revisión de especímenes de herbario y exploración botánica. Quedó estructurada con los siguientes campos: identificador (ID), herbario/s en que está depositado un ejemplar o su duplicado, nombre del género, epíteto específico, autoridad nomenclatural, tipo de categoría infraespecífica, epíteto infraespecífico, autoridad del infraespecífico, nombre común y notas sobre usos, estado, municipio, latitud, longitud, altitud, fecha de colecta, colector/es, número de colecta, tipo de vegetación en que fue recolectado el ejemplar, notas de morfología y abundancia, otras especies asociadas, determinador, fecha de determinación, latitud final, longitud final, altitud final, quien realiza la estimación de coordenadas geográficas, fecha de la estimación y notas sobre la misma. Los campos de latitud, longitud y altitud final se llenaron con la información geográfica verificada o estimada en el caso de aquellos ejemplares que carecían de ella. La verificación se realizó proyectando los puntos de colecta en un mapa y asegurándose que éstos cayeran dentro del polígono del área de estudio y que correspondieran también al estado en el que se habían recolectado; de no ser así, se buscó el error y en su caso se estimaron nuevas coordenadas geográficas. Las estimaciones se realizaron según las recomendaciones de Wieczorek (2001) pero sin el cálculo de valores de incertidumbre, y con el uso de la plataforma Google Earth (2013) y el catálogo de localidades de la Secretaría de Desarrollo Social (SEDESOL, 2013). Para el manejo de los mapas se utilizaron los programas ArcGis vs. 10 (Esri, 1995-2013) y Quantum Gis vs. 1.7.0 (QGIS Development Team, 2014).

Se generó una lista preliminar de las especies registradas para el área de estudio basada en la consulta de literatura especializada (Epling, 1933a, 1933b, 1934, 1939a, 1939b, 1939c, 1940, 1941, 1944, 1947, 1948, 1951, 1960; Lint & Epling, 1945; McClintock y Epling, 1946; Epling & Mathias, 1957; Epling & Játiva, 1963, 1966a, 1966b, 1968; Irving, 1980; Espejo y Ramamoorthy, 1993; Villegas-Flores, 1993; Turner, 1994a, 1994b, 2008a, 2009a, 2009 b, 2011a, 2011b; Berumen-Cornejo, 2006;), inventarios florísticos dentro del área (Machuca-Núñez, 1989; González-Elizondo et al., 1991; Rodríguez y Reynoso-Dueñas, 1992; Lott, 1993; Guerrero-Nuño, 1994; Téllez-Valdés, 1995; Téllez-Valdés et al., 1995; Vázquez-García et al., 1995, 2004; Cedano-Maldonado y Harker, 2000; Contreras-Rodríguez et al., 2000; Cortés-Romero, 2000; Macías-Rodríguez y Ramírez-Delgadillo, 2000; Barba-Robert, 2001; García-Ruiz et al., 2002; Nieves-Hernández, 2002; García-Rubio, 2003; Hernández-Toro, 2003; Wynter-Warra et al., 2003; Harker et al., 2008; Ramírez-Delgadillo et al., 2010; Zamudio y Galván, 2011; Guerrero-Hernández, 2012; Frías-Castro et al., 2013) y bases de datos consultadas en varias ocasiones de 2008-2013 (ReBioMex, 2010; Tropicos, 2013). Se procuró examinar a los especímenes obtenidos con esta consulta, pero sobre todo aquellos que resultaban dudosos. En ocasiones se solicitaron fotografías de los mismos cuando no fue posible consultarlos en la institución que los resguarda.

La examen de los especímenes en las colecciones consultadas fue dirigido a las especies del listado preliminar, pero también a taxones con probabilidad de presentarse en el área de estudio. Los acrónimos de las colecciones que se consultaron de acuerdo al *Index Herbariorum* (Thiers, 2011) son: CIIDIR, CHAPA, CIMI, CREG, ENCB, GUADA, HUAA, HUMO, IBUG, IEB, MEXU, MICH, UC, WIS, XAL, XALU, y ZEA. Además se revisaron los herbarios no registrados de las Universidades Autónomas de Nayarit y de Zacatecas. En cada herbario se verificaron las determinaciones, se fotografiaron los especímenes y se capturaron en la base de datos.

Se realizaron al menos 30 exploraciones de recolecta de noviembre de 2008 a noviembre de 2013 (fig. 1) en búsqueda de especies poco representadas en los herbarios, novedades taxonómicas y de distribución. Se procuró recolectar al menos tres duplicados por muestra, que se procesaron de acuerdo a los señalamientos de Lot y Chiang (1986). Un juego completo de la colección se depositó en el Herbario IBUG.

Los datos capturados se depuraron de forma constante para evitar la presencia de registros repetidos y evitar problemas al incorporarlos en programas de sistemas de información geográfica (SIG’s).

Riqueza de especies. Para analizar la distribución del número de especies de Lamiaceae en el área de estudio, se obtuvieron las cifras correspondientes por unidades temporales (lapsos de 10 años), políticas (estados y municipios), biológicas (tipos de vegetación), biogeográficas (regiones biogeográficas), espaciales (latitud, longitud y altitud), y por cuadrícula dependiente de la amplitud de la distribución de los taxones (Willis et al., 2003). En el aspecto espacial, la latitud y la longitud se manejaron de manera arbitraria en rangos de ½ grado, y la altitud de 100 m. El tamaño de cuadrícula se calculó como el promedio de todos los taxones, de la décima parte de la distancia máxima entre dos puntos de su presencia, como fue sugerido por Willis et al. (2003).

Resultados

Se examinaron en total 8 276 ejemplares de herbario, siendo 1 772 de ellos duplicados. Por tanto, la base de datos reunió 6 504 registros únicos; 5 880 de ellos con coordenadas geográficas o para los cuáles pudieron ser estimadas con base en la información de sus localidades. En trabajo de campo se recolectaron 412 números de colecta que correspondieron a 99 especies. En tres herbarios se concentró el 65% de los registros (IBUG, MEXU y MICH; cuadro 1); aunque la representación del área en ellos fue sesgada hacia Jalisco, Michoacán y Nayarit. Para tener el panorama completo los herbarios CIIDIR, IEB, HUAA y el de la Universidad Autónoma de Zacatecas también fueron claves.

Para el occidente de México se registran 20 géneros, 163 especies de labiadas nativas o naturalizadas, y para cuatro de ellas se reconoció una categoría infraespecífica aparte del taxón típico (apéndice 1, cuadros 2 y 3). En conjunto representaron 5 subfamilias, 2 tribus y 5 subtribus del esquema de clasificación de Harley et al. (2004), La subfamilia Nepetoideae, la tribu Mentheae y la subtribu Salviinae albergaron la mayor cantidad de especies (cuadro 2). El género *Salvia* por sí solo reunió 60% de la riqueza de la familia con 101 especies, le siguieron en número *Hyptis* (14 spp.), *Scutellaria* (10 spp.) y *Stachys* (7 spp.) (cuadro 3). Las especies endémicas (aquellas cuya distribución queda por completo dentro del occidente de México) se concentraron también en el género *Salvia* (37 spp.), luego *Scutellaria* (5 spp.), *Hyptis* (3 spp.), *Stachys* (2), *Clinopodium* L. y *Cunila* (1 c/u).

También se encontraron observaciones de cultivos o de uso como plantas de ornato de especies de los géneros *Clerodendrum*, *Coleus* Lour., *Lavandula*, *Mentha*, *Ocimum*, *Origanum*, *Plectranthus*, *Rosmarinus* y *Tectona*. Además se detectaron algunas especies introducidas con fines de ornato de géneros con representantes nativos en el área, tales como *Salvia officinalis* L., *S. splendens* Sellow ex Wied-Neuw. y *Vitex triflora* Vahl. Ninguna de las plantas introducidas se consideraron en los análisis de la riqueza.

En el transcurso de la investigación se descubrieron 22 taxones nuevos, la mayoría de los cuales ya se publicaron: *Cunila jaliscana* (García-Peña & González-Gallegos, 2013); *Salvia albicalyx* (González-Gallegos, 2013); *S. albiterrarum* y *S. pugana* (González-Gallegos & Castro-Castro, 2013); *S. cacomensis* (González-Gallegos et al., 2012a); *S. carreyesii*, *S. ibugana* y *S. ramirezii* (González-Gallegos et al., 2013); *S. concolor* var. *iltisii*, *S. meera*, *S. rogersiana* y *S. santanae* (González-Gallegos et al., 2012b); *S. cualensis* y *S. cualensis* var. *perezii* (González-Gallegos & Castro-Castro, 2012); *S. vazquezii* y *S. vazquezii* subsp. *tancitaroensis* (Iltis et al., 2012); y *Scutellaria cuevasiana* y *S. sublitoralis* (González-Gallegos & Vázquez-García, 2013) . El resto están siendo todavía trabajados para validar sus nombres (*Hyptis cualensis*, *H. macvaughii*, *Salvia* sp. 1 y sp. 2).

Además se encontraron novedades de distribución de algunas especies, en el sentido de que no se habían registrado con anterioridad para el área de estudio. Se trata de: *Hyptis pseudolantana*, *Lepechinia flammea*, *Salvia unicostata* y *Scutellaria blepharophylla*. A escala de estados, también son nuevos los registros de *Salvia chalarothyrsa* para Colima; *Asterohyptis seemanii*, *Hedeoma plicata*, *Lepechinia flammea*, *Salvia crucis*, *S. unicostata* y *Scutellaria blepharophylla* para Jalisco; *Hyptis pseudolantana* para Jalisco y Michoacán; *Salvia angustiarum* Epling, *S. brachyodonta* y *S. platyphylla* para Zacatecas.

La representación por especie tiene un sesgo fuerte, para 17 de ellas se obtuvieron más de 100 registros que en suma alcanzan 52% de la totalidad (cuadro 4). En contraste, 71 especies cuentan con 10 o menos registros. Aquellas representadas por uno solo son: *Agastache palmeri*, *Lepechinia schiedeana*, *Monarda citriodora*, *Salvia albicalyx*, *S. albiterrarum*, y *S. podadena*.

La primer especie en ser recolectada en el área de estudio fue *Salvia lasiocephala* y la última en adicionarse a la flora de la región fue *S. unicostata*. El lapso de mayor intensidad de recolecta se dio de 1970 a 2000 (fig. 2), mientras de 2010 a 2013 se agregaron todavía tres especies a la cuenta (*S. albiterrarum*, *S. cacomensis* y *S. carreyesii*). La tendencia actual de la riqueza es su estabilización hacia la asíntota (fig. 2).

Jalisco, con 4 549 especímenes, superó por mucho al resto de estados, los cuales entre sí no alcanzaron 500 registros y en conjunto estuvieron por debajo del 30% del total (fig. 3). De igual forma, Jalisco presentó la mayor riqueza con un total de 137 especies, seguido por los fragmentos de Michoacán (74 spp.), Nayarit (56 spp.) y Zacatecas (53 spp.). La menor riqueza se encontró en las porciones de Guanajuato y Durango con 22 y 20 especies, respectivamente. *Leonotis nepetifolia* y *Salvia coccinea* se registraron para los ocho estados que están incluidos dentro del área de estudio. Otras especies también tienen una distribución amplia, ya que se encuentran en siete de los ocho estados: *H. albida*, *Lepechinia caulescens*, *Salvia elegans*, *S. hispanica*, *S. lavanduloides*, *S. mexicana*, *S. microphyla*, *S. misella*, *S. polystachya*, *S. reptans* y *S. tiliifolia*.

Los municipios en que se concentró el mayor número de registros fueron Cuautitlán (379), Zapopan (345), Autlán de Navarro (204), Tapalpa (173) y San Gabriel (163), todos de Jalisco (fig. 3). La mayor riqueza de especies correspondió a los municipios de Cuautitlán (58 spp.), Autlán de Navarro (47 spp.), Mascota (45 spp.), Talpa de Allende (44 spp.), San Sebastián del Oeste (37 spp.), Zapopan (36 spp.) y Jocotepec (35 spp.), también todos de Jalisco. Para 161 municipios se obtuvieron menos de 10 registros y en 19 ni uno solo (Rincón de Romos en Aguascalientes; Armería en Colima; Cuerámaro y San Francisco de los Romo en Guanajuato; Chimaltitán, Huejúcar, Jalostitlán, San Diego de Alejandría, San Julián y Techaluta de Montenegro en Jalisco; Ixtlán, Tanhuato, Tepalcatepec, Tumbiscatio y Yurécuaro en Michoacán; y Apulco, Momax, Tabasco y Villa García en Zacatecas). Se presentaron siete especies endémicas para un municipio dado; se trata de los municipios de Chinicuila (*Salvia synodonta*), Coalcomán de Vázquez Pallares (*S. cyanantha*, *S. gravida* y *S. indigocephala*), Cuautitlán (*S. meera*), El Mezquital (*S. albicalyx*), Huejuquilla (*Scutellaria pallidiflora*) y Villa Purificación (*Salvia cacomensis*).

En cuanto al tipo de vegetación, la mayor cantidad de registros correspondieron al bosque de pino y encino (1 251), bosque de encino (840) y bosque tropical caducifolio (625) (fig. 4). La mayor riqueza de especies se concentró en el bosque de pino y encino (109 spp.), bosque de pino (74 spp), bosque mesófilo de montaña (73 spp.), bosque tropical caducifolio (69 spp.) y bosque de encino (62 spp.). La menor cantidad de registros y riqueza de especies fue para la vegetación sabanoide (12 registros y 6 spp.) y el pastizal (2 registros y 2 spp.). Se obtuvieron registros para todos los tipos de vegetación presentes en el área excepto para el manglar y el palmar. Cerca de 25% de las especies pueden crecer a la orilla o dentro de campos de cultivo. *Salvia longispicata* y *Stachys coccinea* son las que tuvieron mayor amplitud en los tipos de vegetación en que podían subsistir, ya que estuvieron presentes en 11 de ellos y también a la orilla o dentro de cultivos de diferente índole. En contraste nueve especies se restringieron en gran medida a un tipo de vegetación; *Aegiphila skutchii* y *Callicarpa acuminata* al bosque tropical subcaducifolio, las especies inéditas *Hyptis cualensis* e *H. macvaughii* a la vegetación sabanoide, *Salvia brachyodonta* y *S. lasiantha* al bosque tropical caducifolio, *S. cacomensis* al bosque mesófilo de montaña, *S. serpyllifolia* al matorral xerófilo, y *Scutellaria blepharophylla* al bosque de encino.

Se observó una coincidencia en el orden de las provincias biogeográficas por número de registros y de especies (fig. 4). En primer lugar la Faja Volcánica Transmexicana (3 814 registros y 121 spp.), después la Costa Pacífica Mexicana (970 registros y 84 spp.), la Sierra Madre Occidental (514 registros y 71 spp.), el Altiplano Mexicano (436 registros y 53 spp.), la Cuenca del Balsas (64 registros y 34 spp.), y finalmente la Sierra Madre del Sur (54 registros y 25 especies) (fig. 4). Dentro del área de estudio, 23 especies estuvieron restringidas a las porciones del Eje Volcánico Mexicano, 16 al Altiplano, 13 a la Costa Pacífica, nueve a la Sierra Madre Occidental y una a la Sierra Madre del Sur (cuadro 5). Ninguna de las especies se encontró restringida a la Cuenca del Balsas. *Asterohyptis stellulata*, *H. albida*, *H. mutabilis*, *Leonotis nepetifolia*, *Salvia misella*, *S. mexicana* y *S. purpurea*. estuvieron presentes en todas o en cinco de las seis provincias.

La mayor cantidad de registros (3 608) se concentraron en un rango de longitud de -104.5º a -103.0º, mientras la mayor riqueza de especies (122) se acumuló entre -105.0 y -104.5, con el 50% de ellas presentes entre -105.0º y -102.5º (fig. 5). En latitud la mayor concentración de registros se mostró entre 19.5º y 21.0º, la mayor riqueza (93 spp.) entre 19.5º y 20.0º, con el 50% de las especies entre 19.5º y 21º (fig. 5). En altitud, el mayor número de registros (3 110) estuvo entre 1 300 a 2 400 m, y la riqueza entre 900 y 2 600 m con poco más del 50% de las especies creciendo en esta cota (fig. 5).

En el análisis de riqueza por cuadrícula se obtuvo un tamaño de cuadro de 21 km por lado (fig. 6). Se recuperaron siete unidades con entre 31 y 50 especies, tres de ellas ubicadas sobre la Sierra de Manantlán, otra en la Sierra de Cerro Viejo al noreste del Lago de Chapala, El Cuale, Sierra de San Sebastián del Oeste, y Valle de Atemajac (fig. 6). En segundo término, con entre 20 y 30 especies se encontraron varios cuadros, entre ellos destacan una serie que conectan a la Sierra de Manantlán con la de los volcanes de Colima, Sierra de Coalcomán, tres más en las Sierras de Cacoma y El Cuale, Sierra de Juchipila, Sierra de Mazamitla, Sierra de San Juan, y dos en el valle de la ciudad de Guadalajara. En contraste, la porción sur de Colima, las porciones de Durango y Guanajuato, la costa sur, el sur y noreste de Jalisco, el sur y costa de la porción de Michoacán y la mayor parte de Zacatecas fueron las de menor riqueza. Las especies que se registraron de sólo un cuadro fueron *Agastache palmeri*, *Clinopodium brownei*, *Hyptis cualensis*, *Lepechinia flammea*, *L. schiedeana*, *Monarda citriodora*, *Salvia albicalyx*, *S. albiterrarum*, *S. cacomensis*, *S. meera*, *S. podadena*, *Salvia synodonta* y *Scutellaria pallidiflora*.

Discusión

A partir de la representación obtenida por cada uno de los herbarios revisados de las labiadas en el occidente de México, se puede deducir que los análisis de la flora y estudios de diversidad vegetal para esta región deben considerar al menos las colecciones de los herbarios IBUG, CIIDIR, HUAA, IEB, MEXU, MICH y el de la Universidad Autónoma de Zacatecas. Esto debido a que cada uno de ellos alberga especímenes de áreas que entre sí son complementarias y que consisten en una representación regional de los estados en que están ubicadas. Casos especiales son los herbarios MEXU y MICH. El primero cuenta con la colección más completa de labiadas del estado de Nayarit, mientras el segundo incluye muestras de toda el área y colecciones importantes para el occidente como lo son las de W. R. Anderson, C. Anderson, T. F. Daniel, R. McVaugh, C. Feddema y W. N. Koelz, algunas de ellas de áreas recónditas o poco exploradas. En cambio la representación del estado de Colima y el oeste de Guanajuato fue relativamente pobre en todas las colecciones.

La riqueza de géneros y especies de labiadas nativas o naturalizadas en el occidente de México es igual al 62.5% y 27.58%, respectivamente de la diversidad en el país (Martínez-Gordillo et al., 2013). Supera a la encontrada en estados de la República y regiones como el Valle de México, y es casi tan grande como la de Mesoamérica (Cowan, 1983; Sousa-S. & Cabrera-C., 1983; Argüelles et al., 1991; González-Elizondo et al., 1991; Téllez-Valdés, 1995; Rodríguez-Jiménez & Espinoso-Garduño, 1996a, 1996b; Villarreal-Quintanilla, 2001; Domínguez-Vázquez et al., 2002, Calderón de Rzedowski & Rzedowski, 2005; Berumen-Cornejo, 2006; Zamudio & Galván-Villanueva, 2011; Davidse et al., 2012) (cuadro 6). Que la riqueza sea mayor a la de otros estados o el Valle de México es esperable en términos de que el occidente de

México supera en área a cualquiera de los anteriores y anida a algunos de ellos, pero no es así respecto a Mesoamérica, la que sobrepasa por más de cuatro veces su área (172 490 km^2 *vs.* 757 966 km^2). Cabe señalar que las referencias con que se hizo la comparación (cuadro 6), a excepción de tres (Aguascalientes, Berumen-Cornejo, 2006, Chiapas, Domínguez-Vázquez et al., 2002, y Mesoamérica, Davidse et al., 2012), no son enfoques dirigidos en exclusivo a la familia y por tanto sufren de algunas deficiencias. Por ejemplo, la referencia sobre Michoacán (Rodríguez-Jiménez & Espinosa-Garduño, 1996a) cuenta por dos un taxón al considerar sinónimos como válidos [*Asterohyptis stellulata* (=*A. mociniana* (Benth.) Epling), *Hyptis capitata* (=*H. rhomboidea* M.Martens & Galeotti), *Salvia iodantha* (=*S. arbuscula* Fernald), *S. amarissima* (=*S. capillosa* Epling), *S. lasiocephala* (=*S. hyptoides* M.Martens & Galeotti), *S. dichlamys* (=*S. nigriflora* Epling), *S. misella* (=*S. occidentalis* Sw. y *S. riparia* Kunth), *S. roscida* (=*S. remissa* Epling), *S. leptostachys* (=*S. rhyacophila* (Fernald) Epling); nombres aceptados fuera de paréntesis], está desactualizada al no considerar nombres aceptados actuales (*S. cyanicephala* Epling en lugar de *S. indigocephala*, *S. viscidifolia* Epling en lugar de *S. subpatens*, *Satureja macrostema* (Moc. & Sessé ex Benth.) Briq. en lugar de *Clinopodium macrostemum*, y *Scutellaria coerulea* Moc. & Sessé ex Benth. en lugar de *S. dumetorum*), y presenta algunos problemas respecto a taxones dudosos. Por tanto, las comparaciones deben tomarse con cuidado y sería deseable que estos listados se rectificaran y actualizaran. Lo anterior ya lo habían percibido Cornejo-Tenorio e Ibarra-Manríquez (2011), quienes para el caso del género *Salvia* en Chiapas (Domínguez-Vázquez et al., 2002), señalan que el número está sobrestimado debido a la duplicación de especies por la inclusión de sinónimos; de esta manera reducen de 75 a 64 especies las presentes en esa entidad.

De los estados estudiados en su totalidad, Jalisco ocupa el segundo lugar en riqueza sólo por debajo de Chiapas (Domínguez-Vázquez et al., 2002) (cuadro 6), o el primer lugar si se toma en cuenta la corrección que Cornejo-Tenorio e Ibarra-Manríquez (2012) apuntan al listado de Chiapas. La riqueza de los estados de Aguascalientes y Colima es superior a la de aquellos de la península de Yucatán: Tabasco (Cowan, 1983), y Quintana Roo (Sousa-S. & Cabrera-C., 1983).

Las porciones estudiadas de los estados de Durango, Guanajuato, Michoacán y Nayarit albergan una representación considerable de la familia cuando se toma en cuenta su proporción y se les compara con los listados que se han generado para esas entidades (González-Elizondo et al., 1991; Zamudio & Galván-Villanueva, 2011; Rodríguez-Jiménez & Espinosa-Garduño, 1996a, 1996b; y Téllez-Valdés, 1995) (cuadro 6).

La diversidad aquí registrada del género *Salvia* para los estados de Aguascalientes (23 spp.), Colima (23 spp.) y Jalisco (85 spp.), es por mucho superior a la que habían dado Ramamoorthy y Elliott (1998) para los mismos en un análisis sobre la distribución de la riqueza del género por entidades del país: 4, 3 y 49 especies, respectivamente. La inexactitud en las cifras dadas por Ramamoorthy y Elliott (1998) fue evidenciada por Cornejo-Tenorio e Ibarra-Manríquez (2011); sin embargo, es difícil precisar la razón de la discrepancia, ya que los autores no proveyeron de una lista o testigos que respaldaran las cifras que reportaban. Las 85 especies de *Salvia* de Jalisco superan las 64 de Michoacán (Cornejo-Tenorio & Ibarra-Manríquez, 2011), pero éste no es superado por Aguascalientes y Colima.

La preponderancia de la riqueza de *Salvia* sobre otros géneros, como *Hyptis*, *Scutellaria* y *Stachys*, coincide con las referencias analizadas (Cowan, 1983; Sousa-S. & Cabrera-C., 1983; Argüelles et al., 1991; González-Elizondo et al., 1991; Téllez-Valdés, 1995; Rodríguez-Jiménez & Espinoso-Garduño, 1996a, 1996b; Villarreal-

Quintanilla, 2001; Domínguez-Vázquez et al., 2002, Calderón de Rzedowski & Rzedowski, 2005; Berumen-Cornejo, 2006; Zamudio & Galván-Villanueva, 2011), aunque se puede notar un incremento en la proporción de especies de los géneros *Hyptis* y *Scutellaria* hacia el sur, respecto de *Salvia* (Domínguez-Vázquez et al., 2002; Davidse et al., 2012).

El descubrimiento de taxones nuevos de la familia Lamiaceae en México ha sido frecuente en las últimas décadas (Ramamoorthy, 1983, 1984a, 1984b, 1984c; Ramamoorthy & Lorence, 1987; Rzedowski & Calderón de Rzedowksi, 1988; García-Peña, 1989; García-Peña & Tenorio-Lezama, 1997; Levin & Morán, 1989; Espejo & Ramamoorthy, 1993; Turner, 1994a, 1994b, 1995a, 1995b, 1995c, 1996, 2008a, 2008b, 2008c, 2009a, 2009b, 2010, 2011a, 2011b, 2013a, 2013b; Turner & Reveal, 2004; Klitgaard, 2007; Martínez-Gordillo & Valencia-Ávalos, 2009; Cuevas-Guzmán, 2010; Bedolla-García et al., 2011; Martínez-Gordillo & Lozada-Pérez, 2011; Fragoso-Martínez & Martínez-Gordillo, 2013; Lara-Cabrera et al., 2013), por lo que no es sorprendente que se hayan develado especies nuevas en el occidente, pero sí reafirma la hipótesis de México como un centro de origen y diversificación de linajes de la familia, en especial para el género *Salvia* (Hedge, 1992; Ramamoorthy & Elliott, 1998; Walker & Sytsma, 2007; Drew & Sytsma, 2011; Jenks et al., 2013).

El hallazgo de taxones no registrados antes para el occidente, tales como *Salvia chalarothyrsa* para Colima, *Asterohyptis seemannii*, *Hedeoma plicata*, *S. crucis*, *S. unicostata* y *Scutellaria blepharophylla* para Jalisco, y *Salvia angustiarum*, *S. brachyodonta* y *S. platyphylla* para Zacatecas, era de esperarse y significan expansiones ligeras a la distribución conocida en un principio de estas especies. *Salvia chalarothyrsa* se conocía de suelos yesosos con matorral subtropical al sur de Jalisco y noroeste de Michoacán, la localidad nueva en Colima es cercana y tiene condiciones ecológicas similares donde ha podido prosperar la especie. *Asterohyptis seemmannii* y *S. crucis* son especies restringidas a la Sierra Madre Occidental, siendo ahora Jalisco y áreas colindantes de Nayarit, el extremo sur de su distribución. *Hedeoma plicata* y *S. unicostata* son especies características del Altiplano Mexicano, con Aguascalientes y San Luis Potosí como sus límites sureños previos, respectivamente (ver la distribución actual de *S. unicostata* en González-Gallegsos & Gama-Villanueva, 2013). La distribución de *Scutellaria blepharophylla* estaba señalada al norte de Guerrero, Michoacán y el estado de México, en este trabajo se amplía un poco al norte hasta las serranías de Talpa de Allende en Jalisco. De igual manera, para *Salvia angustiarum*, *S. brachyodonta* y *S. platyphylla*, el registrarlas en Zacatecas significa una expansión de pocos kilómetros en su distribución, la que parece estar relacionada con la cuenca del Río Juchipila en esa entidad (la distribución de las dos primeras puede consultarse en González-Gallegos & Gama-Villanueva, 2013, y de la última en González-Gallegos & Castro-Castro, 2013). Las novedades que resultan más destacadas son la de *Hyptis pseudolantana* y *Lepechinia flammea*,. La primera de ellas, era conocida sólo de la colección tipo proveniente del norte de Guerrero, en la presente investigación su distribución se documenta además para Michoacán y Jalisco (González-Gallegos et al., en preparación). *Lepechinia flammea* es una especie con una distribución más o menos amplia en Guerrero e inmediaciones de Oaxaca, aquí se agrega una población en Jalisco, sin que exista una conexión entre las poblaciones del sur y ésta a través del estado intermedio, Michoacán (González-Gallegos et al., en preparación).

La mayor cantidad de registros y de especies obtenido para Jalisco en contraste con las cifras de los otros estados puede explicarse por su mayor superficie, pero también algo que tendría que evaluarse es el papel de la heterogeneidad ambiental que presenta. La relevante riqueza florística de municipios tales como Cuautitlán, Autlán de

Navarro, Mascota, Talpa de Allende, y San Sebastián del Oeste es algo ya bien conocido (Vázquez-García et al., 1995, 2000; Reynoso-Dueñas et al., 2006), lo cual es respaldado por los datos sobre Lamiaceae.

Los hábitat templados en términos de tipos de vegetación son los que albergaron la mayor riqueza, algo que ya se había pronunciado respecto a la familia (Ramamoorthy & Elliott, 1998; Domínguez-Vázquez et al., 2002; Cornejo-Tenorio & Ibarra-Manríquez, 2011), pero cabe señalar que los bosques tropicales caducifolios resguardan una diversidad considerable. Hay géneros que tienen una afinidad más bien tropical como es el caso de *Aegiphila*, *Asterohyptis*, *Hyptis* y *Vitex*. Algunas especies de géneros considerados como de regiones templadas pueden tener también esta afinidad, como lo son *Salvia brachyodonta*, *S. coccinea*, *S. ibugana*, *S. languidula* Epling, *S. lasiantha*, *S. lasiocephala*, *S. pringlei*, *S. purpurea*, *S. sessei* y *S. uruapana*, por mencionar algunas.

Más trascendente que la distribución de la riqueza por provincia biogeográfica, es el hecho de que existan especies que se restringen a alguna de ellas, de tal manera que la conjunción de provincias biogeográficas en el occidente de México contribuye a la heterogeneidad del área y genera un mosaico que incrementa la diversidad total. Llama la atención la ausencia de especies restringidas a la provincia de la Cuenca del Balsas, esto puede ser un reflejo de la afinidad intrínseca de la familia por ambientes templados y a su diversificación en cordilleras montañosas (Ramamoorthy & Lorence, 1987; Ramamoorthy & Elliott, 1998; Domínguez-Vázquez et al., 2002; Cornejo-Tenorio & Ibarra-Manríquez, 2011).

La mayor concentración de registros y taxones en longitudes y latitudes intermedias dentro del polígono puede ser efecto de la forma del polígono de estudio, ya que tiende a ser ovado y por tanto posee menos área hacia sus extremos que al centro. También puede estar relacionada con una mayor abundancia de bosques templados hacia el interior del polígono, ambiente en el que la familia exhibió su mayor riqueza. Esto último puede explicar la mayor riqueza de la familia entre 1 330 y 2 400 m, donde existe una dominancia de bosques templados pero sin condiciones tan hostiles como pudieran ser aquéllas por arriba de ese rango.

En el análisis de cuadrícula se recuperaron cuadros de alta riqueza en las sierras de Cacoma, Cerro Viejo, Coalcomán, El Cuale, Juchipila, Manantlán, Mazamitla, San Juan, San Sebastián del Oeste, Valle de Atemajac y Volcanes de Colima,. Esto se ajusta a los patrones de distribución de riqueza por municipios, ya que coinciden estas áreas con los municipios más ricos. La mayoría de los cuadrados con alta riqueza caen en el occidente de Jalisco, un lugar que ya ha sido identificado como zona de alta riqueza en otros grupos o gremios vegetales [tribu Heliantheae (Asteraceae), Villaseñor, 1993; flora arbórea mexicana, Villaseñor & Ibarra-Manríquez, 1998; flora endémica, Delgadillo-M. et al., 2003; género *Cosmos* Cav. (Asteraceae), Vargas-Amado et al., 2013].

El sesgo que se presentó en el número de registros por municipio y cuadrados de 21 × 21 km (muchos registros concentrados en pocas unidades y muchas unidades con pocos o ningún registro), la revelación de taxones nuevos y novedades de distribución conforme al desarrollo de trabajo de campo y examen de colecciones biológicas, dan evidencia de que los esfuerzos de recolecta e inventario de la diversidad vegetal son aún incipientes. Es crítico que se elabore y discuta un plan de exploración botánica para el occidente. Para el caso de la familia Lamiaceae serían importantes el sur y costa de la porción de Michoacán, sur de Colima, costa sur, sur y noreste de Jalisco, mayor parte de Zacatecas, y las porciones de Durango y Guanajuato. Debe darse prioridad a la actividad de exploración.

La magnitud de la riqueza de especies y el grado de endemismo (54 spp.) para el occidente, lo posicionan como un área importante para la conservación de las labiadas mexicanas. Es necesario que se evalúen e implementen estrategias para su resguardo, sobre todo en aquellos municipios y cuadrados con alta riqueza donde no hay presencia de Áreas Naturales Protegidas. Por ejemplo, siete especies son endémicas de un único municipio; Coalcomán de Vázquez Pallares sobresale al reunir tres de ellas. Algunas especies además de su distribución limitada mantienen preferencias de hábitat específicas (*Aegiphila skutchii*, *Callicarpa acuminata*, las especies inéditas *Hyptis cualensis* e *H. macvaughii*, *Salvia cacomensis* y *S. serpyllifolia*; se restringen a un solo tipo de vegetación por ejemplo), lo que las puede hacer aún más vulnerables.

A pesar de las deficiencias del esfuerzo de recolecta en el área de estudio, el panorama que se ofrece en el presente trabajo bien puede servir de base para investigaciones ulteriores, y es probable que esté reflejando en gran medida la realidad de la riqueza de Lamiaceae en el occidente del país.

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Cuadro 1. Número de especímenes de Lamiaceae del occidente de México registrados en cada no de los herbarios que se consultaron.

Herbario	Número de especímenes
IBUG	3072
MEXU	1319
MICH	980
ZEA	668
WIS	558
IEB	398
HUAA	228
ENCB	204
HUAZ	172
CIMI	162
UC	139
CIIDIR	83
GUADA	78
CREG	71
XAL	53
CHAPA	47
NAY	26
HUMO	16
XALU	2

Cuadro 2. Géneros de Lamiaceae del occidente de México arreglados de acuerdo a la propuesta de clasificación de Harley et al. (2004).

Subfamilia	Tribu	Subtribu	Géneros
Viticoideae			*Vitex* L.
Ajugoideae			*Aegiphila* Jacq. *Teucrium* L.* *Tetraclea* A.Gray
Scutellarioideae			*Scutellaria* L.
Lamioideae			*Leonotis* (Pers.) R.Br. *Marrubium* L. *Stachys* L.
Nepetoideae			
	Mentheae		
		Salviinae	*Lepechinia* Willd. *Salvia* L.
		Menthinae	*Clinopodium* L. *Cunila* D.Royen ex L. *Hedeoma* Pers. *Monarda* L. *Prunella* L.
		Nepetinae	*Agastache* J.Clayton ex Gronov.
	Ocimeae		
		Hyptidinae	*Asterohyptis* Epling *Hyptis* Jacq. *Marsypianthes* Mart. ex Benth.
Incertae sedis			*Callicarpa* L.

* En la prupuesta de Harley et al. (2004), el género *Tetraclea* se consideró como sinónimo de *Clerodendrum*; sin embargo, conforme a los resultados de Yuan et al. (2010) se decidió considerarlo como un género distinto dentro de la subfamilia Ajugoideae.

Cuadro 3. Número de especies (S) nativas o naturalizadas y especies endémicas del occidente de México (E) para cada uno de los géneros de Lamiaceae.

Género	S	E
Salvia	101	37
Hyptis	14	3
Scutellaria	10	5
Stachys	7	2
Hedeoma	4	0
Lepechinia	5	0
Clinopodium	3	1
Cunila	3	1
Vitex	3	0
Agastache	2	0
Asterohyptis	2	0
Aegiphila	1	0
Callicarpa	1	0
Leonotis	1	0
Marrubium	1	0
Marsypianthes	1	0
Monarda	1	0
Prunella	1	0
Tetraclea	1	0
Teucrium	1	0
	163	**54**

Cuadro 4. Especies de Lamiaceae que presentaron el mayor número de registros en el occidente de México.

Especie	**Número de registros**
Salvia mexicana	286
Hyptis albida	261
Asterohyptis stellulata	246
Salvia misella	206
Salvia lavanduloides	200
Salvia iodantha	195
Salvia longispicata	194
Salvia tiliifolia	172
Vitex mollis	168
Stachys coccinea	165
Hyptis mutabilis	162
Salvia purpurea	154
Salvia gesneriflora	152
Salvia thyrsiflora	132
Leonotis nepetifolia	125
Salvia elegans	123
Salvia reptans	118
Total	3 059

Cuadro 5. Especies de Lamiaceae cuya distribución se restringió a una sola provincia biogeográfica en el occidente de México.

Provincia biogeográfica	**Especies restringidas, número y lista de taxones**
Altiplano Mexicano	16 *Hedeoma nana*, *H. patrina*, *H. plicata*, *Monarda citriodora*, *Salvia axillaris*, *Salvia macellaria*, *S. patens*, *S. pulchella*, *S. reflexa*, *S. regla*, *S. serpyllifolia*, *S. subincisa*, *S. unicostata*, *Tetraclea coulteri* y *Teucrium cubense*
Costa Pacífica Mexicana	13 *Aegiphila skutchii*, *Callicarpa acuminata*, *Hyptis cualensis*, *H. macvaughii*, *H. spicigera*, *Marsypianthes chamaedrys*, *Salvia carreyesii*, *S. cualensis*, *S. languidula*, *S. sanctae-luciae*, *S. synodonta*, *S. sublitoralis* y *Vitex hemsleyi*
Cuenca del Balsas	0
Faja Volcánico Transmexicana	23 *Clinopodium brownei*, *Cunila jaliscana*, *Lepechinia flammea*, *L. schiedeana*, *Salvia albiterrarum*, *S. albo-caerulea*, *S. cacomensis*, *S. concolor*, *S. fulgens*, *S. gesneriflora*, *S. guadalajarensis*, *S. manantlanensis*, *S. meera*, *S. nepetoides*, *S. plurispicata*, *S. pugana*, *S. purepecha*, *S. quercetorum*, *S. rogersiana*, *S. tubifera*, *Scutellaria hispidula*, *Stachys aristata* y *S. mexicana*
Sierra Madre Occidental	9 *Agastache coccinea*, *Asterohyptis seemannii*, *Salvia alamosana*, *S. albicalyx*, *S. crucis*, *S. cryptodonta*, *S. pruinosa*, *S. rosei* y *Scutellaria pallidiflora*
Sierra Madre del Sur	1 *Salvia protracta*

Cuadro 6. Comparación de la riqueza de géneros (G) y especies (E) de Lamiaceae nativas o naturalizadas entre el área de estudio y otras zonas con listas o sinopsis florísticas. Si las referencias consultadas consideraban especies introducidas, éstas se excluyeron del conteo para hacerlo comparable con este estudio. Se descartaron los especímenes sin determinación a especie, a no ser que se mencionara un solo registro o que fuera claro que todos los especímenes correspondían a una misma entidad. Los registros determinados como afinidad a una de las especies del listado no fueron contabilizados. *Cifras registradas a partir del presente trabajo.

Área	G	E	**Referencia**
Aguascalientes	11	41	Berumen-Cornejo, 2006
Chiapas	14	141	Domínguez-Vázquez et al., 2002
Coahuila	15	75	Villarreal-Quintanilla, 2001
Durango	12	74	González-Elizondo et al., 1991
Guanajuato	16	69	Zamudio & Galván-Villanueva, 2011
Jalisco	16	101	Ramírez-Delgadillo et al., 2010
Michoacán	16	123	Rodríguez-Jiménez & Espinosa-Garduño, 1996a, 1996b
Nayarit	9	60	Téllez-Valdés, 1995
Querétaro	15	57	Argüelles et al., 1991
Quintana Roo	10	14	Sousa-S. & Cabrera-C., 1983
Tabasco	6	11	Cowan, 1983
Valle de México	13	54	Calderón de Rzedowski & Rzedowski, 2005
Occidente de México	20	163	*
Aguascalientes	12	38	*
Colima	9	42	*
Durango (sur de El Mezquital)	19	20	*
Guanajuato (porción oeste)	6	22	*
Jalisco	17	137	*
Michoacán (porción oeste y noroeste)	12	74	*
Nayarit (porción sur)	11	56	*
Zacatecas (porción sur)	12	53	*
Mesoamérica	22	209	Davidse et al., 2012

Figura 1. Ubicación del área definida como occidente de México y estados o porciones de los mismos que lo conforman (1 Aguascalientes, 2 Colima, 3 Durango, 4 Guanajuato, 5 Jalisco, 6 Michoacán, 7 Nayarit y 8 Zacatecas).

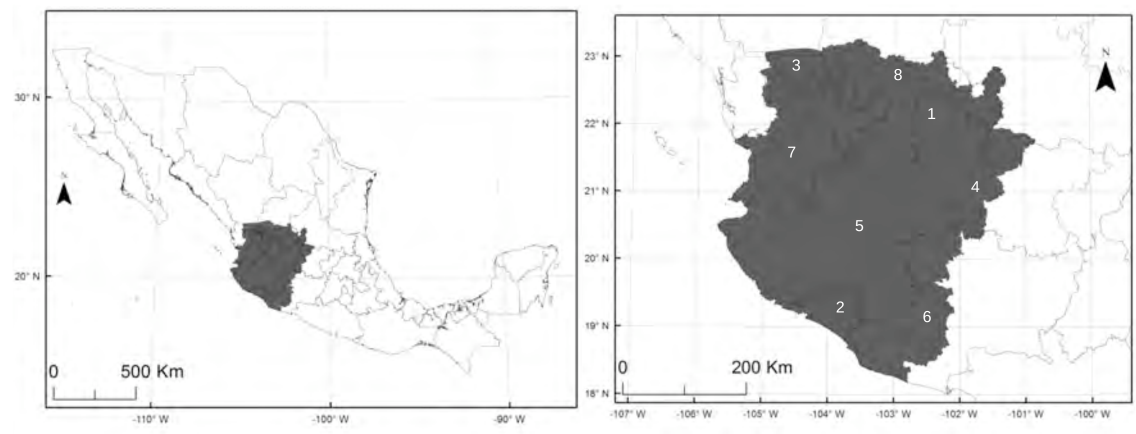


Figura 2. Distribución por décadas de la cantidad de registros (izquierda) y el número acumulado de especies recolectadas (derecha) de Lamiaceae en el occidente de México.

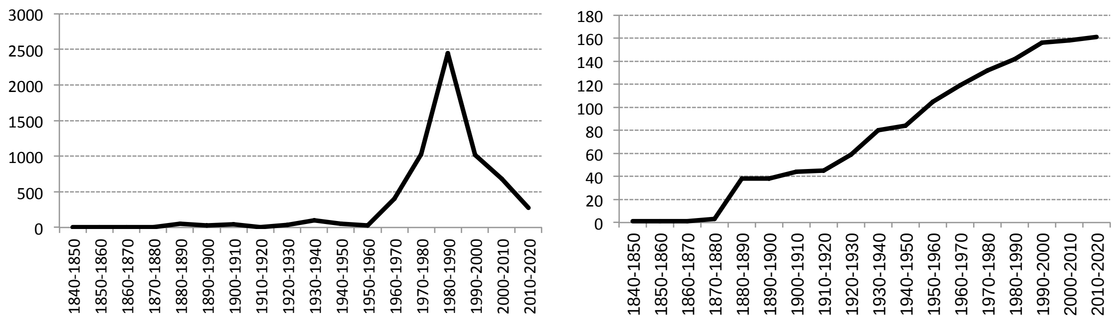


Figura 3. Distribución de registros (A) y especies (B) por estados (izquierda) y municipios (derecha) de Lamiaceae en el occidente de México. Se muestran únicamente los 14 municipios con la mayor cantidad de registros y especies. Estados: Aguascalientes (AGU), Colima (COL), Durango (DUR), Guanajuato (GUA), Jalisco (JAL), Michoacán (MIC), Nayarit (NAY) y Zacatecas (ZAC).

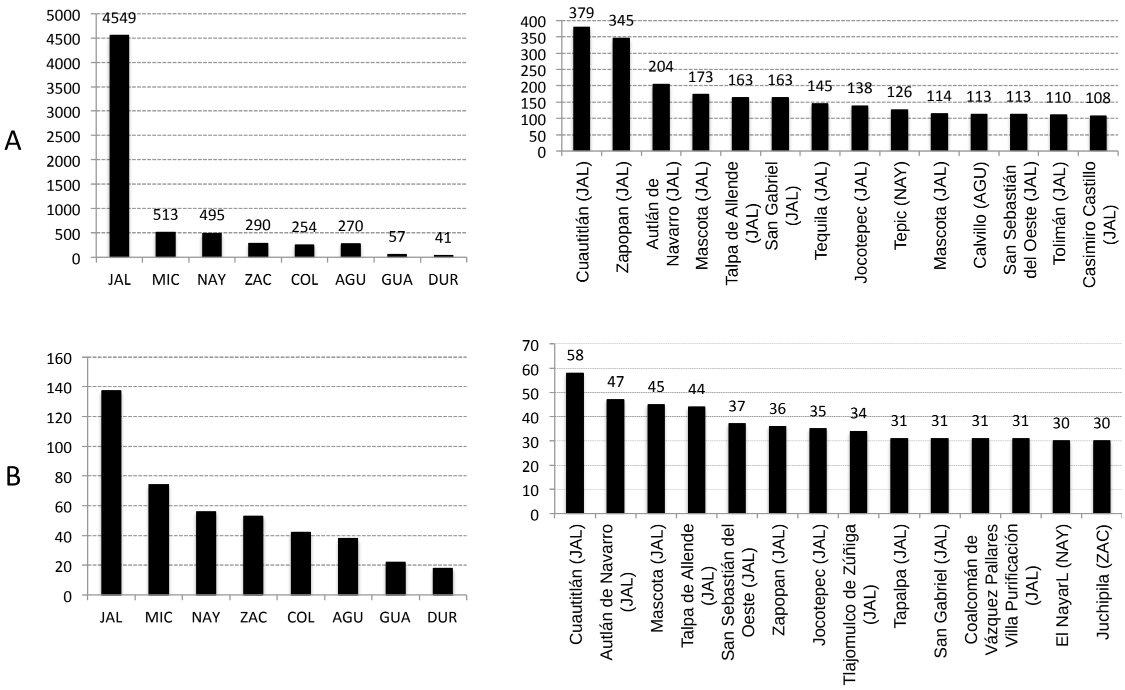


Figura 4. Distribución de registros (izquierda) y especies (derecha) por tipo de vegetación (A) y por provincia biogeográfica (B) de Lamiaceae en el occidente de México. Tipos de vegetación: bosque de encino (BEN), bosque de oyamel (BOY), bosque de pino (BPI), bosque de pino y encino (BPE), bosque espinoso (ESP), bosque mesófilo de montaña (BMM), bosque tropical caducifolio (BTC), bosque tropical subcaducifolio (BTS), campo de cultivo (CUL), matorral subtropical (MST), matorral xerófilo (MXE), pastizal (PAS), vegetación acuática y subacuática (VAS) y vegetación sabanoide (SAB). Provincias biogeográficas: Altiplano Mexicano (AME), Costa Pacífica Mexicana (CPA), Cuenca del Balsas (CBA), Faja Volcánica Transmexicana (EVT), Sierra Madre del Sur (SMS) y Sierra Madre Occidental (SMO).

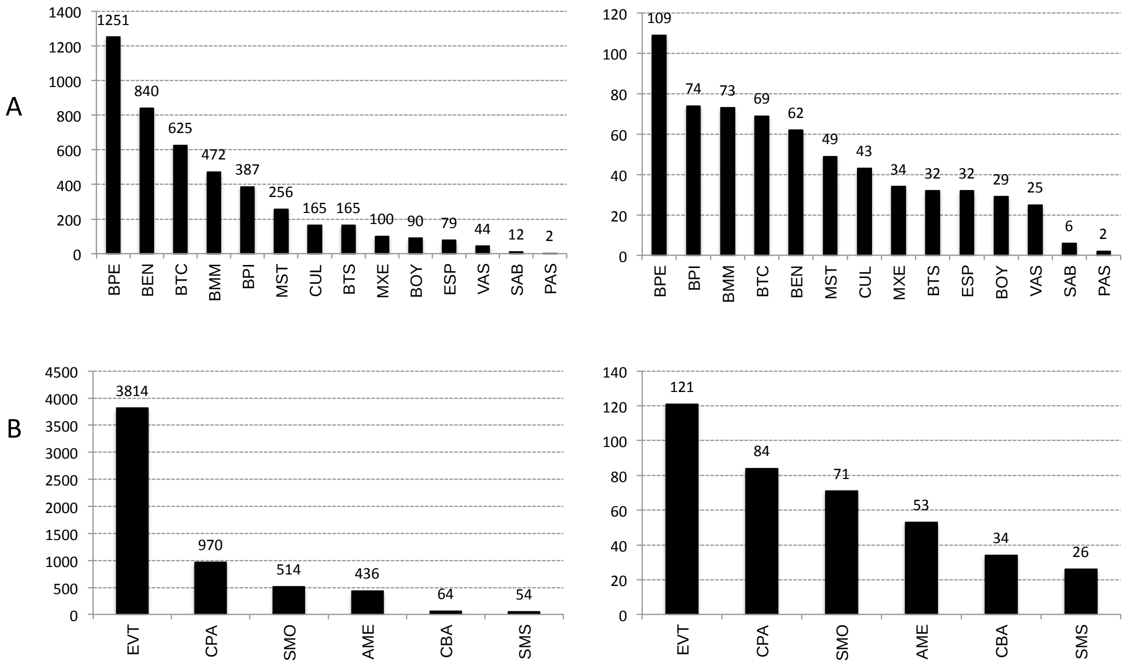


Figura 5. Distribución del número de registros (izquierda) y de especies (derecha) de Lamiaceae en el occidente de México por unidad de longitud (A), latitud (B), y altitud (C).

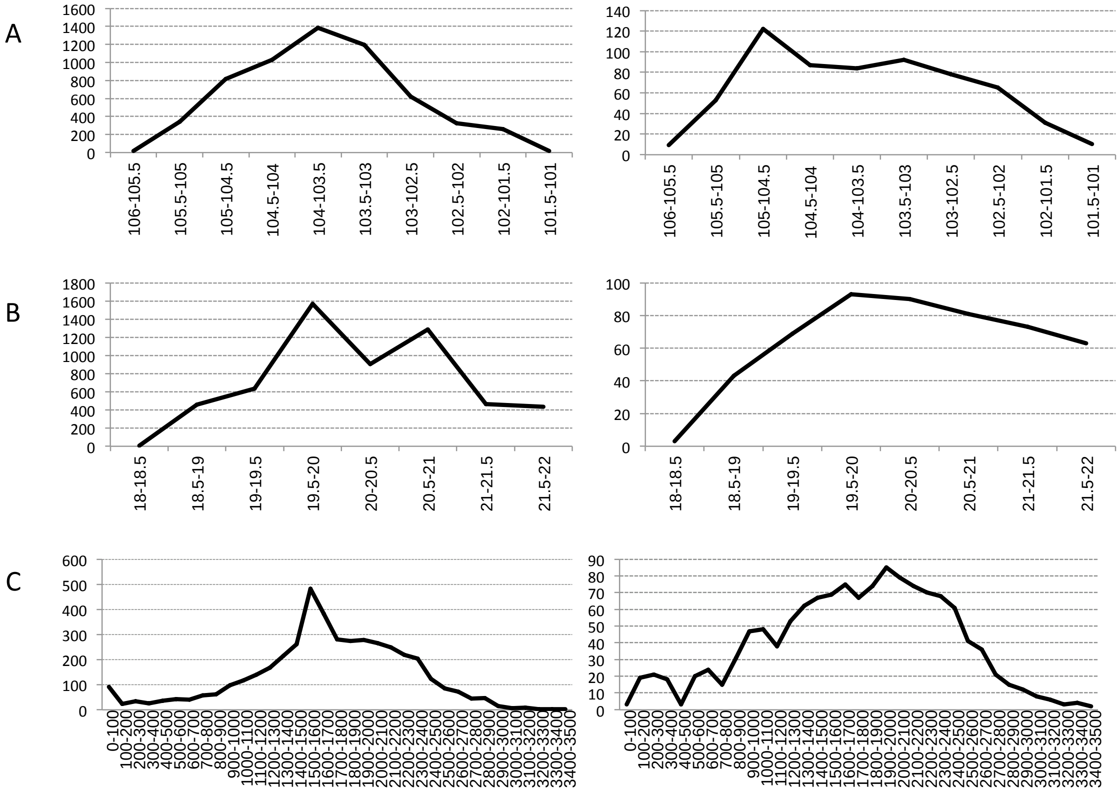
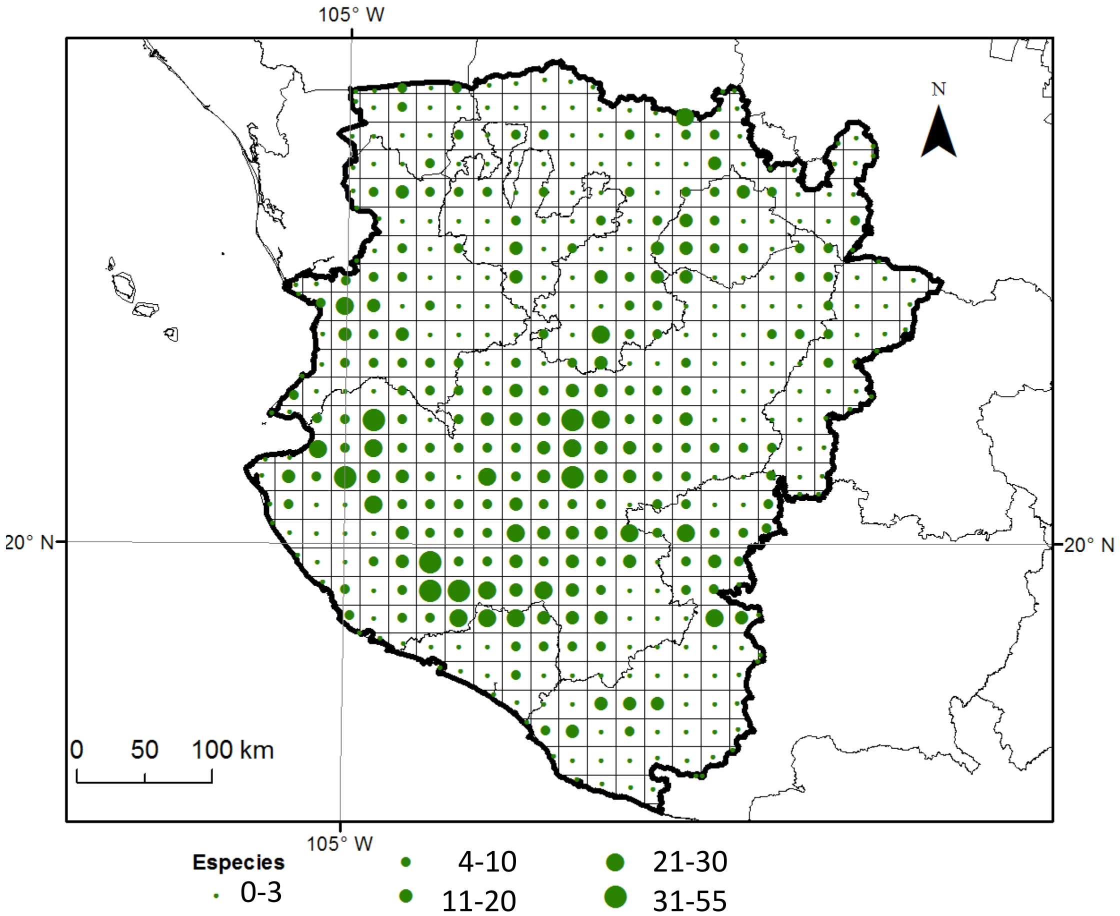


Figura 6. Distribución de la riqueza de Lamiaceae en el occidente de México por cuadros de 21 km de lado.



Apéndice 1. Lista de las especies de Lamiaceae nativas o naturalizadas en el occidente de México.
*Especies endémicas del área
**Colectores abreviados de la siguiente manera: R. Alcalá (RA), J. J. Balleza-C. (JBC), A. Benítez-P. (ABP), C. R. Broome (CRB), I. J. Calzada (IJC), A. Castro-C. (ACC), L. F. Colin-N. (LCN), C. Cuéllar-R. (CCR), R. Cuevas-G. (RCG), E. D. Enríquez-E. (EEE), C. Feddema (CF), A. Flores-A. (AFA), G. García-R. (GGR), I García-R. (IGR), J. García-R. (JGR), M. González-E. (MGE), J. G. González-G. (JGG), J. F. Guerrero-R. (JGR), G. B. Hinton (GBH), H. H. Iltis (HHI), J. N. Labat (JNL), J. A. Machuca-N. (JMN), R. McVaugh (RM), J. G. Morales-A. (JMA), J. Nava-V. (JNV), G. Nieves-H. (GNH), F. Pérez (FP), K. M. Peterson (KMP), C. G. Pringle (CGP), T. P. Ramamoorthy (TPR), A. Rodríguez-C. (ARC), J. L. Rodríguez-H. (JRH), A. R. Romero (ARR), J. N. Rose (JNR), F. J. Santana-M. (FSM), I. Solís (IS), O. Téllez-V. (OTV), L. M. Villarreal de Puga (LMV), J. L. Villa-V. (JVV), y S. Zamudio-R. (SZR).
Acrónimo de los herbarios de acuerdo al *Index Herbariorum* (Thiers, 2011), excepto para los herbarios de la Universidad Autónoma de Nayarit (aquí como NAY) y la Universidad Autónoma de Zacatecas (HUAZ).
*** Aguascalientes (A), Colima (C), Durango (D), Guanajuato (G), Jalisco (J), Michoacán (M), Nayarit (N), Zacatecas (Z).

No.	**Especie**	**Testigo****	**Estado*****
1	*Aegiphila skutchii* Moldenke	RCG 2917 (IBUG, ZEA)	J
2	*Agastache coccinea* (Greene) Lint. & Epling	MGE et al. 1795 (CIIDIR, IEB, MEXU)	D
3	*Agastache palmeri* (B.L.Rob.) Standl.	LMV 8170 (IBUG, MEXU)	J
4	*Asterohyptis seemannii* (A.Gray) Epling	OTV et al. 12277 (IEB, MEXU, MICH)	JN
5	*Asterohyptis stellulata* (Benth.) Epling	JGG 46 (IBUG)	CGJMNZ
6	*Callicarpa acuminata* Kunth	ACC et al. 520 (IBUG)	J
7	*Clinopodium brownei* (Sw.) Kuntze	LMV 2115 (IBUG)	J
8	*Clinopodium jaliscanum* (McVaugh & R.Schmid) Govaerts*****	RCG et al. (MEXU, WIS, ZEA)	J
9	*Clinopodium macrostemum* (Moc. & Sessé ex Benth.) Kuntze	JGG & ACC 815 (IBUG)	JM
10	*Cunila jaliscana* García-Peña & J.G.González*****	JGG 303 (IBUG)	J
11	*Cunila polyantha* Benth.	JGG & ACC 822 (IBUG)	ACJMZ
12	*Cunila pycnantha* B.L.Rob. & Greenm.	RCG et al. 5102 (IBUG, WIS)	JCMN
13	*Hedeoma nana* (Torr.) Briq.	GGR 2854 (HUAA)	A
14	*Hedeoma patens* M E.Jones	JGG et al. 970 (IBUG)	DJZ
15	*Hedeoma patrina* W.S.Stewart	GGR 2845 (CIIDIR, HUAA, IEB)	A
16	*Hedeoma plicata* Torr.	JGG & JVV 1174	AJZ
17	*Hyptis albida* Kunth	JGG et al. 912 (IBUG)	ACGJMNZ
18	*Hyptis capitata* Jacq.	JGG 773 (IBUG)	CJMN

19	*Hyptis cualensis* J.G.González & Art.Castro*****	AFA & ARR 662 (IBUG)	J
20	*Hyptis macvaughii* J.G.González & Art.Castro*****	JGG & ACC 1536 (IBUG)	JN
21	*Hyptis mutabilis* (Rich.) Briq.	JGG 274 (IBUG	CGJMNZ
22	*Hyptis oblongifolia* Benth.	JGG 498 (IBUG)	CJMNZ
23	*Hyptis pectinata* (L.) Poit.	JGG et al. 1233 (IBUG)	JMN
24	*Hyptis pinetorum* Epling*****	JGG 302 (IBUG)	J
25	*Hyptis pseudolantana* Epling	ACC et al. 2619a (IBUG)	JM
26	*Hyptis rhytidea* Benth.	JGG & ACC	JN
27	*Hyptis spicigera* Lam.	JGG et al. 1140	CJMN
28	*Hyptis suaveolens* (L.) Poit.	JGG 734 (IBUG)	CDJMN
29	*Hyptis subtilis* Epling	JGG 767 (IBUG)	CJMN
30	*Hyptis urticoides* Kunth	JGG 778 (IBUG)	JMNZ
31	*Leonotis nepetifolia* (L.) R.Br.	FSM et al. 8653 (ZEA)	ACDGJMNZ
32	*Lepechinia caulescens* (Ortega) Epling	JGG et a. 1271 (IBUG)	CDJMNZ
33	*Lepechinia flammea* Mart.Gord. & Lozada-Pérez	JGG et al. 1468 (IBUG)	J
34	*Lepechinia glomerata* Epling	JGG et al. 947 (IBUG)	J
35	*Lepechinia nelsonii* (Fernald) Epling	JGG & FSM 849 (IBUG, ZEA)	JM
36	*Lepechinia schiedeana* (Schltdl.) Vatke	JGR s.n. (IBUG)	J
37	*Marrubium vulgare* L.	JGG 314 (IBUG)	AJMZ
38	*Marsypianthes chamaedrys* (Vahl) Kuntze	JGG 1168 (IBUG)	JMN
39	*Monarda citriodora* Cerv. ex Lag.	GGR 2461 (HUAA)	A
40	*Prunella vulgaris* L.	JGG et al. 1062 (IBUG)	ADJMN
41	*Salvia acerifolia* B.L.Turner	JGG et al. 788 (IBUG)	JM
42	*Salvia aequidistans* Fernald*****	JGG 737 (IBUG)	JN
43	*Salvia alamosana* Fernald	OTV 11221 (MEXU, NAY)	N
44	*Salvia albicalyx* J.G.González*****	IS 957 (CIIDIR, IBUG)	D
45	*Salvia albiterrarum* J.G.González & Art.Castro*****	JGG et al. 1246 (IBUG)	J
46	*Salvia albo-caerulea* Lindl.	JGG & FSM 838 (IBUG)	JM
47	*Salvia amarissima* Ortega	JBC 12795 (HUAZ)	MZ
48	*Salvia angustiarum* Epling*****	JGG & ACC 606 (IBUG)	JNZ
49	*Salvia assurgens* Kunth	ACC et al. 1952 (IBUG)	DJMNZ
50	*Salvia axillaris* Moc. & Sessé	JGG et al. 1543	AGJZ

51	*Salvia ballotiflora* Benth.	JBC 494 (HUAZ)	AJZ
52	*Salvia brachyodonta* Briq.*****	JGG et al. 1288 (IBUG)	JZ
53	*Salvia breviflora* Benth.	JNL 1093 (MEXU)	M
54	*Salvia cacomensis* J.G.González, J.Morales & J.Rodríguez*****	JMA & JRH 300 (ZEA)	J
55	*Salvia carnea* Kunth	HHI 2629 (IBUG, MEXU, WIS)	J
56	*Salvia carreyesii* J.G.González*****	JGG et al. 798 (IBUG)	J
57	*Salvia chalarothyrsa* Fernald*****	JGG et al. 539 (IBUG)	CJM
58	*Salvia chamaedryoides* Cav.	ARC et al. 6345 (IBUG)	Z
59	*Salvia cinnabarina* M.Martens & Galeotti	JGG 245 (IBUG)	CJ
60	*Salvia clinopodioides* Kunth	JNL 1329 (MEXU)	JM
61	*Salvia coccinea* Buc'hoz ex Etl.	CCR 19 (HUAA)	AJ
62	*Salvia concolor* Lamb. ex Benth.	JGG & JMN 1182 (IBUG)	J
	—— —— var. *iltisii* J.G.González & A.Vázquez*****	HHI et al. 2623 (ENCB, IBUG, MEXU, MICH)	J
63	*Salvia crucis* Epling	OTV et al. 1620 (MEXU)	JN
64	*Salvia cryptodonta* Fernald	JGG et al. 1255 (IBUG)	DJZ
65	*Salvia cualensis* J.G.González*****	JGG et al. 1214 (IBUG)	J
	—— —— var. *perezii* J.G.González*****	JGG et al. 1046 (IBUG)	J
66	*Salvia cyanantha* Epling*****	SZR & RA 13957 (IEB)	M
67	*Salvia decora* Epling	ACC & JVV 2299 (IBUG)	JMN
68	*Salvia dichlamys* Epling	JGG et al. 420 (IBUG)	JM
69	*Salvia elegans* Vahl.	JGG & ACC 825 (IBUG)	ADGJMNZ
70	*Salvia firma* Fernald*****	JGG et al. 1231 (IBUG)	JN
71	*Salvia fulgens* Cav.	IGR & JNV (CIMI, IBUG, IEB, GUADA)	M
72	*Salvia gesneriflora* Lindl. & J.Paxton	JGG 301 (IBUG)	ACJMZ
73	*Salvia gravida* Epling*****	JGG et al. 256 (IBUG)	M
74	*Salvia guadalajarensis* Briq. *****	JGG et al. 1165 (IBUG)	J
75	*Salvia helianthemifolia* Benth.	JGG 467 (IBUG)	J
76	*Salvia heterotricha* Fernald*****	JGG et al. 1278 (IBUG)	JNZ
77	*Salvia hirsuta* Jacq.	JBC & EEE	JZ
78	*Salvia hispanica* L.	JGG 484 (IBUG)	ACDJMNZ
79	*Salvia ibugana* J.G.González*****	JGG 324 (IBUG)	J

80	*Salvia indigocephala* (Epling) Ramamoorthy*****	JGG et al. 424	M
81	*Salvia iodantha* Fernald	JGG 281 (IBUG)	CJMN
82	*Salvia laevis* Benth.	JGG 320 (IBUG)	JMN
83	*Salvia languidula* Epling	JGG 747 (IBUG)	CJMN
84	*Salvia lasiantha* Benth.	FSM et al. 5155 (IBUG, MEXU, WIS, ZEA)	JZ
85	*Salvia lasiocephala* Hook & Arn.	JGG 273 (IBUG)	CJMN
86	*Salvia lavanduloides* Kunth	JGG 306 (IBUG)	ACDJMNZ
87	*Salvia leptostachys* Benth.	LMV 1283 (IBUG)	AGJMZ
88	S*alvia leucantha* Cav.	JGG et al. 401 (IBUG)	CJMZ
89	*Salvia longispicata* M.Martens & Galeotti	JGG 234 (IBUG)	CJMN
90	*Salvia longistyla* Benth.	JGG 209 (IBUG)	JM
91	*Salvia macellaria* Epling	JGG 1132 (IBUG)	AGJZ
92	*Salvia manantlanensis* Ramamoorthy*****	JGG et al. 1223 (IBUG)	J
93	*Salvia meera* Ramamoorthy ex J.G.González & Santana Mich.*****	IJC & GNH 9545 (ZEA, XAL)	J
94	*Salvia melissodora* Lag.	JGG et al. 1291 (IBUG)	AGJMNZ
95	*Salvia mexiae* Epling*****	JGG et al. 882 (IBUG)	J
96	*Salvia mexicana* L.	JGG 374 (IBUG)	ACGJMNZ
	—— —— var. *minor* Benth.	JGG & FSM 828 (IBUG)	ACGJMNZ
97	*Salvia microphylla* Kunth	JGG 1130 (IBUG)	ACDGJMZ
98	*Salvia misella* Kunth	JGG 765 (IBUG)	ACDJMNZ
99	*Salvia mocinoi* Benth.	JGG 305 (IBUG)	JMN
100	*Salvia monantha* Fernald	ABP 3511 (MEXU)	N
101	*Salvia nana* Kunth	JGG et al. 1280 (IBUG)	ADGJZ
102	*Salvia nepetoides* Kunth	JGG 1187 (IBUG)	J
103	*Salvia patens* Cav.	JGG & FP 1128 (IBUG)	AGJ
104	*Salvia platyphylla* Briq.*****	JGG & ACC 1031 (IBUG)	JNZ
105	*Salvia plurispicata* Epling	IGR & JMN 4541 (CIMI, IEB, MICH)	M
106	*Salvia podadena* Briq.	EEE & JBC 1330a (MEXU)	Z
107	*Salvia polystachya* Cav.	JGG 210 (IBUG)	ACGJMNZ
108	*Salvia pringlei* B. L. Rob. & Greenm. *****	JGG 763 (IBUG)	JN
109	*Salvia protracta* Benth.	TPR 4694 (IBUG, MEXU)	M
110	*Salvia pruinosa* Fernald	CF 2427a (MICH)	J

111	*Salvia prunelloides* Kunth	JGG et al. 1235 (IBUG)	ADGJMZ
112	*Salvia pugana* J.G.González & Art.Castro*****	JGG et al. 1524 (IBUG)	J
113	*Salvia pulchella* DC.	JGG 1107	J
114	*Salvia purepecha* Bedolla, Lara & Zamudio	KMP & CRB 378 (IBUG, MEXU, WIS)	JM
115	*Salvia purpurea* Cav.	JGG 481 (IBUG)	ACJMNZ
116	*Salvia quercetorum* Epling*****	JGG 297 (IBUG)	J
117	*Salvia ramamoorthyana* Espejo*****	JGG & FSM 846 (IBUG)	J
118	*Salvia ramirezii* J.G.González*****	JGG et al. 1042 (IBUG)	J
119	*Salvia reflexa* Hornem.	JBC & EEE 12666 (HUAZ)	AJZ
120	*Salvia regla* Cav.	EEE 4041b (HUAZ)	AGJZ
121	*Salvia reptans* Jacq.	JGG 362 (IBUG)	ACGJMNZ
122	*Salvia rogersiana* Ramamoorthy ex J.G.González & Cuevas*****	JGG et al. 781 (IBUG)	J
123	*Salvia roscida* Fernald	JGG 495 (IBUG)	CJMN
124	*Salvia rosei* Fernald*****	JBC & EEE 7828 (HUAZ)	JNZ
125	*Salvia rostellata* Epling*****	JGG 504 (IBUG)	JN
126	*Salvia sanctae-luciae* Seem.*****	JGG et al. 931	N
127	*Salvia santanae* Ramamoorthy ex J.G.González & Guzmán-Hernández*****	JGG 242 (IBUG)	CJ
128	*Salvia serpyllifolia* Fernald	LCN & JGR 782 (IBUG)	JZ
129	*Salvia sessei* Benth.	JGG 230 (IBUG)	CJM
130	*Salvia subincisa* Benth.	JBC & EEE 12540 (HUAZ)	AZ
131	*Salvia subpatens* Epling	JGG & FSM 850 (IBUG)	JM
132	*Salvia synodonta* Epling*****	GBH et al. 12576	M
133	*Salvia thyrsiflora* Benth.	JGG et al. 872 (IBUG)	CJMN
134	*Salvia tiliifolia* Vahl.	JGG 1106 (IBUG)	ACGJMNZ
135	*Salvia tubifera* Cav.	JMN 6056 (WIS)	J
136	*Salvia unicostata* Fernald	JGG & FP 1121 (IBUG)	JZ
137	*Salvia uruapana* Epling	JGG et al. 779 (IBUG)	JM
138	*Salvia vazquezii* Iltis & Ramamoorthy*****	RCG 1723 (IBUG, ZEA)	CJ
	—— —— subsp. *tancitaroensis* J.G.González & A.Vázquez*****	JGG et al. 292 (IBUG)	M
139	*Salvia veronicaifolia* A.Gray ex S.Watson*****	JBC & EEE 8487 (MEXU)	JNZ
140	*Salvia* sp. 1*****	JGG et al. 1260 (IBUG)	DZ

141	*Salvia* sp. 2*****	RCG 416 et al. (IBUG)	J
142	*Scutellaria blepharophylla* Epling	RM 20172 (MICH)	JM
143	*Scutellaria cuevasiana* J.G.González & AVázquez*****	JGG & ACC 1556 (IBUG)	J
144	*Scutellaria dumetorum* Schltdl.	JGG 229 (IBUG)	CGJM
145	*Scutellaria hispidula* B.L.Rob.	LMV et al. 8868 (IBUG)	J
146	*Scutellaria jaliscana* Epling*****	LMV 1017 (IBUG)	JM
147	*Scutellaria pallidiflora* Epling*****	JNR 2487 (GH)	J
148	*Scutellaria potosina* Brandegee	GGR 4061 (HUAA)	A
149	*Scutellaria racemosa* Pers.	LMV 1774 (IBUG, WIS)	J
150	*Scutellaria sipilensis* Cuevas*****	HHI et al. 30995 (IBUG, WIS)	J
151	*Scutellaria sublitoralis* J.G.González*****	JGG 754 (IBUG)	JN
152	*Stachys agraria* Schltdl. & Cham.	JGG	ACGJMN
153	*Stachys aristata* Greenm.*****	CGP 8623 (MEXU)	J
154	*Stachys bigelovii* A.Gray	JGG 212 (IBUG)	AJMNZ
155	*Stachys coccinea* Ortega	JGG et al. 1135 (IBUG)	ACDGJMNZ
156	*Stachys manatlanensis* B.L.Turner*****	JGG 228 (IBUG)	J
157	*Stachys mexicana* Moc. & Sessé ex Benth.	RCG 869 (IBUG)	JZ
158	*Stachys pilosissima* M.Martens & Galeotti	JGG 212 (IBUG)	JC
159	*Tetraclea coulteri* A.Gray	GGR 5326 (CIIDIR, HUAA)	AZ
160	*Teucrium cubense* Jacq.	JBC 2917 (HUAZ)	AZ
161	*Vitex hemsleyi* Briq.	RCG et al. 9051 (ZEA)	CJN
162	*Vitex mollis* Kunth	JGG 595 (IBUG)	CDJMNZ
163	*Vitex pyramidata* B.L.Rob.	JGG & ACC	DJN

Capítulo 4. Descripción de nuevas especies y novedades taxonómicas y biogeográficas de *Salvia* en México, y Lamiaceae en el occidente del país

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Article

Salvia cualensis and *Salvia cualensis* var. *perezii* (Lamiaceae), two new taxa from the Sierra de El Cuale, Jalisco, Mexico

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Abstract

Salvia cualensis and *Salvia cualensis* var. *perezii* are described and illustrated from the Sierra de El Cuale, Jalisco, Mexico. These taxa belong to *Salvia* section *Farinaceae*. They are similar in their morphology to *Salvia jaimehintoniana*, which is distributed in northern Sierra Madre Oriental, Mexico. The new taxa can be distinguished from *S. jaimehintoniana* by their usually shorter petioles, narrow oblong-lanceolate to linear leaf blades, lanceolate and larger floral bracts, longer lower corolla lips, filaments, connectives, and styles. Additionally an expanded description of *S. jaimehintoniana* is also presented, under which *S. jacalana* is synonymized.

Resumen

Se describe e ilustra a *Salvia cualensis* y *Salvia cualensis* var. *perezii* de la Sierra de El Cuale, Jalisco, México. Estos taxa pertenecen a *Salvia* sección *Farinaceae*. Son similares en su morfología a *Salvia jaimehintoniana*, la cual se distribuye en el norte de la Sierra Madre Oriental, México. Los nuevos taxa pueden distinguirse de *S. jaimehintoniana* por sus peciolos usualmente más cortos, láminas oblongo-lanceoladas a lineares, brácteas florales lanceoladas y más grandes, labio inferior de la corola, filamentos, conectivos y estilos más largos. Aquí también se presenta una descripción expandida de *S. jaimehintoniana*, donde *S. jacalana* es sinonimizada.

Introduction

Sierra de El Cuale is one of the botanically richest areas in Jalisco, Mexico. Proof of this are the 30 new plant species that have been described there in the last 39 years (Rzedowski 1972, Grashoff 1974, Magaña & Lott 1983, McVaugh 1987, González-Villarreal 1989, 2003, Ramírez-Delgadillo 1992, González-Tamayo 1992a, 1992b, 1993, 1998, Turner 1992, 2005, González-Ledesma *et al.* 1995, Sánchez-Ken & Dávila 1995, Terrel 1996, Herrera & Peterson 1999, Soejima *et al.* 2001, Rodríguez & Ortiz-Catedral 2003, González-Tamayo & Cuevas-Figueroa 2006a, 2006b, Hernández 2008, González-Tamayo & Hernández-Hernández 2010), and the relatively high degree of endemism that it exhibits, even though its botanical exploration remains scarce (McVaugh 1969, Hernández-López 1995).

The biological importance of this mountain range has not gone unnoticed. The Mexican institution CONABIO (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad) recognized this area as part of the Mexican Priority Land Region 62 (Arriaga *et al.* 2000), which includes several Priority Terrestrial Sites with medium and high relevance (CONABIO *et al.* 2007). Furthermore, it is also considered as a critical priority sub-region for the conservation of montane cloud forest (CONABIO 2010).

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The richness and uniqueness of the Sierra de El Cuale has attracted our attention and recently we made several explorations in the area. As a result, we discover some new sage populations that according to their morphological characters belong to *Salvia* Linnaeus (1753: 23) section *Farinaceae* (Epling 1935: 87) Epling (1939: 186) (Epling 1939, 1940, 1957, 1960), but which do not correspond to any of the species contained therein. In view of that, we describe these populations as a new species and a new variety. These taxa are morphologically similar to the former *Salvia azurea* Michx. ex Vahl (1804: 253) subsp. *mexicana* Epling (1939: 193), which was later elevated to species rank by Turner (1995, 2008). Turner also split it into two different species: *Salvia jaimehintoniana* Ramamoorthy ex Turner (1995: 97) and *Salvia jacalana* Turner (2008: 167); he could not use the epithet "*mexicana*" for one of the resulting taxa because it was already applied for *Salvia mexicana* Linnaeus (1753: 25). Additionally, we examined specimens of both taxa to understand the infraspecific morphological variation, and we found that some of our observations do not agree with Turner´s (1995, 2008) descriptions. For example, he highlights the persistent floral bracts as a diagnostic character. In every specimen examined, however, those are deciduous. Consequently, we include an expanded description of *Salvia jaimehintoniana*, under which we synonymize *S. jacalana*.

Taxonomy

***Salvia jaimehintoniana* Ramamoorthy ex Turner** (1995: 97). Type:—MEXICO. Nuevo León: On the road from Zaragosa [Zaragoza] to Aserradero la Encantada, 4.3 road miles S of Zaragosa [Zaragoza], 20 May 1988 (fl), *B.L. Westlund 24* (holotype TEX!).

Salvia azurea Michx. ex Vahl (1804: 253) subsp. *mexicana* Epling (1939: 193). Type:—MEXICO. Nuevo León: Sierra Madre Oriental, descent to Banco de Santa Ana, about 15 m SW fo Galeana, 17 June 1934 (fl), *C.S. Mueller & M.T. Mueller 857* (holotype UC!).

Salvia jacalana Turner (2008: 167), *syn. nov.* Type:— MEXICO. Hidalgo: Jacala, 6.5 km E–NE of Jacala, between Cuesta Colorada and El Pinalito on Mex 85, 1700 m, 13 July 1991 (fl), *M. Mayfield 820, A. Hemple & A. Jack* (holotype TEX!).

Perennial herb, erect, 60–80 cm tall, glabrous to sparsely covered whit short erect hairs. Leaves usually sessile, or with petioles 2–15 mm long; with axillary fascicles of several immature leaves; blades elliptic to oblanceolate, (1.5–)5–8(–10) × (0.7–)1.3–2.8 cm, long attenuate at the base, acuminate at the apex, the margin diffusely serrate to subentire, upper surface sparsely covered with tiny antrorse hairs, lower surface glabrous except for the veins which are covered with short simple hairs. Racemes (6–)16–37 cm long, 9–12 verticillasters per inflorescence, verticillasters (4–)6–14-flowered, lowermost nodes 3–5 cm apart, the uppermost gradually crowded, floral axis covered with short hairs and glandular dots. Floral bracts ovate–lanceolate to lanceolate, 3–5.4(–11) × (1.6–)2.4–3.5(–5) mm, deciduous, truncate at the base, narrowly acuminate at the apex, the outer surface covered with short erect hairs, the margin entire and bordered with longer erect hairs. Pedicels 2.8–3 mm long (up to 4.7 mm long in fructification), densely covered with erect simple hairs. Calyx (5.5–)6–6.7 × 2.8–3.5 mm in flower, 7.9–8.6 × 4.7–5.7 mm in fruit, green and purple or blue tinged at the upper lip, veins with long straight hairs and glandular dots between them, internally covered with short antrorse hairs towards the apex, the upper lip 5- or 7-veined and entire, lobes of the lips acute, the lower ones short apiculate, margin of the lips bordered with short simple hairs. Corolla blue, with white nectar guides on the lower lip, glabrous except for the upper lip which is densely pilose and the lower one sparsely pilose, tube 6–8(–9) × (2.6–)3–3.5 mm, straight or slightly constricted at the base, ventricose, internally epapillate; upper lip 3.5–4.4(–5.6) mm long, lower one (6–)7.5–8(–11) × 7–9.2 mm. Stamens included; filaments 1–1.6(–1.9) mm long; connectives 3.5–5 mm long, ornate with and acute teeth at its ventral portion; thecae 1.5–1.8 mm long; two staminodes present above and behind the insertion of the filament. Gynobasic horn 0.6–0.8 mm long; styles 7–7.4(–10.7) mm long, pilose at the apex. Nutlets ovate, 1.9–2.2 × 1–1.4 mm, pale amber and occasionally dark marbled, smooth and glabrous.

Distribution, habitat and phenology:—*Salvia jaimehintoniana* is an endemic species from Mexico; it inhabits the Sierra Madre Oriental in the states of Nuevo León, Tamaulipas, Querétaro and Hidalgo, and Sierra Madre Occidental in Durango (figure 1). It grows in pine-oak, oak and pine forests in elevation of (1600–)2100–2300(–2800) m, on limestone soil. It shares the habitat with *Pinus* spp., *Quercus* spp., *Agarista mexicana* (Hemsl.) Judd, *Juniperus flaccida* Schltdl., *Plantago* sp., *Eragrostis* sp., *Chloris* spp. It flowers and fruits from August to October.

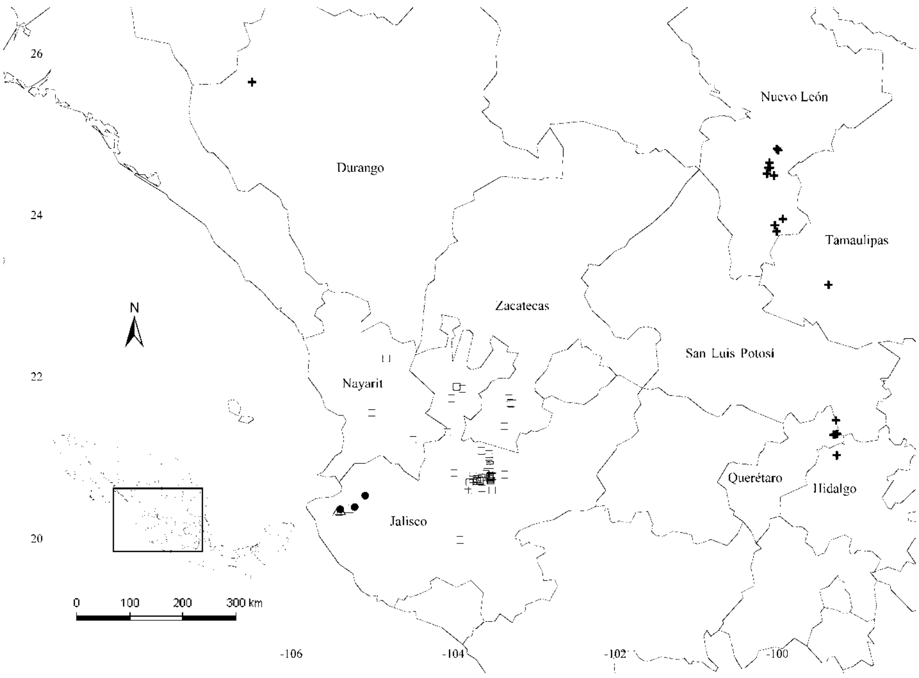

FIGURE 1. Distribution of *Salvia cualensis* and related taxa. *Salvia cualensis* var. *cualensis* (dots), *S. cualensis* var. *perezii* (triangles), *S. heterotricha* (squares), and *S. jaimehintoniana* (crosses).

Discussion:—Epling (1939) described this taxon as *Salvia azurea* subsp. *mexicana*. Peterson (1978) considered this plant as a distinct species and described it as *Salvia tarayensis* Peterson (1978: 107) in her doctoral dissertation, but she did not validly publish the name according to articles 29 and 30 of the International Code of Botanical Nomenclature (McNeill *et al.* 2006), because her dissertation does not include an explicit statement or other internal evidence that it was regarded as an effective publication, and were not widely distributed to general public or principal botanical institutions with accessible libraries. She recognized *S. tarayensis* mainly on the bases of a different chromosome number from what is present in *S. azurea s.s.* (2n=12 *vs.* 2n=20), its smaller calyces and subtruncate lips, slightly different pollen exine morphology (thicker reticulum, smaller lumina and smaller and more numerous perforations), its smaller stature, and disjunct geographical distribution (*S. azurea s.s.* growing exclusively in the United States, and *S. tarayensis* in the Mexican states of Nuevo León and Hidalgo). Later, Turner (1995, 2008) validly published this taxon as two different species, *Salvia jaimehintoniana* and *Salvia jacalana*. He included in *S. jaimehintoniana* the populations from the state of Durango, Nuevo León and Tamaulipas, and in *S. jacalana* the populations from northwestern Hidalgo; he did not examine specimens from Querétaro. He considered the difference in the indumenta (stems minutely hispidulous to subglabrate and leaves subglabrous or pubescent along the major veins in *S. jaimehintoniana*, and stems and leaves moderately to densely pubescent with stiffly spreading white hairs in *S. jacalana*), and an assumption of geographic isolation between them, as sufficient to warrant recognition as different species (Turner 2008). The difference in indumenta highlighted by Turner is not clear and cannot be easily distinguished in the specimens we examined. We conclude that there is a gradient of variation in the pubescence of stems and leaves within the geographic range of the populations of these entities. As the pubescence is not sufficient to distinguish two taxa, we recognize only *S. jaimehitnoniana*, and submerge *S. jacalana* as its synonym.

Turner (1995, 2008) noted that the specimen from Durango differs in its somewhat larger corollas and smaller floral bracts, and was collected in a disjunct locality; therefore, in his opinion, it could deserve recognition as a distinct species. We examined the specimen and found 8–mm long corolla tubes and 4–5 mm long floral bracts; those measurements fall within the range of variation of the other specimens examined. Therefore, we consider it as conspecific, and no new specific epithet would be needed. Nonetheless, the presence of *S. jaimehintoniana* in Durango, without any connection with the populations from Sierra Madre Oriental (Nuevo León, Tamaulipas, Querétaro and Hidalgo) is suspicious. It is likely that the distribution of this species is wider than we think; therefore more field exploration is required, on particular in potential distribution areas that connect both regions to resolve this question.

Additional material examined:—MEXICO. Durango: Tepehuanes, El Tarahumar, 14 km al W de El Huacal, brecha a Tabahueto, 2720 m, 27 August 1983 (fl), *P. Tenorio-L. et al. 4200* (MEXU!, TEX!). Hidalgo: Jacala, along highway 85, immediately N of La Zorra, 7.1 mi NE of Jacala, 1720 m, 21 August 1981, *K.M. Peterson 650* (IEB!, TEX!). Nuevo León: Taray, Pablillo, SE of Galeana, Sierra Madre Oriental, 2100–2300 m, 27 June 1934 (fl), *F.W. Pennell 17041* (US!); along Mexico Highway 68 N near Las Cieneguillas, N of La Ascención, 8.5 miles N of San Juanito, 2435 m, 7 June 1977 (fl), *K.M. Peterson 590* (MEXU!); Doctor Arroyo, Puerto San Onofre, 2870 m, 30 May 1978 (fl), *G. Hinton et al. 17359* (MEXU!); El Carrizo, above Galeana, 1900 m, 16 October 1983 (fl), *G. Hinton et al. 18615* (IEB!); Pablillo, 7 km al E, 1950, 16 May 1985 (fl), *G. Hinton et al. 18840* (IEB!); Sierra El Soldado, cerro Peña Nevada, 2600–2700 m, 24º48’N, 99º51’W, 24 August 1989 (fl), *J. Villarreal et al. 14906* (IEB!), *J. Villarreal et al. 14970* (IEB!); Agua Blanca, above, Galeana, 2305 m, 4 July 1992, *G. Hinton et al. 22285* (IEB!); La Joya de San Diego, above, 2800 m, 6 September 1998 (fl, fr), *G. Hinton 27233* (TEX!), *G. Hinton 27234* (TEX!); SW of Laguna de Labradores, 2283 m, 11 October 2003 (fl, fr), *G. Hinton 27920* (TEX!). Querétaro: Ca. 22 miles E of Landa de Matamoros on Mexico Highway 120, 4 August 1974 (fl, fr), *K.M. Peterson 215* (IEB!); aproximadamente 2 km de la carretera Jalpan-Xilitla, hacia Tres Lagunas, 1900 m, 20 June 1988 (fl), *E. Carranza-G. 639* (IEB!); Jalpan, 3–4 km al E de San Juan de los Durán, Cañada Las Avispas, 1600–1700 m, 23 May 1991 (fl), *B. Servín 1046* (IEB!); Landa de Matamoros, entre El Madroño y la desviación rumbo a la antena de microondas El Pinalito, carretera Xilitla-Landa de Matamoros, 1622 m, 21°17’6.8”N, 99°8’35.5”W, 23 August 2010 (fl, fr), *J.G. González-G. 631* (ENCB!, IBUG!, MEXU!). Tamaulipas: ca. 6 km NW of Rancho El Cielo, ca. 12 km NW of Gómez Farías, 1900 m, 12 August 1991 (fl), *H.H. Iltis 30724* (TEX!).

Salvia cualensis* J.G. González, *sp. nov. (Figs. 1–2, 4)

Salvia jaimehintoniana primo adspectu maxima simile, sed foliis nunc anguste oblongo–lanceolatis nunc linearibus, inflorescentiis brevioribus; inflorescentiarum bracteis, calycibus, corollarum tubis, labiis et stylis longioribus differt.

Type:—MEXICO. Jalisco: Cabo Corrientes, 10.4 km por la brecha de El Tuito a Las Minas de Zimapán, a partir del km 4 al N de El Tuito, carretera a Puerto Vallarta, 1137 m, 20°21’27.14”N, 105°15’30.26”W, 12 August 2011 (fl, fr), *J.G. González-G. 1078, A. Castro-Castro, R. Guerrero-H.* & *E. De Castro-Arce* (holotype IBUG!, isotypes ENCB!, IEB!, MEXU!, XAL!, ZEA!).

Perennial herb, erect, 20–70 cm tall, thickened roots, stems sparsely covered with retrorse and short glandular-capitate hairs towards the apex. Petioles 0–2.5 mm long, sparsely covered with retrorse hairs; leaf blades oblong-lanceolate to linear, (4.7–)8.6–14.4 × (0.3–)0.9–1.7 cm, cuneate to rounded at the base, acute at the apex, the margin sparsely and shortly serrate to entire, both surfaces glabrous except the middle vein which is sparsely covered with short conical hairs and sometimes with tiny glandular capitate hairs, upper surface lustrous; usually with axillary fascicles of several leaves. Inflorescences (4–)8–17(–25) cm long, 4–7 verticillasters per inflorescence, verticillasters (2–)4- or 6(–8)-flowered, lowermost nodes 1.7–4.1 cm apart, the uppermost ones gradually crowded, floral axis covered with long eglandular and tiny glandular-capitate hairs (less than 0.5 mm long). Floral bracts ovate-lanceolate to lanceolate, (2–)14–18.6 × (1–)4–6.7 mm, deciduous, truncate at the base, acute or long caudate at the apex, green and magenta tinged, the margin entire and bordered with erect hairs, the outer surface sparsely covered with appressed hairs, the inner one glabrous. Pedicel (2–)2.7–4.4 mm long in flower, covered with long straight eglandular and tiny glandular-capitate hairs. Calyx (6–)7.9–11 × (3–)4.4–6.5 mm, green, magenta or purple tinged at the upper lip, veins with long straight hairs and sometimes with tiny glandular-capitate hairs between them, internally covered with dark conical short hairs toward the apex, the upper lip 5-veined and entire, lobes of the lips acute, margin of the lips bordered with short simple hairs. Corolla white and the lips sky or dark blue, white nectar guides present on the lower lip, glabrous except the upper lip and the ventral surface of the lower one which are pilose; tube (6–)8.5–11 × 3.5–4.4 mm, straight or slightly constricted at the base, slightly ventricose, internally epapillate, upper lip (3.3–)5.2–8 mm long, lower one (7–)11.1–15 × 6.8–11(15) mm. Stamens included; filaments 1.5–2.4 mm long; connectives 4.5–6.4(–7.5) mm long, ornate with an acute or rarely truncate short teeth at the insertion point with the filament; thecae 1.6–2.5 mm long; two staminodes present above and behind the insertion point of the filament to the corolla tube. Gynobasic horn 1.3–1.5 mm long; styles (9.5–)12.4–13.6 mm long, pilose at the apex. Nutlets ovate, 2.8–3 × 2–2.4 mm, pale amber and irregularly dark brown reticulated, surface glabrous and smooth.

Salvia cualensis* var. *cualensis

Petioles 1–2.5 mm long; leaf blades oblong-lanceolate, (5.2–)8.6–14.4 × 0.9–1.7 cm, rounded to short cuneate at the base. Inflorescences (4–)8–17 cm long, with 4- to 6-flowered verticillasters. Floral bracts ovate-lanceolate, (7–)14–18.6 × 4–6.7 mm. Pedicel 2.7–4.4 mm long. Calyx 7.9–11 × 4.4–6.5 mm, veins covered with long straight and sometimes with tiny glandular-capitate hairs between them. Corolla tube (7.5–)8.5–11 × 3.5–4.4 mm; upper lip 5.2–8 mm long, lower lip 11.1–15 mm long. Connective 4.5–6.4(–7.5) mm long; thecae 1.7–2.5 mm long. Styles (11–) 12.4–13.6 mm long.

Distribution, habitat and phenology:—*Salvia cualensis* var. *cualensis* has been collected in three different areas in Sierra de El Cuale, Jalisco (figure 1). It is likely that an increase in the botanical exploration of this mountain range reveals a wider distribution. It grows in ecotones between pine-oak and tropical deciduous forests at 1130 to 1600 m. It blooms and fructifies from July to October.

Additional specimens (paratypes) examined:—MEXICO. Jalisco: Mascota, Ejido Zapotán, 8.5–9 km al SO de El Mosco, por la brecha rumbo a El Nogalito, frente al montículo rocoso conocido como Cerro del Cabro, 1600 m, 20°31’40”N 104°57’01”W, 21 July 2011 (fl), *J.G. González-G. 1040, A. Castro-Castro, R. Guerrero-H. & C. Beltrán* (IBUG!, IEB!, MEXU!, ZEA!); Talpa de Allende, 2 km al SO de El Cuale por la brecha hacia las Minas de Zimapán, 1540 m, 20°23’10.7”N 105°4’46.6”W, 28 October 2011 (fl), *J.G. González-G. 1153 & D. Juárez* (IBUG!); Talpa de Allende, entre el aserradero de El Cuale y la brecha que sube a las minas de Zimapan, 500–600 m al S de la población, aproximadamente 26 km en línea recta al O de Talpa, 20.388°N 105.073°W, 15 July 2012 (fl, fr), *J.G. González-G. 1214, A. Castro-Castro, G. Munguía-Lino, E. De Castro-Arce & V. Ramírez-Cruz* (IBUG!, MEXU!).

Etymology:—The epithet of *Salvia cualensis* makes reference to the Sierra de El Cuale, a unique and interesting mountain range of Western Mexico.

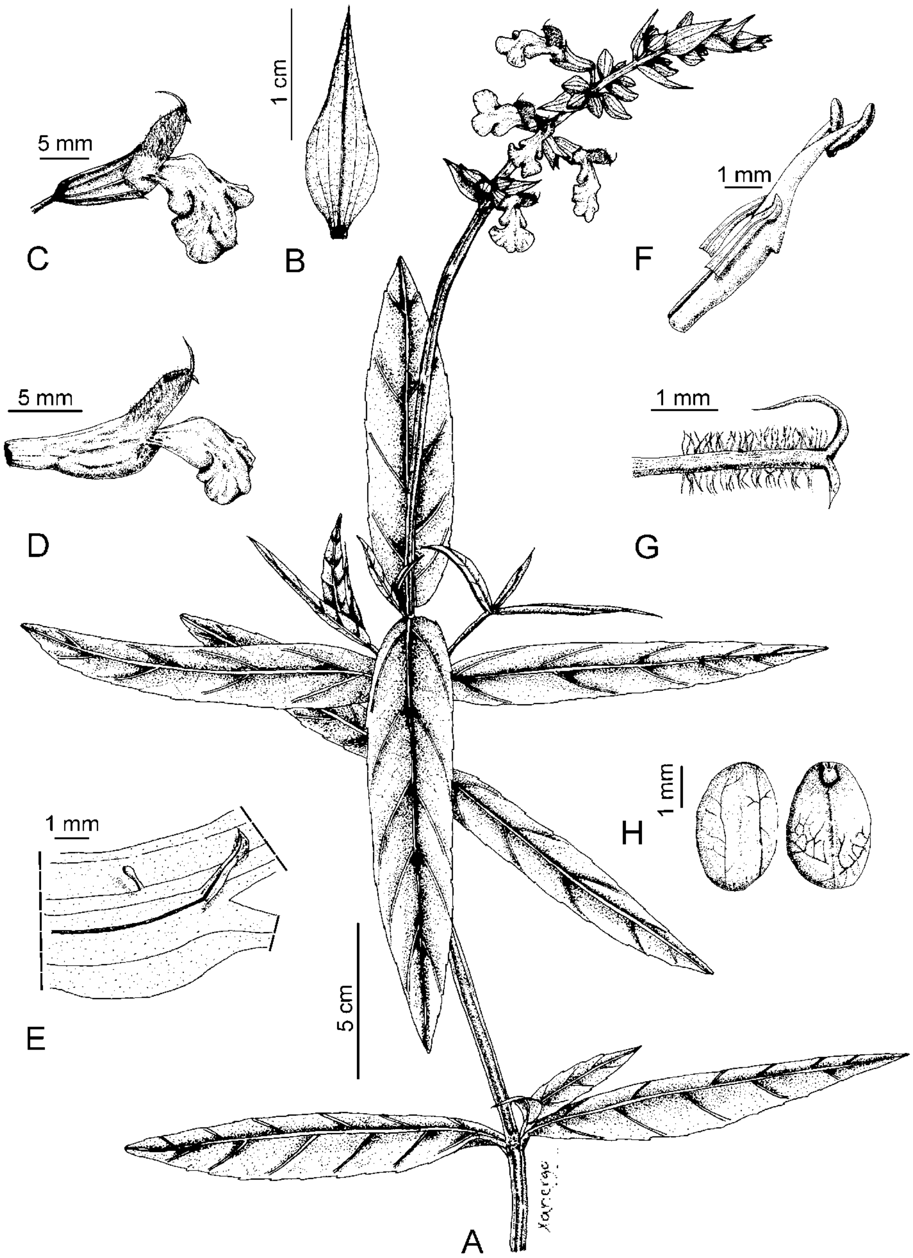

FIGURE 2. *Salvia cualensis* var. *cualensis*. A) General aspect; B) Floral bract, outer surface; C) Flower; D) Corolla; E) Corolla section showing a filament and a staminode; F) Stamens; G) Apex of the style; H) Nutlets, dorsal and ventral view (based on *J.G. González-G. 1078 et al.*; drawn by J.G. González-G.).

Salvia cualensis* var. *perezii* J.G. González, *var. nov.(Figs. 1, 3–4)

A Salvia cualensi var. cualensi foliis linearibus; inflorescentiarum bracteis, pedicellis, calycibus et stylis brevioribus differt.

Type:—MEXICO. Jalisco: Cabo Corrientes, 12–13 km por la brecha de El Tuito a Las Minas de Zimapán, a partir de 4 km al N de El Tuito, carretera a Puerto Vallarta, 1026 m, 20°21’22.4”N 105°14’57.9”W, 13 August 2011 (fl, fr), *J.G. González-G. 1085, A. Castro-Castro, R. Guerrero-H.* & *E. De Castro-Arce* (holotype IBUG!; isotypes ENCB!, IEB!, MEXU!, XAL! , ZEA!).

Petioles 0–1.4 mm long; leaf blades linear, 4.7–10.5 × 0.3–0.5(–0.7) cm, short cuneate at the base. Inflorescences 4–25 cm long, with 2- to 8-flowered verticillasters. Floral bracts lanceolate, (2–)7.5–11.2 × (1–)2.3–3 mm. Pedicels 2–3 mm long. Calyx 6–6.6 × 3–4.5 mm, veins covered with long straight hairs. Corolla tube 6–7.6 × 3.5–3.9 mm; upper lip 3.3–6 mm long, lower lip (7–)8–12.2 mm long. Connective 4.5–5.6 mm long; thecae 1.6–2 mm long. Styles 9.5–11 mm long.

Distribution, habitat and phenology:—*Salvia cualensis* var. *perezii* dwells in the western slopes of the Sierra de El Cuale, along the dirt road from El Tuito to Minas de Zimapán (figure 1). It grows in ecotones between pine-oak and montane cloud forests at 940 to 1130 m. It shares the habitat with *Calophyllum brasiliense* Cambess., *Dioon edule* Lindl., *Magnolia pacifica* A. Vázquez, *Oreopanax xalapensis* (Kunth) Decne. & Planch., *Pinus oocarpa* Schiede ex Schltdl., *Podocarpus reichei* J. Buchholz & N. E. Gray, *Saurauia serrata* DC., *Conostegia* sp. and *Salvia cualensis* var. *cualensis*. It flowers and fruits from July to September.

Additional specimens (paratypes) examined:—MEXICO. Jalisco: Cabo Corrientes, km 7 camino a las Minas de Zimapán, 850 m, 13 August 1980 (fl), *J.A. Pérez de la Rosa 1579 & L.M. González-Villarreal* (IBUG!); El Tuito, km 11, delante de Provincia, por el camino a El Cuale, 1200 m, 20°23’00”N 105°09’20”W, 25 February 1993 (fl), *G. Castillo-C. 10359* (XAL!); 6.5 km por la brecha de El Tuito a Las Minas de Zimapán, a partir de 4 km al N de El Tuito, carretera a Puerto Vallarta, 941 m, 20°21’42.95”N 105°17’0.95”W, 12 August 2011 (fl, fr), *J.G. González-G. 1076, A. Castro-Castro, R. Guerrero-H. & E. De Castro-Arce* (IBUG!, IEB!, MEXU!).

Etymology:—The infraspecific name of *Salvia cualensis* var. *perezii* honors the earliest collector of this taxon, Jorge Alberto Pérez de la Rosa, an enthusiastic botanist from Universidad de Guadalajara (Mexico).

The morphological characters exhibited by *Salvia cualensis* correspond to those which defined section *Farinaceae*: perennial herbs, up to 3 m tall; oblong to linear or elliptic leaf blades, covered with appressed or straight, eglandular or glandular-capitate hairs; 6- to 12-flowered verticillasters; lanceolate, deciduous or persistent floral bracts; 3- to 7-veined upper calyx lips; blue corollas, internally naked or ornate with two papillae, upper lip evidently shorter than the lower one; stamens included in the upper corolla lip, connectives ornate at midportion with a retrorse tooth; and pilose styles. The Section *Farinaceae* includes 13 species according to Epling (1939, 1940, 1957, 1960), and 15 according to Peterson (1978); Turner (2008) recognized 14 species in Mexico, and transferred *Salvia amissa* Epling (1939: 187), *S. platycheila* Gray (1870: 292) and *S. similis* Brandegee (1901: 108) to section '*Tomentosae'*. However, none of the *Salvia* sections is named '*Tomentosae*'; hence, it is likely that Turner (2008) misspelled the name and actually meant *Tomentellae* (Epling 1935: 55) Epling (1939: 18).

Salvia cualensis differs from *S. jaimehintoniana* in the shape of the leaves, usually shorter inflorescences, the floral bracts evidently larger, the calyx slightly longer and wider, always 5-veined, corolla tube and lower lip larger, and longer style (table 1). *Salvia cualensis* var. *perezii* is similar to *Salvia heterotricha* Fernald (1900: 500) in the shape and size of the leaves and racemes; however, *S. heterotricha* bears glandular-capitate hairs on the floral axis, pedicel and calyx, smaller floral bracts, and longer styles. Furthermore, *S. heterotricha* differs in ecological preferences and distribution (table 1, figure 1).

The two varieties of *Salvia cualensis* differ in leaf width, leaf shape at the base, floral bract shape and size, and proximal connective shape (see key below, table 1, and figures 2–3). As shown by the specimens examined, those characters are consistent and do not intergrade. Moreover, *S. cualensis* var. *perezii* has been exclusively found in the western slopes of Sierra de El Cuale, while *S. cualensis* var. *cualensis* shows a wider distribution from eastern to western slopes (figure 1). The consistency between geographic distribution and morphological variation supports the recognition of two varieties in *S. cualensis*. However, it should be noted that increasing botanical exploration in a biological rich and poorly known region as Sierra de El Cuale could provide new evidence that corroborate or contradict our hypothesis.

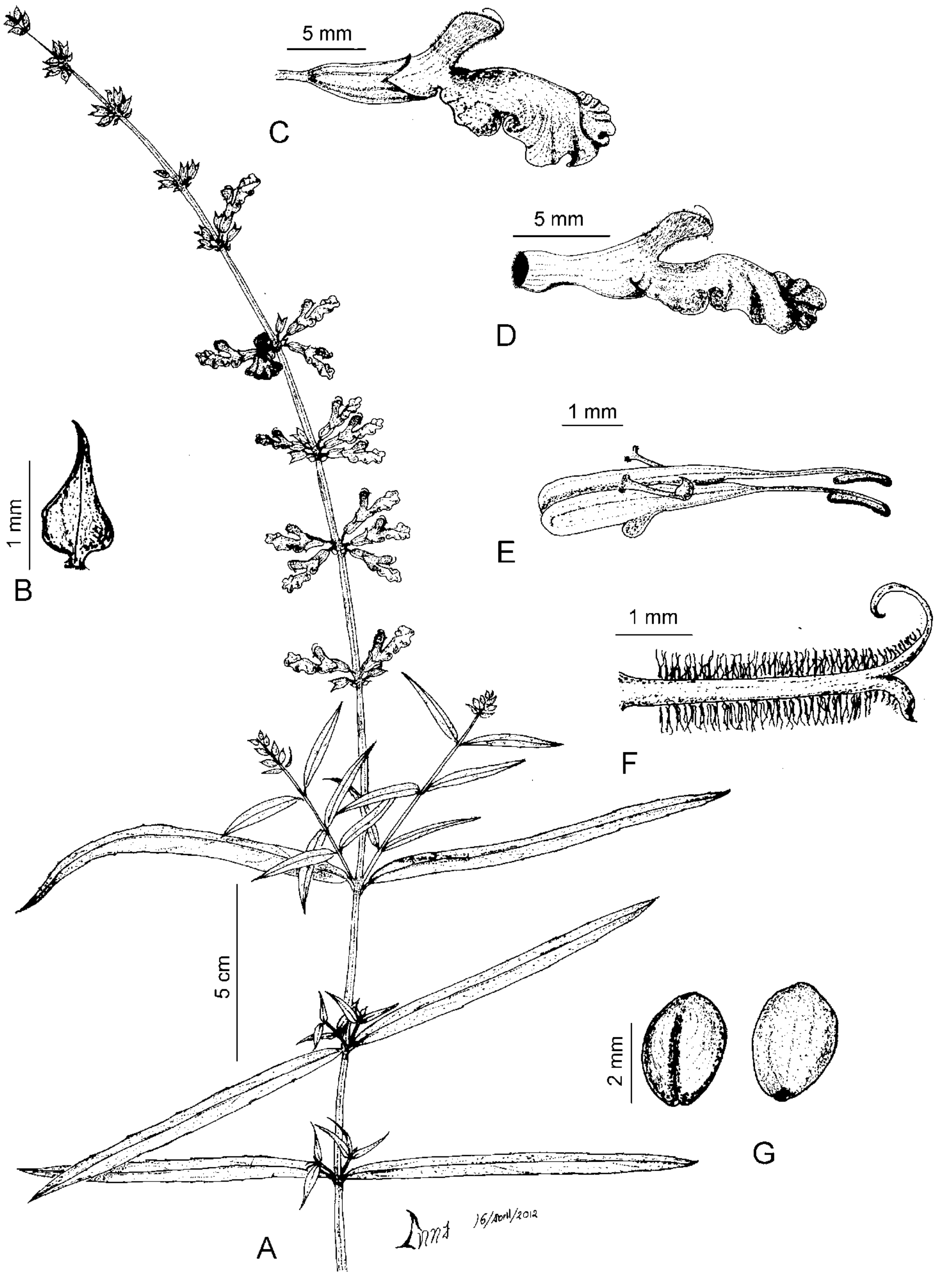

FIGURE 3. *Salvia cualensis* var. *perezii.* A) General aspect; B) Floral bract, outer surface; C) Flower; D) Corolla; E) Stamens; F) Apex of the style; G) Nutlets, dorsal and ventral view (based on *J.G. González-G. 1085 et al.*; drawn by A. Paizani-Guillén).

TABLE 1. Comparison of characters, habitat and distribution between *Salvia cualensis* and morphologically similar taxa.

	S. jaimehintoniana	*S. cualensis var. cualensis*	*S. cualensis var. perezii*	*S. heterotricha*
Petiole length (mm)	(0–)2–15	1–2.5	0–1.4	0
Leaf shape	elliptic to oblanceolate	oblong-lanceolate	linear	linear to narrow lanceolate
Leaf size (cm)	(1.5–)5–8(–10) × (0.7–)1.3–2.8	(5.2–)8.6–14.4 × 0.9–1.7	4.7–10.5 × 0.3–0.5(–0.7)	3–10 × 0.2–0.9
Shape of the leaf base	long attenuate	rounded to short cuneate	short cuneate	cuneate to attenuate
Inflorescence length (cm)	(6–)16–37	(4–)8–17	4–25	8–20
Flowers per verticillaster	(4–)6–14	4–6	2–8	2–6
Floral bract size (mm)	3–5.4(–11) × (1.6–)2.4–3.5(–5)	(7–)14–18.6 × 4–6.7	(2–)7.5–11.2 × (1–)2.3–3	6–9 × 1–3
Calyx size in flower (mm)	(5.5–)6–6.7 × 2.8–3.5	7.9–11 × 4.4–6.5	6–6.6 × 3–4.5	6–10 × 4–5.5
Calyx pubescence	veins covered with long straight hairs	veins covered with long straight and sometimes with tiny glandular-capitate hairs between them	veins covered with long straight hairs	moderately to densely covered with long glandular-capitate and eglandular hairs
Veins on the upper calyx lip	5 or 7	5	5	5
Corolla tube size (mm)	6–8(–9) × 3–3.5	(7.5–)8.5–11 × 3.5–4.4	6–7.6 × 3.5–3.9	6–8 × 3.8–4.8
Upper corolla lip length (mm)	3.5–4.4(–5.6)	5.2–8	3.3–6	4–7
Lower corolla lip length (mm)	(6–)7.5–8(–11)	11.1–15	(7–)8–12.2	9–13
Connective length (mm)	3.5–5	4.5–6.4(–7.5)	4.5–5.6	6–7
Style length (mm)	7–7.4(–10.7)	(11–)12.4–13.6	9.5–11	13–14
Vegetation	pine-oak, oak and pine forests	ecotones between pine-oak and tropical deciduous forests	ecotones between pine-oak and montane cloud forests	pine-oak and oak forests
Elevational range (m)	(1600–)2100 –2300(–2800)	1130–1600	940–1130	1050–1900(–2450)
Geographical range	Durango, Nuevo León, Tamaulipas, Hidalgo and Querétaro	western Jalisco	western Jalisco	Aguascalientes, southeastern Nayarit, Jalisco, Aguascalientes and southern Zacatecas

Key to *Salvia cualensis* and its morphologically closest relatives

1. Floral axis, pedicel and calyx covered with glandular-capitate hairs mixed with eglandular hairs (1.2–1.8 mm long) .... *Salvia heterotricha*
– Floral axis, pedicel and calyx covered with eglandular hairs and rarely with glandular-capitate hairs (less than 0.5 mm long) 2
2. Petiole (0–)3–15 mm long, leaf blade elliptic to oblancolate; upper calyx lip 5- to 7-veined; filament 1–1.6(–1.9) mm long, connective 3.5–5 mm long; style 7–7.4(–10.7) mm long .... *Salvia jaimehintoniana*
– Petiole 0–2.5 mm long, leaf blade oblong-lanceolate to linear; upper calyx lip 5-veined; filament 2.1–2.4 mm long, connective 4.5–7.5 mm long; style 9.5–13.6 mm long 3
3. Leaf blade oblong-lanceolate, (5.2–)8.6–14.4 × 0.9–1.7 cm; floral bract (7–)14–18.6 × 4–6.7 mm; pedicel 2.7–4.4 long; calyx 7.9–11 × 4.4–6.5 mm; corolla tube (7.5–)8.5–11 × 3.5–4.4 mm, upper lip 5.2–8 mm, lower lip 11.1–15 mm long; proximal connective gradually narrowed; style (11–)12.4–13.6 mm long.. *Salvia cualensis* var. *cualensis*
– Leaf blade linear, 4.7–10.5 × 0.3–0.5(–0.7) cm; floral bract (2–)7.5–11.2 × (1–)2.3–3 mm long; pedicel 2–3 mm long; calyx 6–6.6 × 3–4.5 mm; corolla tube 6–7.6 × 3.5–3.9 mm, upper lip 3.3–6 mm, lower lip (7–)8–12.2 mm long; proximal connective abruptly narrowed; style 9.5–11 mm long ....*Salvia cualensis* var. *perezii*

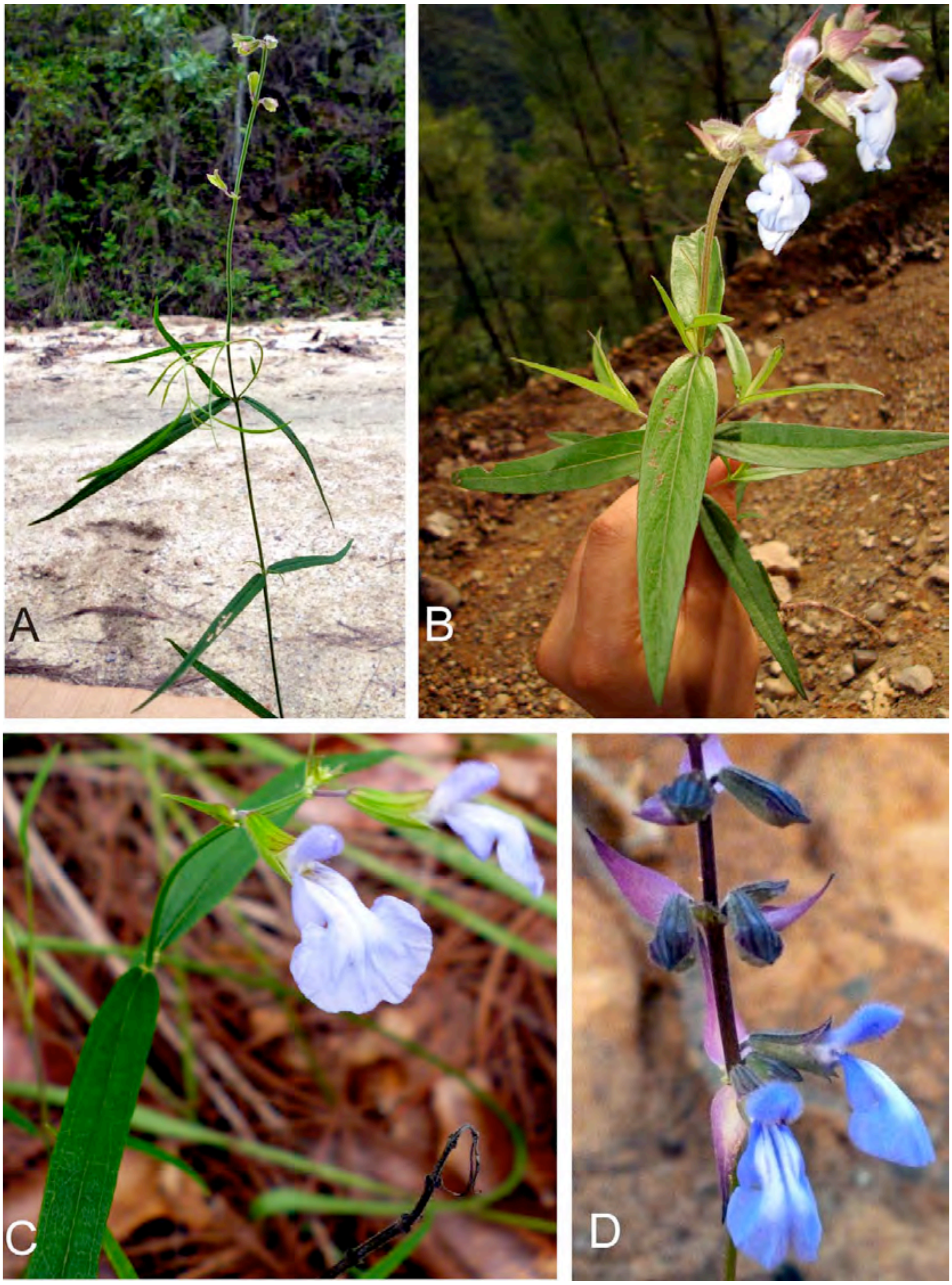

FIGURE 4. *Salvia cualensis* var. *perezii*. A) Habit; C) Detail of flower. Salvia cualensis var. cualensis. B) Habit; D) Detail of flower. A–D by J.G. González-G.

Acknowledgments

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4.2 González-Gallegos, J. G., J. G. Morales-Arias y J. L. Rodríguez-Hernández. 2012. *Salvia cacomensis* (Lamiaceae), a new species from Jalisco, Mexico. *Revista Mexicana de Biodiversidad*: 341-34

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Salvia cacomensis (Lamiaceae), a new species from Jalisco, Mexico

Salvia cacomensis (Lamiaceae), una nueva especie de Jalisco, México

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Abstract. A new species from a botanically little known region of Jalisco, Mexico, is described and illustrated. The morphology of *Salvia cacomensis* J. G. González, J. Morales et J. Rodríguez is related to that of the species of sections *Briquetia* Epling and *Tubiflorae* (Epling) Epling of subgenus *Calosphace* (Benth.) Benth. The new taxon is distinguished by the combination of its essentially glabrous surface, the 2-flowered verticillasters, the pink to magenta corollas, and the particular dimensions of the floral bract, the calyx and the corolla.

Key words: endemic, Jalisco, *Salvia* section *Briquetia*, *S.* section *Tubiflorae*.

Resumen. Se describe e ilustra una especie nueva procedente de una región botánicamente poco conocida de Jalisco, México. La morfología de *Salvia cacomensis* J. G. González, J. Morales et J. Rodríguez está relacionada con aquella de las especies de las secciones *Briquetia* Epling y *Tubiflorae* (Epling) Epling del subgénero *Calosphace* (Benth.) Benth. El nuevo taxón se distingue por la combinación de su superficie esencialmente glabra, sus verticilastros bifloros, el color rosa o magenta de sus corolas y las dimensiones particulares de la bráctea floral, el cáliz y la corola.

Palabras clave: endémica, Jalisco, *Salvia* sección *Briquetia*, *S.* sección *Tubiflorae*.

Introduction

Salvia L. includes at least 900 species worldwide, with main centers of diversity in SW Asia, Southern North, Central and South America (Harley et al., 2004); it is 1 of the 3 richest genera of vascular plants in Mexico with approximately 292 species in the country (Villaseñor, 2004), and at the same time one of the most poorly understood. In the last 3 decades, a new impulse in the study of Mexican sages has resulted in the description of several new taxa (Ramamoorthy, 1983, 1984a, 1984b, 1984c; Ramamoorthy and Lorence, 1987; Levin and Moran, 1989; Espejo and Ramamoorthy, 1993; Turner, 1995, 1996, Klitgaard, 2007; Turner, 2008a, 2008b, 2008c, 2009a, 2009b, 2010; Bedolla et al., 2011; Martínez-Gordillo and Loazada-Pérez, 2011; Turner, 2011). However these efforts have been insufficient, because there are still new taxa to be described and some species that need to be reevaluated.

While conducting floristic research, Morales and Rodríguez discovered an interesting population of *Salvia* at Villas de Cacoma, Jalisco, Mexico, one of the least botanically explored areas of Western Mexico. We tried to identify the specimens using the publications of Epling and coworkers (1939, 1940, 1941, 1944, 1947, 1951; Epling and Mathias, 1957; Epling and Játiva, 1966), and those papers highlighted in the last paragraph, where new taxa were recently described. We have examined, since September 2008 to September 2011, *Salvia* collections from large and relatively small Mexican herbaria, according to the number of specimens that they harbor. In small herbaria (CIIDIR, CHAPA, CREG, GUADA, HEM, HUMO, OAX, SERO, USON, UAGC, ZEA, XALU), we examined the entire collections of *Salvia* including those specimens not yet identified. In large herbaria (ENCB, IEB, MEXU, XAL), we restricted the revision to specimens collected in Jalisco, those belonging to the sections related to the *Salvia* found at Cacoma (*Briquetia* Epling and *Tubiflorae* (Epling) Epling), and non-identified specimens. In both cases the specimens examined were photographed. All *Salvia* specimens from IBUG herbarium were also examined. We analyzed the type specimens of the species in sections *Briquetia* and *Tubiflorae* through a collection of digital photographs obtained from the web pages of the following herbaria: K, LD, LL, MA, MICH, MO, NY, UC, US, WU. As a result of the revision of literature and examination of

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herbarium specimens and photographs, the finding of Morales and Rodríguez could not be referred to any known species of *Salvia*. Here, we describe it as a new taxon related to the sections *Briquetia* and *Tubiflorae* of subgenus *Calosphace* (Benth.) Benth.

Description

Salvia cacomensis J. G. González, J. Morales et J. Rodríguez, sp. nov. (Figs. 1, 2).

Type: **Mexico**, Jalisco: munincipio de Villa de Purificación, Villas de Cacoma, 19º49'53" N, 104º31'57" O, 1 360 m alt., 26 Aug. 2010 (fl, fr), *J. L. Rodríguez, J. G. Morales and M. G. Gama 340* (holotype: ZEA; isotypes: IBUG, MEXU).

S. venulosae similis sed petiolibus (0.9)1.2-1.9(2.2) mm longis, floribus 2 in verticilastris, bracteis floralibus 7.5-9 x 3.5-4 mm, pedicellis 4-5 mm longis, calycibus sine pilis glandularibus et 5 venis in labio superiore calycum.

Perennial suffrutex up to 2 m tall, erect, stems essentially glabrous. Petioles (9-)1.2-1.9(-2.2) cm long, diffusely covered by simple multicellular hairs with dark-red septa; blades elliptic-lanceolate to lanceolate, 5.5-8.5 cm long, (2-)2.5-3.5 cm wide, cuneate to short cuneate and sometimes oblique at the base, acuminate to long-acuminate at the apex, margin serrate and sparsely bordered by simple multicellular hairs with dark-red septa, green and glabrous above, glaucous and glabrous beneath, only with the main vein covered with simple multicellular hairs. Inflorescence (8-)11-18 cm long, nodes 0.5-1 cm apart toward the base, 9 to 19 verticillasters at each floral axis, the verticillasters 2-flowered, floral axis purplish red, glabrous. Floral bracts narrow ovate to oblanceolate, 7.5-9 x 3.5-4 mm, purplish red, caudate at the apex, attenuate and truncate at the base, the margin entire and bordered with hairs similar to those of the blade margin, the rest glabrous, foliose, veins not visible, deciduous. Pedicels 1.5-2.5(-3) mm long, moderately covered with simple multicellular hairs with dark-red septa. Calyces 7-13 mm long, 2.5-3 mm wide at the throat, upper lip 3-veined, margin of the throat covered with tiny conical hairs and with some simple hairs at the apex of the upper lip, the rest glabrous, purplish red throughout its surface, the lobes acute, the upper one entire. Corolla pink to magenta, covered with long flexible, simple hairs with dark-red septa, these concentrated mainly on the lips; tube 15-17 mm long, (3-)4-5 mm wide at its widest portion, ventricose, not invaginated at the base, internally naked (epapillate); upper lip 6-6.5 mm long, lower one 5-6(-6.5) mm long, 1.4-1.6(-1.8) mm wide. Stamens included; filaments 1.5-1.6(-2.3) mm long; connective 1-1.1 cm long, with an acute little tooth just after the insertion with the filament; theca 0.6-1 mm long; a pair of staminodes present above and behind the insertion point of the filament to the corolla tube. Gynobasic horn 0.3-0.4 mm long; style 2-2.1 cm long, pilose at the apex, branches slightly exserted, the upper one longer and arcuate. Nutlets ovate, 0.8-1.2 mm long, 0.5-0.7 mm wide, light brown, and dark brown marbled, surface smooth and sparsely covered with whitish flexible hairs at the base on immature nutlets.

Taxonomic summary

Distribution, habitat and phenology. *Salvia cacomensis* is, to our knowledge, an endemic species restricted to 1 locality on the Pacific slope of the Sierra de Cacoma, Jalisco, Mexico. It is locally scarce. It inhabits montane cloud forest with *Quercus* L., *Sebastiana* Spreng., *Ficus* L., *Clusia* L. and *Fuchsia* L., at 1 300-1 400 m. It flowers and fructifies in August (- September).

Etymology. The specific epithet of this taxon refers to the area that embraces its distribution, the Sierra de Cacoma, Jalisco, Mexico.

Remarks. There are 2 *Salvia* subgenus *Calosphace* sections with species morphologically similar to the new taxon: *Tubiflorae* and *Briquetia*. *S. cacomensis* fits well with every character of the species in *Tubiflorae*: shrubs or subshrubs, blades ovate, acuminate at the apex, rounded to attenuated at the base, (2-)6 to 12-flowered verticillasters, bracts deciduous, 3-veined upper lips of the calyces or sometimes 5-veined, pink to magenta corollas, epapillate corolla tubes, upper corolla lips longer than the lower ones, connectives entire or toothed and styles pilose. Among the species of *Tubiflorae*, *S. tubifera* Cav. and *S. venulosa* Epling are the morphologically closest relatives. The first one differs in having ovate, rounded at the base blades, (0.5-)1-3.3(-7) cm long petioles, lower blade surface slightly white pubescent, 6 to 8-flowered verticillasters, 3.5-5(-8) mm long pedicels, short glandular-capitate hairs on the calyces, 24-25 mm long corolla tubes, (1.8-)2-2.6 cm long connectives, 1.8-1.9 mm long nutlets (table 1). The second one can be distinguished by its 5-10 mm long petioles, lower blade surface with purplish reticulate prominent veins, 2-6-flowered verticillasters, 2-3 x 2-2.5 mm floral bracts, 4-5 mm long pedicels, 5-veined upper lip of the calyces and those covered with capitate glandular hairs (table 1). All characters in the species of *Briquetia* also matches with the characters in the new taxon: thick herbs, blades acuminate at the apex and rounded to attenuate at the base (sometimes truncate or cordate), 3-veined upper lips of the calyces, dark blue corollas, corolla tubes ventricose, invaginated at the base, and internally epapillate, connectives entire or toothed, and styles pilose; excluding the color of the corolla (purple vs. magenta or

Table 1. Comparison of characters between S. cacomensis and morphologically similar species

Character	*S. cacomensis*	*S. venulosa*	*S. tubifera*	*S. mexicana*
HABIT	Suffrutex up to 2 m tall	Decumbent suffrutex up to 1.5 m tall	Perennial herb up to 2 m tall	Perennial herb to shrub up to 3 m tall
LEAVES				
Petiole length (cm)	(0.9-)1.2-1.9(-2.2)	0.5-1	(0.5-)1-3.3(-7)	1-10
Blade shape	Elliptic-lanceolate to lanceolate	Narrowly ovate to ovate-elliptic	Widely ovate (rarely orbicular)	Rhomboid-ovate to ovate
Blade size (cm)	5.5-8.5 × (2-)2.5-3.5	6-9.6 × 3-4	5-16 × 4-11	6-18 × 2.5-12
Shape of the leaf base	Cuneate to short cuneate and sometimes oblique	Cuneate to attenuate	Cuneate to attenuate and sometimes oblique	Long attenuate, cuneate, subcordate to rarely rounded
Shape of the leaf apex	Acuminate to long-acuminate	Acute to acuminate	Acute to shortly acuminate	Acute to acuminate
Shape of leaf margin	Serrate	Crenate-serrate	Crenate-serrate	Crenate-serrate
INFLORESCENCE				
Length (cm)	(8-)11-18	5-15	8-13(-18)	30-50
Distance between the lowermost nodes (cm)	0.5-1	1-1.5(-2)	1-2.7	1-3
Number of verticillasters	9-19	7-10	7-13	(8-)10-20
Flowers per verticillaster	2	2-6	6-8	(8-)10-12(-20)
FLORAL BRACTS				
Shape	Narrow ovate to oblanceolate	Ovate	Lanceolate to ovate	Ovate
Size (mm)	7.5-9 × 3.5-4	2-3 × 2-2.5	9-12 × 4-4.5	6-12 × 3-5
Apex shape	Caudate	Acuminate to caudate	Caudate	Acuminate
Base shape	Truncate	Truncate	Truncate	Truncate
Duration	Deciduous	Deciduous	Deciduous	Deciduous
PEDICEL				
Length	1.5-2.5(-3)	4-5	3.5-5(-8)	3-20
CALYCES				
Size (mm)	7-13 × 2.5-3	8-9.3 × 4-5.5	(6.5-)8-11 × 3.4-5	8-17(-20) × 3-5
Number of Veins in the upper lip	3	5	3	3
Pubescence	Glabrous	Glandular-capitate	Pilose and with short glandular-capitate hairs	Pilose, mainly on the veins
COROLLA				
Color	Pink to magenta	Wine-red	Red to magenta	Dark blue to purple
Tube size (cm)	1.5-1.7 × (0.3-)0.4-0.45	1.5-1.8 × 0.4-0.5	(1.8-)2.1-2.5 × 0.4-0.5	1.5-2.5 × 0.5-0.7
Length of the upper lip	6-6.5	6-6.5	5-8	12-16
Length of the lower lip	5-6(-6.5)	5.5-6.3	2.5-5(-6)	12-16
NUTLETS				
Shape	Ovate	Not seen	Ovate	Ovate
Size (mm)	0.8-1.2 × 0.5-0.7	Not seen	1.8-1.9 × 1-1.2	2.6-3 × 1.8-1.9

Table 1. Continues

Character	*S. cacomensis*	*S. venulosa*	*S. tubifera*	*S. mexicana*
ALTITUDINAL RANGE (m)	1 300-1 400	1 500-2 000	(1 900-) 2 400-2 800 (-3 000)	(850-) 1 400-2 200 (-2 900)
HABITAT	Montane cloud forest	Sub-Andean cloud forest	Montane cloud forest	Oak, pine-oak, montane cloud and in tropical deciduous forests
DISTRIBUTION	Villas de Cacoma, Jalisco, Mexico	Western and Central Cordillera, Risaralda and Antioquia, Colombia	Highlands from Belize, Guatemala and Mexico	Widely distributed in Mexico

Figure 1. *Salvia cacomensis* J. G. González, J. Morales et J. Rodríguez. General appearance (drawn from the holotype).

pink magenta in *S. cacomensis*) and the invagination at the base of the corolla tube. However, there is a member of *Briquetia* which does not present invaginated corollas at the base, *S. ecuadorensis* Briq; and other one, which very rarely can exhibit magenta corollas, *S. mexicana* L. *S. cacomensis* differs from the rest of the species of section *Briquetia* because of its 2-flowered verticillasters (vs. 3-12-flowered), magenta or magenta-pink corollas (vs. purple ones), the length of the calyx (7-13 mm vs. (7-)12-15 m) and corolla tube (15-17 mm vs. (11-)15-25 mm).

Salvia cacomensis can be distinguished by the combination of its 0.5-1 cm long petioles, elliptic-lanceolate to lanceolate blades with short to short cuneate, sometimes oblique bases and acuminate to long-acuminate apices, 2-flowered verticillasters, 7.5-9 mm long floral bracts, calyces without glandular capitate hairs, 3-veined upper lips of the calyces, pink to magenta corollas, with the lower lip as long as the upper one and straight.

In the region where *S. cacomensis* inhabits (Jalisco), only 2 members of section *Tubiflorae (S. pringlei* B. L. Rob. and Greenm. and *S. tubifera),* and only 1 of section *Briquetia* (*S. mexicana*) are found. None of them share habitat with *S. cacomensis*. *Salvia pringlei* inhabits tropical lowlands, from 400-920 m altitude. It can be found near the coast of Jalisco, Nayarit and Sinaloa, and in an area of the Barranca del Río Santiago in Jalisco and Nayarit. *Salvia tubifera* has an affinity for a colder and wetter habitat. It grows in high montane cloud forests mainly from 2 400-2 800 m altitude (Table 1). In Jalisco, this species is only known from Cerro Viejo, North of Lago de Chapala. In contrast, *S. mexicana* can occupy oak, pine-oak, montane cloud and even tropical deciduous forests, from 850-2 900 m altitude in a wide area of Jalisco. *Salvia venulosa,* which is the morphologically most similar species to *S. cacomensis* inhabits also cloud forests and exhibits a narrow geographical range; however, this species grows in Colombia at a distance of 3 500 km from Cacoma, Jalisco (Table 1).

As we can conclude from the above mentioned, the affinity between *S. cacomensis* with either of the 2 sections alluded is not clear. Therefore, we prefer not to assign it to either of them, and wait for new evidence and a new more natural classification than that proposed by Epling and coworkers (1939, 1940, 1941, 1944, 1947, 1951; Epling and Mathias, 1957; Epling and Játiva, 1966).

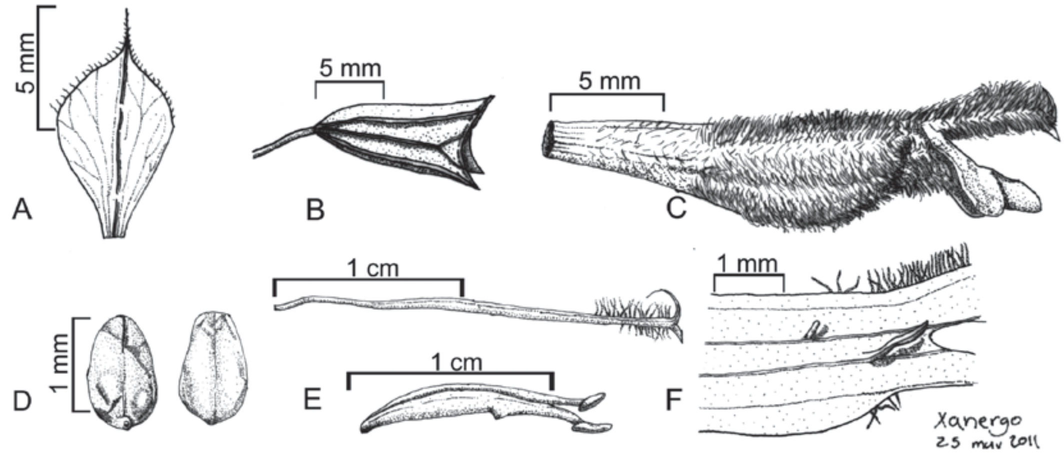

Figure 2. *Salvia cacomensis* J. G. González, J. Morales et J. Rodríguez. A, floral bract; B, calyx; C, corolla; D, nutlets, ventral (left) and dorsal (right) views; E, style (up) and stamens (down); F, corolla dissection showing the filament (right) and the staminode (left) (drawn from the holotype).

Key for *Salvia cacomensis* and closest morphologically relatives

1a Corolla dark blue to purple .... *S. mexicana*
1b Corolla pink to magenta.. 2
2a Lower corolla lip shorter than the upper one and bent backward.. *S. tubifera*
2b Lower corolla lip as long as the upper one and straight, directed forward.. 3
3a Petioles 0.5-1 cm long; blades narrowly ovate to ovate-elliptic, long attenuate at the base; verticillasters 2 to 6-flowered; floral bract 2-3 mm long; calyces with glandular capitate hairs, the upper lip 5-veined. Endemic to Western and Central Cordillera, Risaralda and Antioquia, Colombia .... *S. venulosa*
3b Petioles (9-)1.2-1.9(-2.2) cm long; blades elliptic-lanceolate to lanceolate,cuneate to short cuneate at base (sometimes oblique) verticillasters 2-flowered; floral bract 7.5-9 mm long; calyces without glandular capitate hairs, the upper lip 3-veined. Endemic to Sierra de Cacoma, Jalisco, Mexico.. *S. cacomensis*

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Salvia meera, S. rogersiana, *S. santanae* and *S. concolor* var. *iltisii* (Lamiaceae), three new species and a variety from Jalisco, Mexico

Salvia meera, *S. rogersiana*, *S. santanae* y *S. concolor* var. *iltisii* (Lamiaceae), tres especies nuevas y una variedad de Jalisco, México

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Abstract. As part of a major project on the genus *Salvia* in the state of Jalisco and adjacent areas, Mexico, 4 new taxa of *Salvia* L. are described and illustrated. Identification Keys for the related species and comparison tables of morphological characters are given. Three of them were tentatively proposed -but not formally published- as new species in the book *Flora de Manantlán*.

Key words: Jalisco, sect. *Angulatae*, sect. *Briquetia*, sect. *Dusenostachys*, Sierra de Manantlán.

Resumen. Como parte de un proyecto mayor del género *Salvia* en el estado de Jalisco y áreas colindantes, México, se describen e ilustran 4 nuevos taxa. Se proveen claves de determinación para las especies relacionadas y tablas comparativas de caracteres morfológicos. Tres de ellos fueron tentativamente propuestos -pero no formalmente publicados- como nuevas especies en el libro de *Flora de Manantlán*.

Palabras clave: Jalisco, sect. *Angulatae*, sect. *Briquetia*, sect. *Dusenostachys*, sierra de Manantlán.

Introduction

The genus *Salvia* L. as traditionally accepted is not monophyletic; nonetheless, according to Walker et al. (2004, 2007), 3 different clades are recognized. One of these corresponding to subgenus *Calosphace* (Benth.) Benth., which grows from southern United States to northern Argentina and in the Caribbean Islands. This embraces almost all the Mexican species including those treated in this paper. For the 2 remaining clades, 1 is restricted to Eastern Asia and the second has species found in North America, Europe, Southern Africa and Middle East. Epling and coworkers (Epling, 1939; Epling et Mathias, 1957; Epling, 1960; Epling et Játiva, 1963, 1966, 1968) extensively worked on subgenus *Calosphace* and produced a classification that many users follow to date. This classification often reflects groupings defined more by similarity and practical characters rather than by systematic evolutionary assumptions. It is challenging due to the high number of doubtfully circumscribed sections. Such classification divides the subgenus in 104 sections on the basis of shared morphological characters, but without a phylogenetic analysis that corroborates its validity as a natural group. Despite this, the trend by most users, is to keep using Epling's classification until a new proposal which reflects a better understanding of phylogenetic relationships is produced.

Vázquez-García et al. (1995), and specimens annotated by Ramamoorthy give evidence of at least 6 new *Salvia* L. species in the Sierra de Manantlán, Jalisco, Mexico: *S. brucebenzii*, *S. cuevasiana*, *S. mcvaughii*, *S. meera*, *S. santanae* and *S. vazquezii*; all these names lack of published protologues. The name annotation does not state how to recognize each taxon nor their taxonomic position within any of the infrageneric classifications proposed. As part of a major project, *Flora de Jalisco y Áreas Colindantes*, we have reexamined *Salvia* specimens from the Sierra de Manantlán, particularly those proposed as new taxa. We consider that what Ramamoorthy annotated as*S. cuevasiana* in *Flora of Manantlán* (Vázquez-García et al., 1995) belongs to an extreme of variation of *Salvia polystachya* Cav.; *S. brucebenzii* was published by Turner (2008) as *Salvia acerifolia* B. L. Turner based on a specimen from

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Coalcomán, Michoacán; and *Salvia vazquezii* is formalized (Iltis et al., manuscript submitted). After examining the specimens corresponding to *S. meera*, *S. rogersiana*, and *S. santanae*, we agree that these deserve recognition as 3 new species, herewith described and illustrated; additionally we propose the Manantlán populations of *Salvia concolor* Lamb. ex Benth., as being part of a new variety.

Description

Salvia concolor* var. *iltisii J. G. González et A. Vázquez var. nov. Figs. 1, 2.
Type: **Mexico.** Jalisco. Mpio. Cuautitlán: at first stream crossing (and before rapid descent) of lumber road, 2 km S from San Miguel "meadows", E-slope of the Sierra de Manantlán Central, 5.3 km S of Rincón de Manantlán, 17.5 km S of El Chante, 19º33'00" N, 104º12'15" W, 2 400 m, 12 Jan 1980 (fl, fr), *H. H. Iltis*, *P. Sorensen* and *P. Matekaitis 2623* (holotype: IBUG; isotypes: ENCB, MEXU, WIS not seen).
Salvia concolor Lamb. ex Benth. primo adspectu maxime simile, sed foliis tenuibus ad basin alte cordatis, calycibus flavovirentibus, calycum labio superiore longe caudato (cauda 3-4 mm longa) integro ad apicem.

Perennial herbs or subshrubs, erect, 1-2(-3) m tall, stems lax and slightly inclined, sparsely pilose, mainly on the ribs and with some pale orange sessile glandular dots. Petioles 7-13.2 cm long, glabrescent. Leaves ovate, 10-15 × 6-13 cm, deeply cordate at the base, acuminate at the apex, the margin finely serrate and sparsely bordered with straight simple hairs, both surfaces green, concolor, the adaxial surface sparsely covered with conical tiny hairs, the abaxial surface glabrous or with some appressed hairs spread on the veins, covered with pale orange sessile glandular dots (not visible to the naked eye), chartaceous texture. Inflorescences on terminal racemes, 25-38 cm long, each raceme with 9-25 verticillasters, these 1.5-2.5 cm apart from each other toward the base, verticillaster 6-12-flowered; floral axis profusely pilose and with tiny glandular capitate hairs. Floral bracts ovate-lanceolate, 5-6 × 1-2 mm, rounded or truncate at the base, long attenuate at the apex, yellowish-green, deciduous. Pedicels 4-6 mm long in flower, 9-12 mm long during fructification, covered with glandular capitate hairs longer than those present on the floral axis. Calyces 6-8 × 3-4 mm in flower, accrescent 10-15 × 4-6 mm in fructification, yellowish green, slightly darker on the dorsal line, the lips acute and unequal particularly during the fructification, the upper one 3.5-5 mm long, the lower one 2-3 mm long, both aristate at the apex, the aristae of the lower lobes 1.8-2 mm long, those from the upper lobe 3-4 mm long during fructification, the upper lip 5-veined, moderately covered with pale orange sessile glandular dots, occasionally covered with tiny conical hairs on the inner surface toward the throat. Corollas dark blue with white nectar guides, sparsely pilose throughout its surface, with pale orange sessile glandular dots concentrated toward the lips; tube 20-22 mm long, slightly ventricose, 4.5-5.5 mm wide at its widest portion, not invaginated at the base, internally naked (epapillate); upper corolla lip 5-6.5 mm long, the lower one 5-6(-8) mm long, 5-6 mm wide. Stamens included; filaments 1-2 mm long, connectives 7.5-8.5 mm long, entire, theca 1-2 mm long; 2 staminodia relatively developed behind and above the insertion point of the filaments, 1 mm long, globose at the apex. Gynobasic horn 2-3 mm long; styles 25-26 mm long, abaxially and adaxially pilose toward the apex, the upper branch longer and exserted. Nutlets ovate, 2-2.3 × 1.3-1.4 mm, tan and dark brown marbled, smooth and glabrous.
Taxonomic summary
Distribution, habitat and phenology. Salvia concolor var. *iltisii* grows in montane cloud forests at 2 400 m altitude, with *Abies religiosa* (Kunth) Schltdl. et Cham., *Alnus jorullensis* Kunth, *Cirsium tolucanum* (B. L. Rob. et Seaton) Petr., *Montanoa andersonii* McVaugh and *Tillandsia sp*. It presents flowers and fruits in January.
Etymology. This new variety honors Prof. Hugh H. Iltis, who has been instrumental in the establishment of the Reserva de la Biosfera Sierra de Manantlán (Jalisco and Colima, Mexico) and for his botanical exploration and knowledge of its flora.
Additional material examined. Mexico. Jalisco. Mpio. Cuautitlán: 5.3 km S of Rincón de Manantlán, 2 400 m, 12 Jan 1980 (fl), *Iltis 15202* (GUADA).
Remarks

Salvia concolor belongs to Sect. *Dusenostachys* (Epling) Epling. This section is recognized by its leaves rounded or cordate at the base, 6 or more flowers per verticillaster, floral bracts deciduous, upper lip of the calyx with 5 to 9 veins, corolla tube ventricose, internally naked (epapillate) at the base, stamens included, and style pilose toward the apex. Currently 8 species are recognized; 6 species growing in Mexico and 2 restricted to southeastern Brazil. Section *Dusenostachys* needs further studies to support weather it is a monophyletic section.

Specimens of *S. concolor* var. *iltisii* were previously reported as *S. concolor* (Vázquez-García et al. 1995). Nonetheless, specimens from the Sierra de Manantlán differ in having thinner and deeply cordate leaves, floral bracts 5-6 mm long, calyces slightly shorter (12-15 mm in fruit), yellowish green, with the upper lobe long caudate (3-4 mm long) but entire (Table 1). *Salvia concolor* has thicker leaves with rounded or slightly cordate bases (except for some specimens from the states of Mexico, Morelos, and surroundings of Mexico city, which have cordate leaves: *Salazar s.n.* (MEXU 135793), *Engle et*

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Remington 87A (MEXU), *Salazar 461* (MEXU); floral bracts 7-23 mm long, calyces 18-22 mm long in fruit, dark blue, with the upper lip long caudate but shorter (2-3 mm long) and with 2 lateral mucrons. Furthermore, *S. concolor* inhabits the central region of Mexico: Mexico, D. F., Mexico State, eastern Michoacán and Morelos. The Manantlán populations are isolated from those of the typical variety.

Key for varieties of *Salvia concolor*

1a Leaves coarse, rounded at the base or slightly cordate; floral bracts 7-23 mm long; calyces 18-22 mm long, dark blue, with the upper lip long caudate (2-3 mm long) and with 2 lateral mucrons. Endemic to the Valley of Mexico, Puebla and eastern Michoacán ....*S. concolor* var. *concolor*

1b Leaves thin, deeply cordate at the base; floral bracts 5-6 mm long; calyces 12-15 mm long, yellowish green, with the upper lip long caudate (3-4 mm long) and entire, without lateral mucrons. Endemic to the Sierra de Manantlán...*S. concolor* var. *iltisii*

Table 1. Comparison of morphological and distributional characteristics of *Salvia concolor* and *S. concolor* var. *iltisii*

Character	*S. concolor* var. *iltisii*	*S. concolor* var. *concolor*
Petiole length (cm)	7-13.2	3-8(-12)
Leaf dimensions (cm)	10-15 × 6-13	5-13(-20) × 3-12
Inflorescence length (cm)	25-38	14-30
Number of flowers per verticillaster	6-12	6-12
Floral bract length (mm)	7-23	5-6
Calyx length in fruit (mm)	10-15	18-22
Calyx color	Yellowish-green	Blue to purple
Shape of the upper lip of the calyces	Acute and long caudate (cauda 3-4 mm long)	Acute, long caudate and with 2 lateral mucrones (cauda 2-3 mm long)
Corolla tube length (mm)	20-22	20-25(-32)
Upper corolla lip length (mm)	5-6.5	4-7
Lower corolla lip length (mm)	5-8	(6-)8-10
Altitudinal range (m)	2400-2500	2650-3300
Habitat	Montane cloud forests	Montane cloud and pine forests
Distribution	Endemic to Sierra de Manantlán, Jalisco	Mexico D. F., State of Mexico, Puebla, and eastern Michoacán

Salvia meera Ramamoorthy ex J. G. González et Santana Michel sp. nov. Figs. 2, 3.

Type: **Mexico.** Jalisco. Mpio. Cuautitlán: en el poblado del Aserradero de Manantlán, carretera para Puerta Pesada, Sierra de Manantlán, 1 520 m, 12 Dec. 1982 (fl, fr), *J. I. Calzada et G. Nieves H. 9545* (holotype: ZEA; isotype: XAL).

Species insignis ob corollas albas, folia anguste lanceolata serrata, flores 2 in verticillastri dispositi; bracteas anguste lanceolatas interdum lineares 1.2-1.4 mm longas, 0.1-0.2 mm latas, et calycum labiis superiores 3-venis.

Perennial herbs, erect, (0.7-)1-2.4(-3) m tall; stems with whitish appressed and retrorse hairs, abundantly distributed on and between the ribs. Petioles 3-7 mm long, the middle portion of the adaxial surface sunken, pilose. Leaves lanceolate, 7-9.6 × 1.4-2.4 cm, attenuate at the base and the apex, the margin widely serrate, green on both surfaces, sparsely covered with appressed hairs on the veins and pale orange sessile glandular dots on both surfaces. Inflorescences arranged in terminal and subterminal axillar racemes, 1-4.5 cm long, each one with 2 to 4 verticillasters, 7-9 mm apart from each other toward the base, verticillasters 2-flowered, floral axis profusely pilose. Floral bracts narrowly lanceolate or almost linear, 1.2-1.4 × 0.1-0.2 mm, attenuate at the base and the apex, the margin entire, green, densely pilose, soon deciduous. Pedicels 5-8.5 mm long, densely pilose. Calyx 1.3-1.5 cm long, 4-6 mm wide at the throat, yellowish green, the lips equal or subequal in length (2.5-5 mm long), the upper one 3-veined, with tiny appressed and antrorse hairs on the veins, between them and along the margin of the lips, internally verrucose and with tiny conical hairs. Corollas white, glabrous except sparsely to densely pilose on the upper lip and abaxial surface of the lower one; tube 2-2.2 cm long, (3-)4-5 mm wide at its widest portion, slightly ventricose and arcuate, not invaginated at the base, internally naked (epapillate); upper lip 5-6 mm long, the lower one 4.5-6.2 mm long. Stamens included; filaments 1.5-2 mm long; connectives 11.5-12.5 mm long, with an acute tooth at the middle; theca 2-2.2 mm long; staminodia

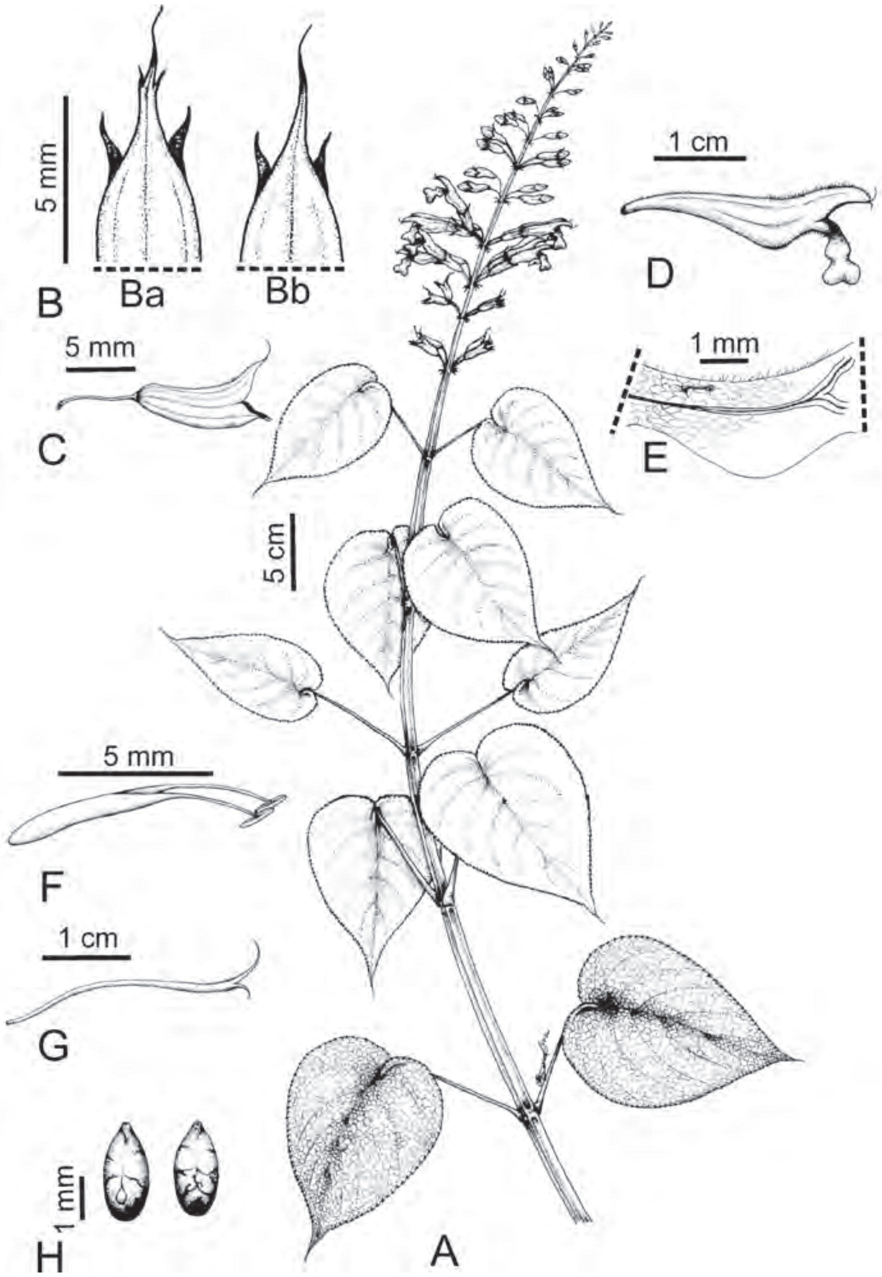

Figure 1. *Salvia concolor* var. *iltisii* J. G. González et A. Vázquez. A, general aspect; B, comparison between the apex of the calyces of *S. concolor* var. *concolor* (Ba) and *S. concolor* var. *iltisii* (Bb); upper view; C, valyx in fruit, lateral view; D, corolla; E, corolla section showing a filament and a staminodium; F, connective and theca of a stamen; G, style showing its 2 stigmatic branches; H, nutlets (A-H based on *H. H. Iltis et al. 2623*; drawn by O. Zuno-Delgadillo).

Figure 2. Distribution of the 4 new taxa: *Salvia concolor* var. *iltisii* J. G. González et A. Vázquez (★), *S. meera* Ramamoorthy ex J. G. González et Santana Michel (•), *S. rogersiana* Ramamoorthy ex J. G. González et Cuevas (♦) and *S. santanae* Ramamoorthy ex J. G. González et Guzmán-Hernández (+). The shaded area corresponds to the polygon of the Sierra de Manantlán Biosphere Reserve.

absent. Gynobasic horn 0.3-0.4 mm long; styles 2.2-2.4 cm long, abaxially and adaxially pilose toward the apex, the upper branch of the style longer and exserted, the lower one shorter and included. Nutlets ovate, 2-2.5 × (0.3-)9-1.1 mm long, pale orange or red, concolor, smooth, glabrous.

Taxonomic summary

Distribution, habitat and phenology. *Salvia meera* grows in pine-oak forests, from 1 500-1 800 m in altitude. Probably sharing habitat with *Abies guatemalensis* Rehder, *Alnus acuminata* Kunth, *Oreopanax sanderianus* Hemsl., *Pinus douglasiana* Martínez, *Quercus candicans* Née, *Q. excelsa* Liebm., *Q. obtusata* Humb. et Bonpl., and *Q. scytophylla* Liebm., according to records near its location. It presents flowers and fruits from late November to middle of December.

Etymology. We retain the name used by Ramamoorthy in Vázquez-García et al. (1995). *Meera* is the name of a Hindu woman between historical reality and myth; she lived during the sixteenth century and there are several songs and poems attributed to her (Subramanian, 2005).

Additional material examined. **Mexico.** Jalisco. Mpio. Cuautitlán: Sierra de Minantlán [Manantlán], above Haceradero [Aserradero], 5 900 ft [1 800 m], 23 Nov 1963 (fl, fr), *Boutin et Brandt 2505* (CAS seen as photograph, MEXU, MICH seen as photograph).

Remarks

The characters of *Salvia meera* fit well between Sect. *Tubiflorae* (Epling) Epling except for its striking white corollas with the lower lip as long as the upper one or longer, and its leaves narrower than those typical of such group. This section is composed of shrubs or subshrubs with ovate leaves, acuminate at the apex and rounded or attenuate at the base, with 6 to 12 flowers per verticillaster, floral bracts deciduous, upper lip of the calyces 3-veined or sometimes 5-veined, corollas magenta with the tube straight and internally naked (epapillate), the upper lip of the corolla as long as the lower one or longer, the connective entire or with a short tooth in the middle and the style pilose. The taxa most related morphologically to *S. meera* are: *Salvia pringlei* Rob. et Greenm., and *S. tubifera* Cav. The first differs because of its ovate leaves (4-6 cm wide), inflorescences (3-)6-8(-12) cm long, 4 to 12 flowers per verticillaster, magenta corollas with the upper lip 1.2-1.5 cm long and the lower one 0.8-1.0 cm long; the second species, *S. tubifera* is recognized by its ovate leaves, 4-6.5 cm wide, inflorescences 7-14(-22), 2 to 6 flowers per verticillaster, calyces 0.6-0.9 cm long, corollas magenta with the tubes 1.8-2 cm long and the lower lip 0.2-0.4 cm long (table 2). Furthermore, the 3 species have different distributional patterns: *S. meera* is a restricted endemic species from the Sierra de Manantlán; grows in montane cloud forests from 1 500-1 800 m altitude; *S. pringlei* has wider distribution, endemic to eastern Jalisco and southern Nayarit from 400-750 m; *S. tubifera* inhabits high mountains from (1 900-)2 000-2 600(-3 000) m in Mexico and Guatemala (Table 2). The 3 species are found in Jalisco state, but do not share the same localities.

Salvias with entirely white corollas are unusual among the Mexican species (Ramamoorthy, 1984); from the approximately 300 species that are found in the country, 14 (4.67%) have entirely white corollas: *S. albiflora* M. Martens et Galeotti, *S. assurgens* Kunth, *S. decora* Epling, *S. diegoae* Mart. Gord. et Lozada-Pérez, *S. divinorum* Epling et Játiva, *S. durantiflora* Epling, *S. leninae* Epling, *S. leucantha* Cav., *S. meera*, S. *perblanda* Epling, *S. pericona* B. L. Turner, *S. pineticola* Epling, *S. rzedowskii* Ramamoorthy and *S. sphacelifolia* Epling. Other species like *S. coccinea* Buc'hoz ex Etl. (with typical red corollas), *S. purpurea* Cav. (with purple ones) and, *S. helianthemifolia* Kunth and *S. roscida* Epling (with sky blue ones), can exceptionally have white or very pale blue, almost white corollas.

Tripp and Manos (2008) postulated that white corollas can act as an evolutionary dead-end in *Ruellia* L. (Acanthaceae) according to the animal species they can exploit as pollinators. They built a cladogram of 40-55% of the species of *Ruellia*, and mapped floral characters on it, such as corolla color. The white corollas of *Ruellia* attract hawk moths and bats; they are the result of a likely irreversible loss of some pigments from species with red or purple corollas, which are pollinated by hummingbirds and bees, respectively. This irreversible loss diminishes the evolutionary potential of the species, since

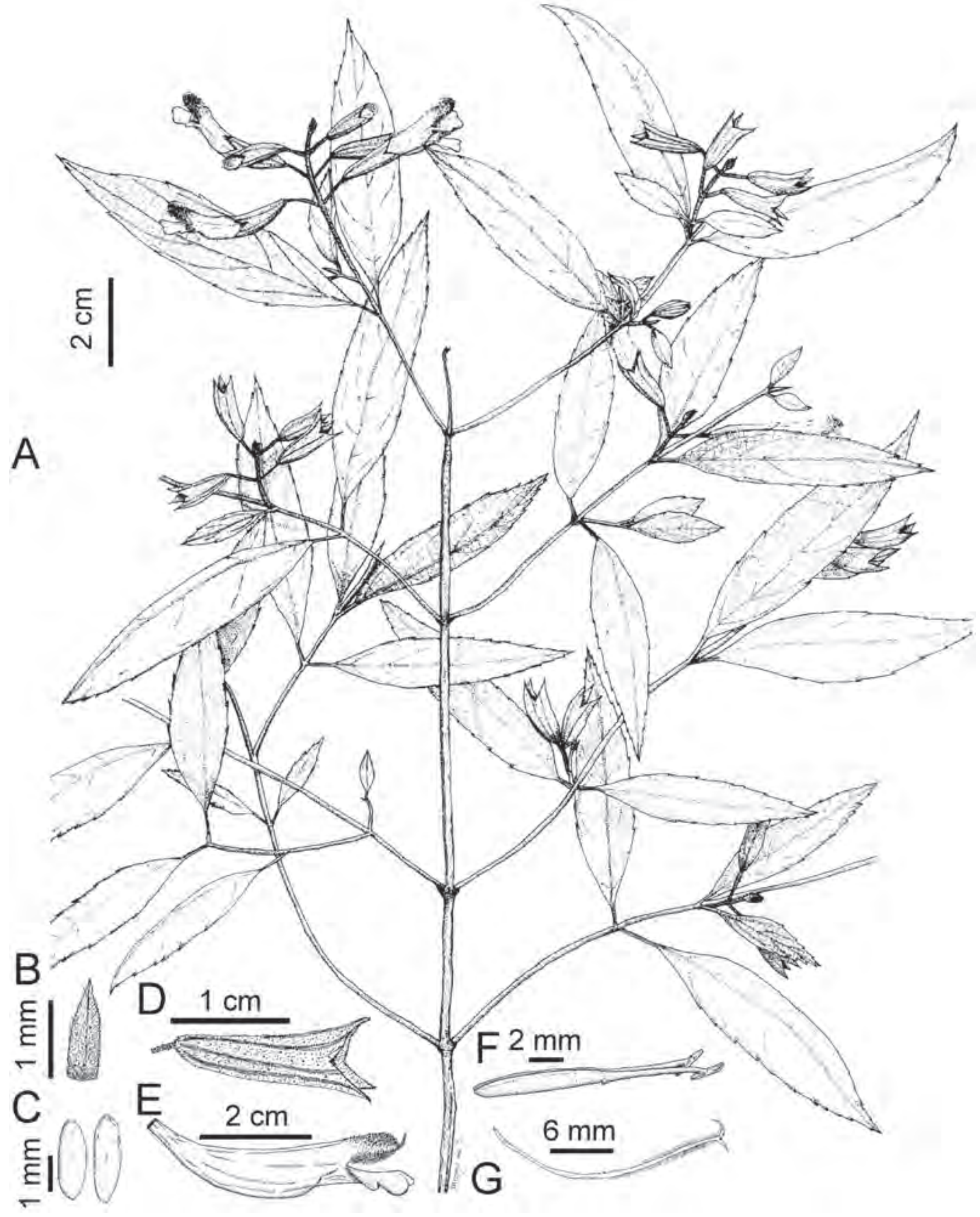

Figure 3. *Salvia meera* Ramamoorthy ex J. G. González et Santana Michel. A, general aspect; B, floral bract, outer surface; C, nutlets; D, calyx in flower; E, corolla; F, connective and theca of a stamen; G, style (A-G based on *J. I. Calzada et G. Nieves H. 9545*; drawn by J. G. González-Gallegos).

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Table 2. Character comparison between *Salvia meera*, *S. pringlei* and *S. tubifera*

Character	*S. meera*	*S. pringlei*	*S. tubifera*
Leaf shape	Lanceolate	Ovate	Ovate
Leaf width (cm)	1.4-2.4	4-6	4-6.5
Inflorescence length (cm)	1-4.5	(3-)6-8(-12)	7-14(-22)
Flowers per verticillaster	2	4-12	2-6
Floral bract length (mm)	1.2-1.4	6-11(-14)	3-4
Calyx length (mm)	13-15	(8-)11-14	6-9
Corolla color	White	Magenta	Magenta
Corolla tube length (mm)	20-22	20-22	18-20
Upper corolla lip length (cm)	0.5-0.6	1.2-1.5	0.4-0.6
Lower corolla lip length (cm)	0.45-0.62	0.8-1.0	0.2-0.4
Altitudinal range (m)	1500-1800	400-750	(1900-)2000-2600(-3000)
Habitat	Pine-oak forests	Tropical oak forests and tropical deciduous forests	Montane cloud forests
Distribution	Endemic to the Sierra de Manantlán, Jalisco, México	Endemic to eastern Jalisco and southern Nayarit, Mexico	Sparsely distributed in Guatemala and the half southern portion Mexico

lineages with red corollas are originated by lineages with purple ones in the cladrogram and vice versa, but lineages with white ones are caused by any of the above, but can not give rise to a lineage with a different corolla color. It is worth noting the similarity between *Ruellia* and *Salvia* in terms of its high richness dominated by species with blue to purple corollas, fewer with red and very few with white or yellow ones, and the homoplasy of such character. Moreover, Coberley and Rausher (2008) found a probable deleterious pleiotropic effect associated with the allele codifying for white corollas in *Ipomoea purpurea* (L.) Roth. This allele consists of an insertion of a transposable element into the exon of the chalcone synthase D gene, which is responsible for the beginning of the flavonoid pathway; the interruption of this pathway with the consequent lack of flavonoids could make the plants vulnerable to drought, UV radiation and herbivory. It is possible that there are similar processes in *Salvia* that limit the diversification of species with white corollas.

Key for *Salvia meera* and its morphologically closest relatives
1a Leaves lanceolate; inflorescences 1-4.5 cm long; floral bracts 1.2-1.4 mm long; corollas white. Endemic to the Sierra de Manantlán Jalisco ……………………………………....................……………………….……………………... *S. meera*
1b Leaves ovate; inflorescences (3-)6-14(-22) cm long; floral bracts 3-11(-14) mm long; corollas magenta. Plants absent in the Sierra de Manantlán.
2a Floral bracts 3-4 mm long; calyces 6-9 mm long; upper corolla lips 6-9 mm long, lower ones 2-4 mm long. Guatemala and almost throughout the Pacific slope of Mexico, from 2 000-2 600(-3 000) m……….............………...…….*S. tubifera*
2b Floral bracts 6-11(-14) mm long; calyces (8-)11-14 mm long; upper corolla lips 12-15 mm long, lower ones 8-10 mm long. Endemic to Jalisco and Nayarit, Mexico, from 400-750 m……...................………………...…..……….*S. pringlei*

Key for the mexican native salvias with entirely white corollas
1a Leaves adaxially white tomentose.
2a Petioles 2-3 cm long; leaves ovate-deltoid, cordate at the base; calyces covered with minute glandular capitate hairs between eglandular longer ones. Endemic to Oaxaca…………..………...…….*S. pericona*
2b Petioles 0.1-1.5 cm long; leaves oblong-lanceolate or elliptic, cuneate or rounded at the base; calyces without glandular capitate hairs.
3a Inflor escences in short (2-3 cm long) crowded terminal racemes. Endemic to the State of México……..….*S. rzedowskii*
3a Inflorescences in long racemes (15-40 cm long) with verticillasters 1-2.5 apart.
4a Calyces densely purple tomentose; corolla tubes 13-14 mm long. Widespread in Mexico and extensively cultivated worldwide as ornamental …..……...……………………..*S. leucantha*
4b Calyces sparsely pubescent, green; corolla tubes 8-9 mm long. Endemic to Sinaloa …...……………...*S. sphacelifolia*
1b Leaves adaxially glabrous or sparsely covered with appressed or flexible curled hairs.
5a Upper lip of the calyces 5 to 7-veined. Endemic to Michoacán.

6a Petioles 1.5-5 cm long; corolla tubes 12-14 mm long; floral axis, pedicel and calyx without glandular capitate hairs... ....*S. leninae*
6b Petioles 0.2-0.7(-1.3) cm long; corollas tube 5.5-6.5 mm long; floral axis, pedicel and calyx densely covered with glandular capitate hairs..……………………..………………………………………*S. assurgens*
5b Upper lip of the calyces 3-veined.
7a Corolla tubes 1.1 cm or longer.
8a Petioles 0.3-0.7 cm long; leaves narrowly lanceolate, 1.4-1.6 cm wide ……..........……….…………………..*S. meera*
8b Petioles (0.5-)1.5-5 cm long; leaves ovate, (2.1-)3-10 cm wide.
9a Leaves long attenuate at the base; calyces purple with the apices of the lower lobes long caudate; corolla tubes 2-2.2 cm long. Endemic to Oaxaca…..……*S. divinorum*
9b Leaves truncate, rounded or subcordate at the base; calyces green or red with the apices of the lower lobes almost truncate or shortly acute but not long aristate, corolla tubes 1.2-2.9 cm long. Endemic to Michoacán or Guerrero.
10a Leaves glabrous on the upper surface, rounded or subcordate at the base; verticillasters 2-flowered, calyces red; corolla tube 2.4-2.9 cm long, internally epapillate, the upper lip 1.2-1.3 cm long and lower one 6.5-10 mm long. Endemic to Guerrero...*S. diegoae*
10b Leaves covered with long hairs on the upper surface, rounded or truncate at the base;verticillasters 6–12-flowered, calyces green and sometimes tingled with purple; corolla tube 1-2 cm long, internally ornamented with 4 papillae, upper and lower lips 8-9 mm long. Endemic to Michoacán…...……………………………..*S. leninae*
7b Corolla tubes shorter than 1 cm long.
11aLeaves cuneate at the base; corolla tubes internally naked at its base. Mainly from the Atlantic slope, from Veracruz to Chiapas……………………………...………….……...*S. albiflora*
11b Leaves rounded or truncate at the base; corolla tubes internally ornamented with 1 or 2 papillae pairs at its base.
12a Lobes of the calyces connivent in fruit. Guerrero and Oaxaca……..........…………………..…………..*S. durantiflora*
12b Lobes of the calyces straight and separated in fruit
13a Calyces 3-4 mm long; corolla tubes 4-5 mm long. Pacific slope, from Nayarit to Oaxaca ……………..........*S. decora*
13b Calyces 5-7 mm long; corolla tubes 8-10 mm long
14a Petioles 5-7 mm long; racemes 5-15 cm long. Endemic to Veracruz ....………………………..……..*S. pineticola*
14b Petioles 5-10 mm long; racemes 3-5 cm long. Endemic to Guerrero ……………...........………………..*S. perblanda*

Salvia rogersiana Ramamoorthy ex J. G. González et Cuevas sp. nov. Figs 2 and 4
Type: **Mexico.** Jalisco, Mpio. Autlán de Navarro: 500-600 m de Corralitos por la brecha que sube a la Estación Científica Las Joyas, 19°37'37.4" N, 104°19'16.3" W, 1 780 m, 30 Oct 2010 (fl), *J. G. González-Gallegos, F. J. Satana-M., A. S. Monroy-S. and A. Paizanii-G. 781* (holotype: IBUG; isotypes: ENCB, IEB, MEXU, ZEA, XAL).
Salviae sectione *Briquetia* Epling adscribenda, ex species sectionis inflorescentis compactis et brevibus, floribus 2 in verticillastris dispositi, calycibus 10 mm longis vel brevibus, calycum labiis superioribus truncatis ad apicem, corollarum tubis 15-17 mm longis distinguenda.

Perennial herbs, erect, (0.5-)0.8-1(-1.5) m tall, stems sparsely to densely pilose on and between the ribs, mainly on young stems. Petioles (1.4-)1.8-3(-4.5) cm long, sparsely to densely pilose. Leaves ovate or ovate-elliptic, (5-)7-9(-10) × (3.5-)4.5-6.5 cm, rounded and shortly cuneate at the base, acuminate at the apex, the margin serrate, sparsely covered with appressed hairs on both surfaces. Inflorescences arranged on terminal racemes, (5-)7-12(-17) cm long, 7–17 verticillasters per floral axis, 6-12(-15) mm apart from each other toward the base; verticillasters 2-flowered; floral axis densely pilose. Floral bracts ovate, 4-8(-9.7) × (2-)3-5 mm, truncate at the base, slightly rounded and abruptly caudate at the apex, the margin entire, foliose, densely covered with long flexible hairs on the outer surface and along the margin, the inner surface glabrous, the hairs eglandular, pluricellular and uniseriate with red septa giving its yellowish-red appearance, deciduous. Pedicels 2-3.5 mm long, thickly pilose. Calyces 7-9.5 × (4-)5-6 mm, yellowish green, concolor, the upper lip acute and bent upward, the apex with a truncate appearance, the lower lip truncate and with a tiny terminal tooth on each lobe (up to 0.2 mm long), the upper lip 3-veined, densely covered with long flexible hairs, the inner surface covered with short conical hairs, mainly toward the apex. Corollas dark blue to purple, glabrous except for the pilose upper lip and to a lesser extent the pilose abaxial surface of the lower lip; tube 15-18.3 cm long, 5.5-6 mm wide in its widest portion, arcuate, widely ventricose just after the lower lip, straight at the base, internally naked (epapillate); upper lip 5-6.7 mm long, lower lip (4.5-)6-8.6 × 8-8.4 mm. Stamens included; filaments (1.7-)2.3-3.3 mm long; connectives 7.8-13 mm long, not geniculate but with a short ventral tooth; thecae 1.4-2 mm long; 2 filiform

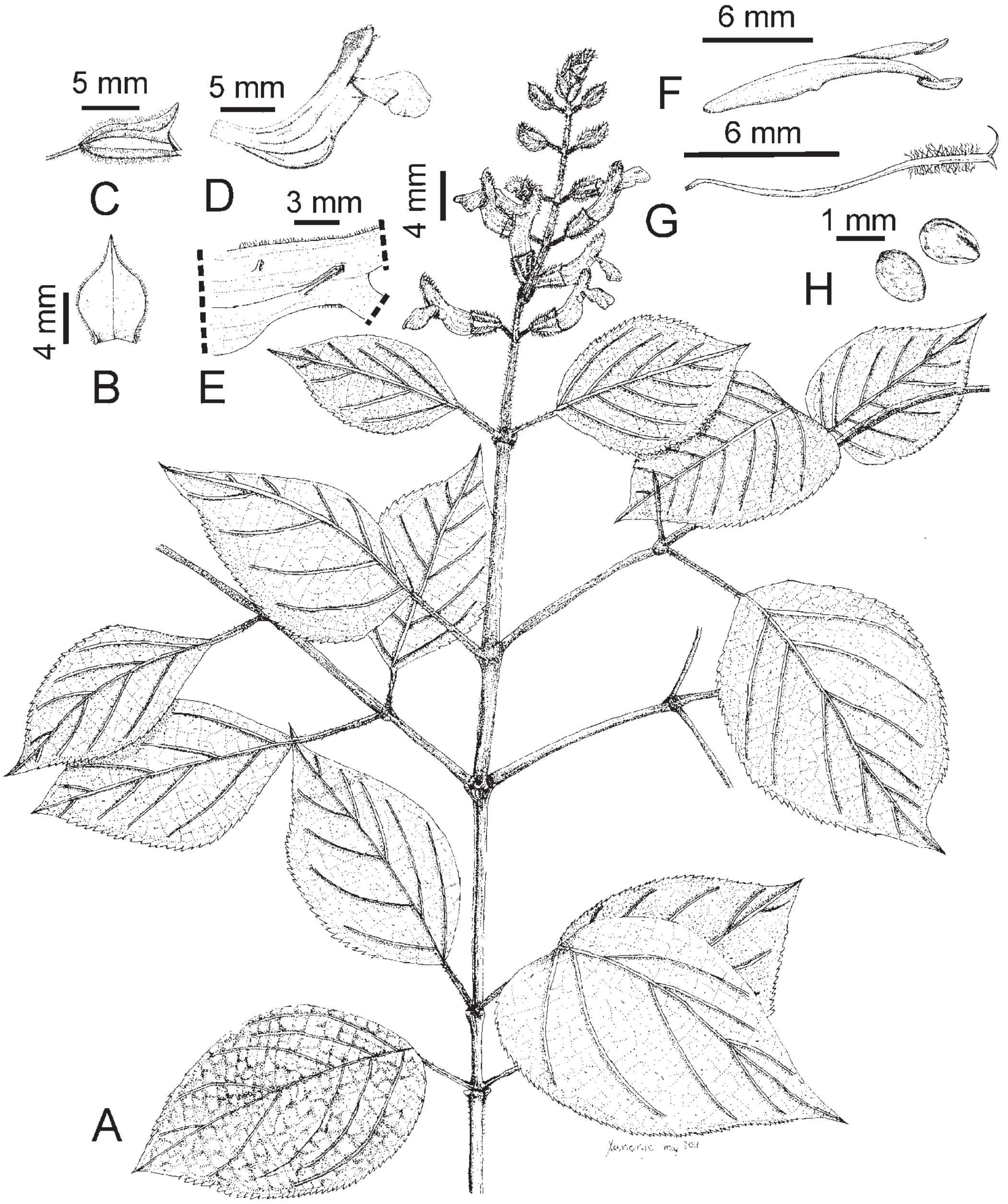

Figure 4. *Salvia rogersiana* Ramamoorthy ex J. G. González et Cuevas. A, general aspect; B, floral bract, outer surface; C, calyx in flower; D, corolla; E, corolla section showing a filament and a staminodium; F, connective and theca of a stamen; G, style; H, nutlets (A-H based on *J. G. González-Gallegos et al. 781*; drawn by J. G. González-Gallegos).

staminodia present behind and above the insertion point of the filaments. Gynobasic horn 0.5-1 mm long; styles 2.1-2.2 cm long, abaxially and adaxially pilose toward the apex, included except for the upper branch of the style, both branches purple, the lower branch acute. Nutlets ovate, 1.5-1.6 × 7-1.4 mm, reddish brown and dark brown marbled (concolor when immature), smooth and glabrous (with tiny appressed hairs on immature ones).

Distribution, habitat and phenology. *Salvia rogersiana* grows along dirt roads in montane cloud and in oak forests, within shaded humid ravines, from (1 100-)1 800-1 900 m altitude. It shares habitat with *Alnus jorullensis*, *Aphananthe monoica* (Hemsl.) J.-F. Leroy, *Cestrum confertiflorum* Schltdl., *Clusia salvinii* Donn. Sm., *Citharexylum mocinnoi* D. Don, *Juglans major* (Torr.) A. Heller, *Otatea acuminate* (Munro) C. E. Calderón et Soderstr., *Prunus serotina* Ehrh. subsp. *capuli* (Cav.) McVaugh, *Symplococarpon purpusii* (Brandegee) Kobuski, *Synardisia venosa* (Mast.) Lundell, *Tilia americana* L. var. *mexicana* Schltdl., *Trophis racemosa* (L.) Urb., *Bursera* sp, *Ficus* sp, *Trichilia* sp, and *Viguiera* sp. The species has flowers and fruits from middle June to December.

Taxonomic summary

Etymology. This species corresponds to what is registered as *S. mcvaughii* in Vázquez-García et al. (1995). However, we do not retain that name because it has already been applied to another new species placed into sect. *Polystachyae* Epling (Bedolla-García et al., 2011). The species is dedicated to Rogers McVaugh's first name in recognition to his outstanding contributions to botany and the study of the Western Mexican flora, particularly the *Flora Novo-Galiciana.*

Additional material examined. **Mexico.** Jalisco. Mpio. Autlán de Navarro: Cerro Las Juntas, Estación Científica Las Joyas, 3 Aug 1986 (fl), *Cuevas 1471* (ZEA); Las Galeras, Estación Científica Las Joyas, 19º37'03" N, 104º16"28" W, 1 600-1 650 m, 3 Dec. 1996 (fl), *Cuevas et Sánchez 5452a* (IBUG, ZEA); parte alta de la cañada del Alentrisco, 600 m al S de Corralitos, 1 800-1 900 m, 19 Jun 1996 (fl), *Sánchez et Cuevas 118* (IBUG, ZEA); 11-12 km al SSE de Autlán, 2 km al S de Ahuacapán, 19º39'31" N, 104º19'14" W, 1 100 m, 24 Jul 1988 (fl, fr), *Santana and De Niz 3669* (ZEA). Mpio. Talpa de Allende: Triunfo, 19 km WSW of Talpa de Allende, along road to La Cuesta and Tomatlán, 1 555 m, 11 Sep 1986 (fl), *Breedlove et Anderson 64166* (MEXU).

Remarks

The characters of *Salvia rogersiana* match those of sect. *Briquetia* (see identification Key below and table 3). None of the other species within the section grows in the same region than *S. rogersiana* except for *S. mexicana*; however this species has not been found in the same locality.

Key for *Salvia mexicana* and *S. rogersiana*

1a Petioles 1-10 cm long, leaves 6-18(-20) cm long; floral bracts 6-12 mm long; calyx 18-17(-20) mm long; upper lip of the corolla 13-14(-19) mm long, lower one 12 mm long...*S. mexicana*

1b Petioles 1.8-2.7 cm long, leaves (6-)7-9(-10) cm long; floral bracts 4-5.2 mm long; calyx 7-9.5 mm long; upper lip of the corolla 5-6.5 mm long, lower one (4.5-) 6-6.6 mm long ....*S. rogersiana*

Salvia santanae Ramamoorthy ex J. G. González et Guzmán-Hernández sp. nov. Figs. 2, 5

Type: **Mexico.** Jalisco. Mpio. Tolimán: 1-1.5 km al N de El Terrero, 12-13 km al NE de Minatitlán, 19º27'13" N, 103º56'56" W, 2 300 m, 4 Sep 1990 (fl), *L. Guzmán-H. et R. Cuevas-G. 1091* (holotype: ZEA; isotype: WIS not seen).

Species habitu cum *Salvia longispicata* M. Martens et Galeotti aemulans optime congruens, sed differt floribus 2-4 in verticillastris dispositi bracteis persistentibus, calycibus 7-9 mm longis et corollarum tubis (9-)1-15 mm longis (vs. flores 6-18 in verticillastris dispositi bracteas caducas, calyces 5-6.5 mm longos, corollarum tubos 5-8 mm longos).

Perennial herbs, erect (0.6-)1-1.5 m tall, stems with flexible retrorse hairs between the ribs, puberulent on the ribs. Petioles 3-4.5(-9) cm long, thin, sparsely covered with tiny appressed hairs. Leaves ovate-elliptic, (6-)10.5-13.5 × (3.5-)6-8.5 cm, long-cuneate at the base, acuminate at the apex, the margin serrate (the teeth regularly 3-5 mm wide at the base), green, both surfaces barely covered with appressed hairs, concentrated mainly on the veins. Inflorescences of axillary or terminal racemes, (10-)15-20 cm long, each one with 11 to 15 verticillasters, these spaced 6-10 mm toward the base, verticillasters 2 or 4-flowered (rarely 5-flowered); floral axis glabrous. Floral bracts narrowly lanceolate, (1.8-)2-4 × 0.5-1.3 mm, green, truncate at the base, aristate at the apex, the margin entire, foliose, glabrescent, persistent. Pedicels 2.5-4 mm long, covered with flexible retrorse hairs and light orange sessile glandular dots, the hairs pluricellular and uniseriate with purple septa. Calyces 7-9 mm long, 3-4 mm wide at the throat, the dorsal portion dark green and the ventral one yellowish green, both lips 2-3(-5) mm long, acute and

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Table 3. Character comparison between *Salvia rogersiana* and *S. mexicana*

Character	*S. rogersiana*	*S. mexicana*
Petiole length (cm)	(1.4-)1.8-3(-4.5)	7-13.2
Leaf dimensions (cm)	(5-)7-9(-10) × (3.5-)4.5-6.5	10-15×6-13
Inflorescence length (cm)	(5-)7-12(-17)	30-50
Number of flowers per verticillaster	2	10-12
Floral bract length (mm)	4-8(9.7)	6-12(-20)
Calyx length (mm)	7-9.5	8-17(-20)
Aspect of the calyx at its apex	Truncate (the upper lip bent backward)	Acute (lips straight forward)
Corolla tube length (mm)	15-18.3	15-25
Upper corolla lip length (mm)	5-6.7	13-14(19)
Lower corolla lip length (mm)	(4.5-)6-8.6	12-16
Altitudinal range (m)	(1100-)1800-1900	(1300-)1700-2600(-2900)
Habitat	Montane cloud and oak forests	Pine-oak and oak forests
Distribution	Endemic to western Jalisco	Widespread in Mexico, almost in all the states except for those from the California and Yucatán Peninsulas

Table 4. Character comparison between *Salvia santanae* and *S. longispicata*

Character	*S. santanae*	*S. longispicata*
Petiole length (cm)	3-4.5(-9)	(1-)2-4(-4.5)
Leaf dimensions (cm)	(6-)10.5-13.5 × (3.5-) 6-8.5	4-8(-11) × 3-8
Inflorescence length (cm)	10-15(-20)	15-30
Flowers per verticillaster	2-4(-10)	6-12(-18)
Floral bract dimensions (cm)	(1.8-)2-4 × 0.5-1.3	(2-)4-7 × (1-)2-3
Floral bract duration	Persistent	Mostly deciduous
Calyx length (mm)	7-9	5-6.5
Corolla tube length (mm)	(9-)10-15	5-8
Upper corolla lip length (mm)	6-7	(3-)4.5-5
Style length (mm)	15-16	8-9(-10)
Altitudinal range (m)	(1800-)2100-2300	(700-)1000-1900(-3400)
Habitat	Montane cloud and oak forests	Tropical deciduous forests and secondary vegetation
Distribution	Endemic to the Sierra de Manantlán, Jalisco, México	Widespread in Mexico, almost in all the states except for those from the California and Yucatán Peninsulas

shortly aristate, the upper lip 3-veined, the veins with the same pubescence as the pedicel and glandular-punctate between them, with a scaly appearance due to a thickened at the insertion point of the hairs and its dark purple color. Corollas dark blue or purple with white nectar guides on the lower lip, the upper lip densely pilose, mainly at the ventral surface, the lower lip abaxially pilose, the rest glabrous; tube (9-)1-15 mm long, 2-3 mm wide at its widest portion, ventricose and slightly invaginated at the base, internally naked (epapillate); upper lip 6-7 mm long, the lower lip equal or subequal in length and 8-8.5 mm wide. Stamens included; filaments 2-2.5 mm long; connectives 9-9.5 mm long, straight and with an acute tooth bending backwards at the middle portion; thecae 1.1-1.2 mm long; 2 staminodia present behind and above the attachment of the filaments to the corolla. Gynobasic horn 0.5-0.7 mm long; styles 15-16 mm long, abaxially and adaxially pilose (hairs with purple septa), the branches purple and exserted. Nutlets ovate, 1.3-1.4 × 0.7-0.8 mm, light brown, almost concolor, smooth and glabrous.

Taxonomic summary

Distribution, habitat and phenology. Salvia santanae inhabits montane cloud forests and oak forests from (1 800-)2 100-2 300 m, in karstic calcareous soils in massif Cerro Grande. It grows together with *Clethra fragrans* L. González et R. Ramírez, *Dendropanax arboreus* (L.) Decne. et Planch., *Oreopanax peltatus* Linden, *O. xalapensis* (Kunth) Decne. et Planch., *Quercus candicans*

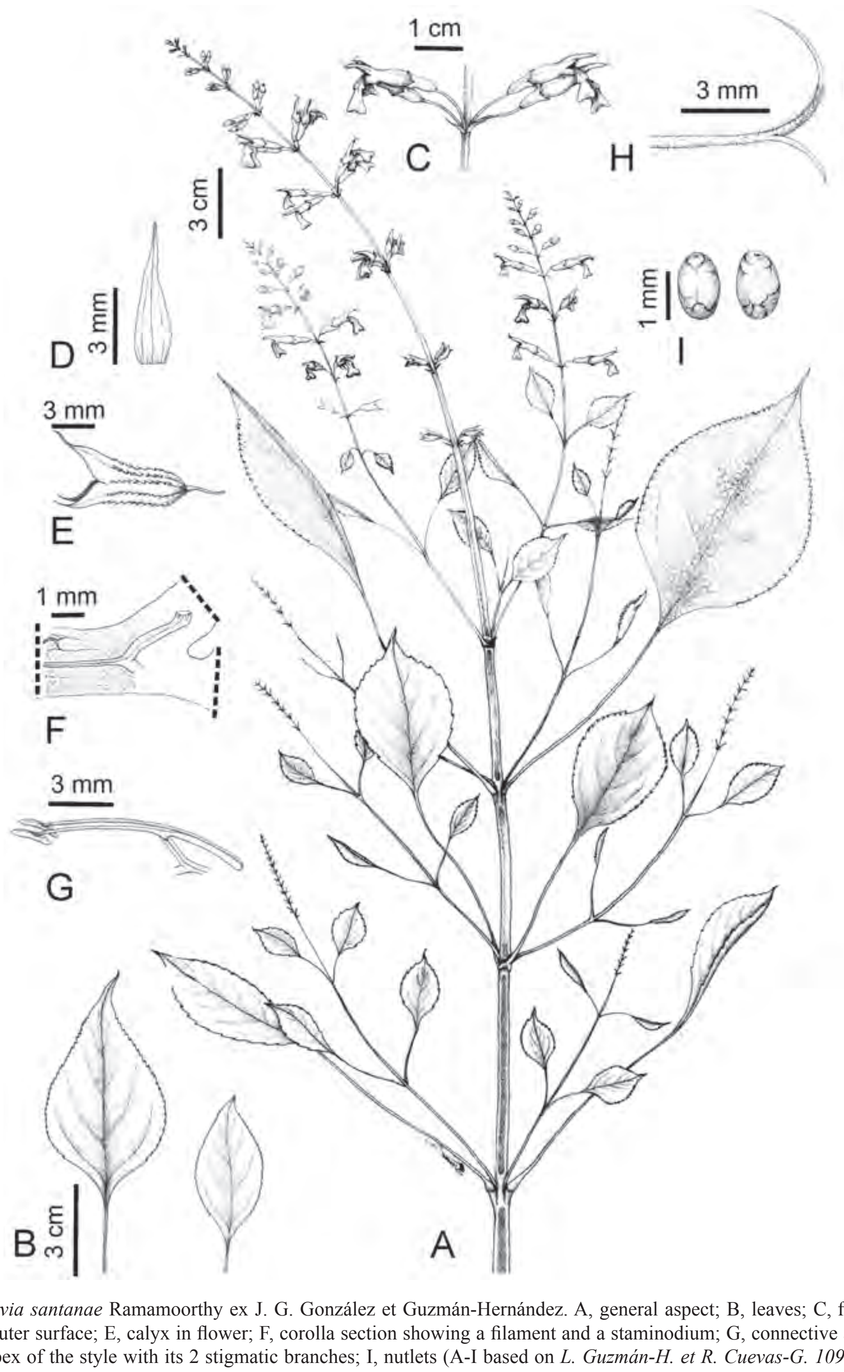

Figure 5. *Salvia santanae* Ramamoorthy ex J. G. González et Guzmán-Hernández. A, general aspect; B, leaves; C, floral node; D, floral bract, outer surface; E, calyx in flower; F, corolla section showing a filament and a staminodium; G, connective and theca of a stamen; H, apex of the style with its 2 stigmatic branches; I, nutlets (A-I based on *L. Guzmán-H. et R. Cuevas-G. 109*; drawn by O. Zuno-Delgadillo).

Née, *Q. castanea* Née, *Q. crassipes* Humb. et Bonpl., *Q. laurina* Bonpl, *Q. obtusata* Bonpl., *Symplocos citrea* Lex. ex La Llave et Lex., *Styrax ramirezii* Greenm, and *Ternstroemia lineata* DC. The species has flowers and fruits from September to March.

Etymology. We retain the name suggested by Ramamoorthy in Vázquez-García et al. (1995), the name is to honor Francisco J. Santana-Michel for his contribution to the knowledge of the flora of Jalisco and Colima (Mexico).

Additional material examined. Mexico. Jalisco. Mpio. Tolimán: 9 km al NE de Minatitlán, 2-4 km al SO de El Terrero, 19º26'00" N, 103º58'38" W, 1 750-1 900 m, 13 Oct 1988 (fl, fr), *Cuevas et López 3323* (ZEA, WIS); 17-18 km al NNE de Minatitlán, 2 km al S de La Laguna, 19º31'28" N, 103º59'00" W, 2 100-2 200 m, 18 Dec 1988 (fl, im fr), *Cuevas et Núñez 3463* (ZEA); Cerro Grande, 19°25'19" N, 103°57'01" W, 1 806 m, 7 Dec 2008 (fl), *González et Vázquez 231* (IBUG, MEXU); 12-13 km al ENE de Minatitlán, 2 km al NO de El Terrero, 19º26'57" N, 103º57'00" W, 2 300 m, 16 Mar 1993 (im fr), *Muñoz et Vázquez 35* (ZEA, WIS); El Terrero, 2 200 m, 25 Nov 1992 (im fr), *Navarrete 312* (ZEA, WIS); La Ciprecera, 2 km al NO de El Terrero, 12-13 km al ENE de Minatitlán, 19º26'57" N, 103º57'00" W, 2 280 m, 19 Nov 1993 (fl, im fr), *Santana et al. 6286* (ZEA).

Remarks

The morphology of *Salvia santanae* is closely related to that of *S. longispicata* M. Martens et Galeotti (see identification key below). Both species differ in their ecology: *S. santanae* grows preferably in montane cloud forests and to a lesser extent in oak forests, above 1 800 m; while, *S. longispicata* inhabits tropical deciduous forest or secondary vegetation along roadsides and dirt roads, it can be rarely found in oak forests or oak-pine forests, generally from 1 000-1 900 m. While *S. santanae* is endemic to Cerro Grande, Jalisco, in contrast *S. longispicata* can be found in almost all the Mexican states except for those from the California and Yucatán Peninsulas.

We have observed an interesting peculiarity in the morphology between *S. santanae* and *S. longispicata*: the purple thickened bases at the insertion point of the hairs on the calyces, a peculiar character of *S. santanae,* it is also present in some populations of *S. longispicata*, particularly from those which inhabit the eastern face of Sierra de Coalcomán (Michoacán), down from Paso Malo to Aguililla, in facing of the Balsas Depression.

We propose *S. santanae* as a member of Sect. *Angulatae*, as it is distinct from the other species included in that section by its persistent floral bracts and corolla tubes 10 mm or longer.

Key for *Salvia longispicata* and *S. santanae*

1aVerticillasters 6–12 (or rarely 18)-flowered, with deciduous floral bracts; calyces 5-6.5 mm long; corolla tube 5-8 mm long, with the upper lip (3-)4.5-5 mm long; style 8-10 mm long...*S. longispicata*

1bVerticillasters 2–4 (rarely 10)-flowered, with persistent floral bracts; calyces 7-9 mm long, corolla tube (9-)10-15 mm long, with the upper lip 6-7 mm long; style 15-16 mm long..*S. santanae*

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A new species and a new subspecies of *Salvia* (Lamiaceae) from Jalisco and Michoacán, Mexico

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Abstract. A new species and a new subspecies of *Salvia*, **Salvia vazquezii** and **Salvia vazquezii** subsp. **tancitaroensis**, from the Jalisco-Colima border and Michoacán, Mexico, respectively, are segregated from the *S. gravida* complex. They are described, illustrated and compared. A key to the three taxa and a translated and expanded circumscription of *S. gravida* are provided.

Key Words: Allopatric, *Salvia gravida* complex, resupinate flowers.

Resumen. Se segregan una nueva especie y una subespecie del complejo de *Salvia gravida*, **Salvia vazquezii** y **Salvia vazquezii** subsp. **tancitaroensis**, de los límites entre Jalisco y Colima, y Michoacán, respectivamente. Se describen, ilustran y comparan. Se incluye una clave para la separación de los tres taxa y una circunscripción traducida y expandida de *S. gravida*.

The genus *Salvia* L. comprises some 900 known species (Mabberley, 1997; Harley et al., 2004). Although cosmopolitan, *Salvia* is mostly distributed in temperate mountainous areas of the world and has three well-defined radiation centers: Central and South America; Middle East and Mediterranean Basin; and eastern Asia, mainly China (Harley et al., 2004; Walker et al., 2004).

According to Bentham (1832, 1876), the genus includes four subgenera and 12 sections, but the ambiguity and difficulty of observing the characters that define his groups make this classification problematic. Furthermore, his proposal is largely outdated, and most of the groups he defined are not natural in the light of recent phylogenetic analysis (Walker et al., 2004; Walker & Sytsma, 2007). Subgenus *Calosphace* (Benth.) Benth., the largest subgenus, contains most of the species of Mexico and Central America, including those addressed in this paper. Epling's monograph (1939) and his successive supplementary notes (Epling, 1940, 1941, 1944, 1947, 1951, 1960; Epling & Játiva, 1963, 1966, 1968; Epling & Mathias, 1957) remain the most comprehensive analysis of New World *Salvia*, and they have been used as the basis for classification in the current studies, despite the fact that the subgeneric key is practically unusable because of its unorthodox construction and sometimes conflicting circumscriptions (Standley & Williams, 1973).

In 1995 the first author (Iltis) and *Salvia* scholar T. P. Ramamoorthy (now retired) identified a distinctive *Salvia* with a lax inflorescence from Cerro Grande, in the eastern Sierra de Manantlán, straddling the border of Colima and Jalisco, Mexico, as a striking new species related to *S. gravida* Epling, the latter a perennial herb with a dense, heavy inflorescence from the Sierra de Torrecillas, within the Sierra de Coalcomán,

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Michoacán (Epling, 1940). They tentatively named their new species *S. vazquezii* in the *Flora de Manantlán* (Vázquez-García et al., 1995), a nomen nudum until now. These two species plus a third taxon, *S. vazquezii* subsp. *tancitaroensis*, form a series of closely related, allopatric endemics that individually and collectively exhibit a narrow geographic range, growing in the two areas previously mentioned and in a third location on the western slopes of Pico de Tancítaro, Michoacán (García-Ruiz, 1998; García-Ruiz et al., 2002). We consider that these three taxa integrate the *Salvia gravida* complex, characterized as monopodial herbs with pendulous inflorescences, showy persistent floral bracts and relatively large (corolla tube 2–3.3 cm long), resupinate flowers. All three populations have rarely been collected. As part of a survey of the genus in western Mexico, we have visited several populations along altitudinal gradients at each of these localities to answer questions about the taxonomic identity of specimens belonging to the *S. gravida* complex. As a result of field and herbarium studies, we propose one new species and one new subspecies and provide an expanded circumscription for *S. gravida*, amplifying its original description with our observations.

Key to taxa in the *Salvia gravida* complex

1. Inflorescences dense (verticillasters crowded and overlapping), 7–30 cm long; bracts and calyces green; flowers (10–)12(−14) per verticillaster; Sierra de Coalcomán, Michoacán. . . . .*S. gravida*
1. Inflorescences lax, rarely dense, 19–60 cm long; bracts and calyces partially or entirely magenta; flowers 6–8(−10) per verticillaster; Jalisco-Colima border and Tancítaro, Michoacán
    2. Flowers usually 6 per verticillaster; bracts and calyces proximally green, distally magenta; nutlets 2.4–2.8 mm long; Cerro Grande, Sierra de Manantlán, Jalisco-Colima border . . . . *S. vazquezii* subsp. *vazquezii*
    2. Flowers 6–8(−10) per verticillaster; bracts and calyces entirely magenta; nutlets 3.0–3.3 mm long; Pico de Tancítaro, Michoacán . . . .*S. vazquezii* subsp. *tancitaroensis*

Salvia gravida Epling, Bull. Torrey Bot. Club 67: 532. 1940. Type: Mexico. Michoacán: Coalcomán, Sierra de Torricillas [Torrecillas], 2400–2680 m, 12 Oct 1938 (fl), *G. B. Hinton 12355* (holotype: LA in UC, n.v.; isotypes: LL, MO). (Fig. 2)

Fleshy perennial herbs, stems monopodial, erect, 1–2(−2.5) m tall, often with fascicles of very reduced leaves in the upper axils, very aromatic; stems pilose upward with thick hairs 2–2.5 mm long, short gland-tipped hairs mixed with spreading slender eglandular hairs 0.5–3 mm long; young shoots densely crisp-pilose. Leaf blades green, widely ovate, less often triangular-ovate, 9–21.5 × 8–11 cm, rounded or cordate at the base, acuminate to long caudate at the apex, sparsely pilose and gland-dotted on both surfaces, mainly when young, almost glabrous and slightly bullate at maturity, paler beneath, minutely glandular-puberulent on the veins and across the surface with intermixed spreading, transparent long hairs more copious on the midrib than on the branch veins and proportionally less copious on the smaller veins, the margin serrate. Petiole 3–15 cm long, covered with short gland-tipped hairs. Inflorescence spiciform racemes with 5–17 verticillasters, compact and dense even in fructification, tilted downward, 7.5–15(−30) cm long and usually 5–7 cm in diam. (upper calyx lobes, tip to tip), the nodes bearded, each verticillaster with 12 flowers (rarely 10 or 14). Bracts persistent, concealing almost the totality of the mature calyces, oval or ovate, (1.4–)3–4.5 × 1.9–4.6 cm, foliaceous, cordate at the base, acuminate at the apex, abaxially minutely glandular-puberulent, the margin entire to serrulate and remotely ciliate. Pedicel 0.7–1.5 cm long. Calyx bilabiate, strongly 8–9-veined (the upper lip 3- or 5-veined), (2–)2.4–2.6 cm long, 0.7–1.2 cm wide at the apex, the lobes ovate-deltate and acuminate at the apex, the upper one lobe not tridentate at the apex, closely covered (under 20X lens) with minute stalked and sessile glands. Corolla resupinate, magenta, 4.4–5.2 cm long, 0.5–0.8(−1) cm wide at the throat, the outer surface glabrous (minutely pubescent and sparsely glandular-papillate on the helmet-like tip of the upper lip); corolla tube well exserted from the calyx, 2.2–3 cm long, ventricose, epapillate; upper lip galeate, 1.4–

2.2 cm long, the lower lip reflexed, 1.4–2.5 cm long, trilobulate with the lateral lobes shorter and narrower than the emarginated middle lobe. Filament 5–6.5 mm long, with a tooth backward to the filament joint; the anterior connective arm 0.9–1.1 cm long, the posterior connective arm 1.3–1.6 cm long, flattened and connate; theca (2.7–)3.6–4.4 cm long. Style magenta at the apex, (3.5–) 4–4.4 cm long, pilose, about equaling the corolla except for the exserted unequal style branches, the upper branch 2–5(−6) mm long, the lower one 1–3 mm long. Nutlets oblong-ellipsoid, 2–2.4×2.5–3 mm, brown mottled with dark brown, smooth.

Distribution and ecology.—This species is endemic to the Sierra de Coalcomán in the Mexican state of Michoacán (Fig. 3). It occurs at (1700–) 2000–2680 meters in pine and cedar forests, under a canopy of *Pinus devoniana* Lindl., *P. douglasiana* Martínez, *Juniperus flaccida* Schltdl., *Quercus castanea* Née, *Fraxinus uhdei* (Wenz.) Lingelsh., *Arbutus xalapensis* Kunth, and *Montanoa* sp., sharing the understory stratum with *Lobelia laxiflora* Kunth, *Agave* spp., *Rubus* sp. and several Asteraceae.

Phenology.—Flowering from (September) October to January, peaking during November and December; fruiting from late November to early March.

Etymology.—The specific epithet *gravida* refers to the heavy inflorescence and indirectly to its eventual pendulous posture.

Additional specimens examined. MEXICO. Michoacán: Sierra de Coalcomán, subiendo por Maruatilla a partir de la carretera de Tepalcatepec-Coalcomán, 8 km al E de Maruatilla y ca. 6 km al O de La Nieve, 18° 49'29"N, 103°05'28"W, 1700 m, 13 Dec 2008 (fl, fr), *González et al. 255* (IBUG, IEB, MEXU, WIS); Sierra de Coalcomán, subiendo por la desviación de Maruatilla hacia La Nieve y Sierra de Torrecillas, 1.4 km al SO de Mesa Alta, 2.5 km al W de La Nieve, 18°49'23"N, 103° 03'54"W, 2043 m, 14 Dec 2008 (fl, fr), *González et al. 256* (IBUG, IEB, MEXU, WIS); Sierra de Coalcomán, subiendo por Maruatilla a partir de la carretera de Tepalcatepec a Coalcomán, 7.5 km antes de llegar a Coalcomán, 1.5 km al SO de Mesa Alta, 3.1 km al W de La Nieve, 18°49'19"N, 103°03'52.1"W, 2050 m, 31 Oct 2009 (fl), *González et al. 399* (IBUG, IEB, MEXU, WIS); Coalcomán, Sierra Torricillas [sic], 2680 m, 15 Oct 1938 (fl), *Hinton 12397* (MEXU, MICH, MO, US); Coalcomán, Sierra Torricillas [sic], 2600 m, 20 Dec 1938 (fl), *Hinton 12799* (ENCB, MICH, MO, TEX, US); Coalcomán, Sierra Torricillas [sic], 2400 m, "10-4-39" [4 Oct 1939] (fl), *Hinton 15271* (US); steep limestone slopes near summits, 8–12 km SW of Aserradero and nearly west of Aguililla, 2250–2400 m, 5–6 Mar 1965 (fr), *McVaugh 22821* (IEB, MICH); La Nieve, carretera Coalcomán-Aguililla, 2200 m, 20 Oct 1979 (fl), *Soto & Ramírez 1913* (ENCB, MEXU, TEX, WIS); Aquila, 43 km al NO del Crucero Dos Aguas de la carretera Apatzingán-Aguililla, cerca del vivero Paso Malo, 18°48'N, 102°57'W, 2235 m, 19 Nov 1997 (fl), *Tenorio & Flores 19623* (MEXU); 21 km al N de Varoloso [Barroloso] por la brecha a Dos Aguas, 18º46'21"N, 102º57'22"W, 2400 m, 3 Nov 2007 (fl), *Zamudio & Alcalá 13962* (IEB).

Salvia vazquezii H. H. Iltis & Ramamoorthy, **sp. nov.** Type: Mexico. Jalisco: Cerro Grande, 7 km by air N of El Terrero on road to La Laguna, 2340 m, 18 Dec 1988 (fl), *H. H. Iltis, R. Cuevas-G. & L. Guzmán-H. 30163* (holotype: WIS-0257511; isotypes: MEXU, TEX, US, WIS-5 sheets, ZEA). (Figs. 1, 2)

Salviae sectione *Nobiles* Epling tentatim adscribenda, species nova cum *S. gravida* optima congruens, sed inflorescentiis laxis saepe longioribus, bracteis obtusis in parte distali partim magenteis et floribus 6 in verticillastris dispositis (*S. gravida*: inflorescentiis densis, bracteis viridibus basi cordatis et floribus 12 in verticillastris dispositis) differt.

Perennial herbs with extremely marked apical dominance (stems monopodial), erect, 1–3 m tall, often with fascicles of very reduced leaves in the upper axils, very aromatic; stems, petioles and rachis copiously and evenly puberulent with very short (0.1 mm or less), mostly gland-tipped hairs mixed with spreading slender eglandular hairs ca. 0.5–3 mm long; young shoots densely crisp-pilose. Leaf blades green (rarely purplish), widely ovate to ovate-lanceolate, less often deltate to triangular-ovate, 10–26×6–20 cm, broadly obtuse to rounded or cordate at the base, caudate-acuminate at the apex, pilose and gland-dotted on both surfaces when young, glabrous to sparsely pilose and slightly bullate above at maturity, paler beneath, minutely glandular-puberulent on the veins and across the surface with intermixed spreading, transparent long hairs more copious on the midrib than on the branch veins and proportionally less copious on the smaller veins, the margin serrate. Petiole (1–, uppermost pair) 2–14 cm long. Inflorescence spiciform racemes with 8–27 verticillasters, lax (usually) or dense, tilted downward, 19–60 cm long and 5–7 cm in diam. (upper calyx

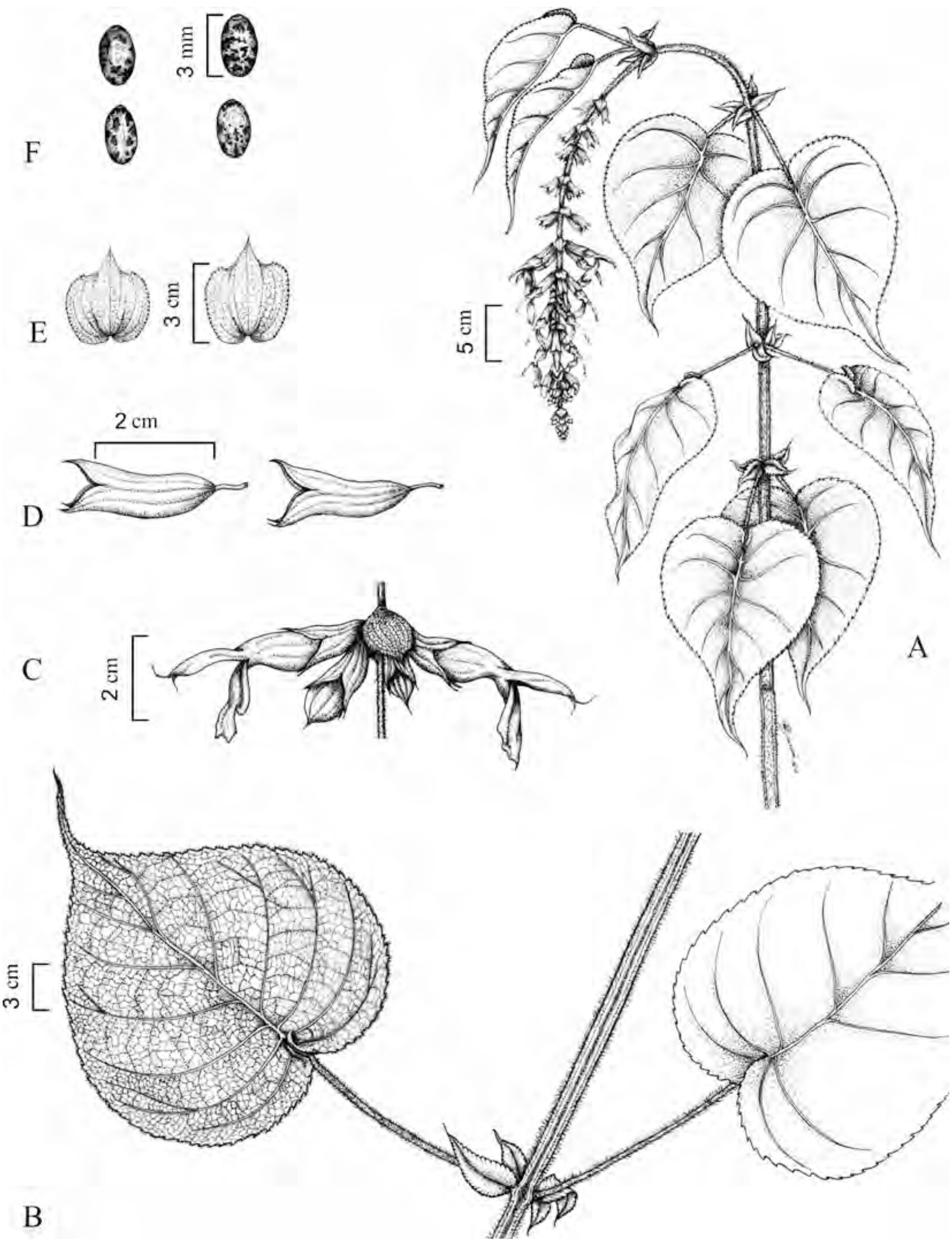

Fig. 1. *Salvia vazquezii* subsp. *tancitaroensis*. **A.** Habit. **B.** Leaves. **C.** Verticillaster from one node. **D.** Representative calyces. **E.** Representative basal inflorescence bracts. **F.** Representative nutlets, ventral (left) and dorsal (right) views of two different nutlets. (Drawn from the holotype.).

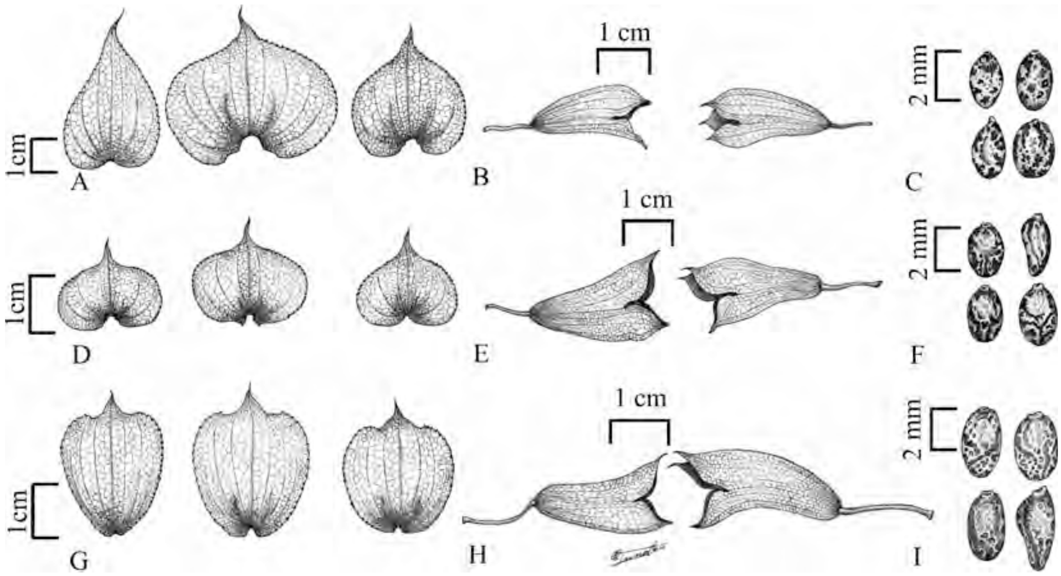

FIG. 2. Comparison of the shape and size of floral bracts, calyces, and nutlets (dorsal views of different nutlets), respectively, between *Salvia gravida* (**A**, **B** and **C**; *González et al. 256* and *399*, IBUG)*, S. vazquezii* subsp. *vazquezii* (**D**, **E** and **F**; *González et al. 242,* IBUG) and *S. vazquezii* subsp. *tancitaroensis* (**G**, **H** and **I**; holotype and *González et al. 383*, IBUG).

lobes, tip to tip), the nodes bearded, the basal internodes 0.9–1.8 cm long, each verticillaster with 6–8(−10) flowers. Bracts persistent, concealing half the length of the mature calyces, oval, rhombic or suborbicular, 1.4–2.9 × 1.1–3.1 cm, foliaceous, rounded to truncate and cuspidate to acuminate at the apex, abaxially minutely glandular-puberulent, the margin entire to serrulate and remotely ciliate. Pedicels 0.8–1.6 cm long. Calyx bilabiate, strongly 12–14-veined (the upper lip 5-veined), 1.6–2.6 cm long, 0.6–1.4(−1.9) cm wide at the apex, the lobes ovate-deltate and acuminate at the apex, the two of the lower lip about as long as the one of the upper, not tridentate at the apex of the upper lobe, closely covered (under 20X lens) with minute stalked and sessile glands. Corolla resupinate, magenta, 4–5.2 cm long, 0.6–1.1 cm wide at the throat, the outer surface glabrous (minutely and sparsely glandular-papillate on the helmet-like tip of the upper lip); corolla tube well-exserted from the calyx, 2–3.3 cm long, ventricose, epapillate; upper lip galeate, 1.4–2.2 cm long, the lower lip reflexed, 1.6–2.1 cm long, trilobulate with the lateral lobes shorter and narrower than the emarginate middle lobe. Filament 4–7 mm long, with a tooth backward to the filament joint; the anterior connective arm 1.0–1.3 cm long, the posterior connective arm 1.3–1.8 cm long, flattened and connate; thecae 3–4 mm long. Style magenta at the apex, 4.1–5.3 cm long, pilose, about equaling the corolla except for the exserted unequal style branches, the upper branch (2–)3–5(−6) mm long, the lower 1–3 mm long. Nutlets oblong-ellipsoid, 2.4–3.3 × 1.5–2.2 mm, brown mottled with dark brown, somewhat compressed, smooth.

Etymology.—The specific epithet of this new taxon honors J. Antonio Vázquez-García, of the Institute of Botany, University of Guadalajara, Mexico, an outstanding botanical explorer and senior author of the *Flora de Manantlán* (Vázquez-García et al., 1995).

Salvia vazquezii subsp. **vazquezii** Perennial herbs 1–2(−2.5) m tall; inflorescences lax, rarely dense, with 8–27 verticillasters, each verticillaster with 6 flowers; floral bracts with the proximal half green, the distal half strongly suffused with purplish-red (color concentrated toward the edges); calyx purplish-red toward the summit (lobes only or as much as the distal half) above the green base; nutlets elliptic-oblong to widely elliptic-oblong, 2.4–2.8 × 1.5–2.1 mm.

Distribution and ecology.—*Salvia vazquezii* subsp. *vazquezii* is endemic to Cerro Grande, a massive limestone plateau in the southeastern Sierra de Manantlán (Fig. 3), Jalisco, where it occurs at elevations from 1900–2560 m (see Vázquez-García et al., 1995, and Vázquez-García & Givnish, 1998), especially in cloud forest gaps. It is often the most abundant element in the understory of the rather dry forest there, especially on the western slope, growing together with *Arbutus xalapensis, Oreopanax xalapensis* (Kunth) Decne. & Planch., *Pinus douglasiana*, *P. pseudostrobus* Lindl., *Quercus candicans* Née, *Q. castanea*, *Q. laurina* Humb. & Bonpl. and *Viburnum hartwegii* Benth.

Phenology.—Flowering from September to February, peaking during December; fruiting from late November to mid June.

Additional specimens examined. MEXICO. Colima: Mpio. Minatitlán, Cerrito Breñoso, torre de microondas, al SE de El Terrero, 2500 m, 24 Feb 1987 (fl), *Santana 2688* (IBUG). **Jalisco:** Cerro Grande, 5 km al SSE de La Laguna, 19°30'N, 103°58'W, 2400 m, 19 Nov 1987 (fl), *Benz & Canales 1170* (TEX, WIS-2 sheets, ZEA); Cerro Grande, El Terrero, 2200 m, 18 Dec 1988 (fl), *Cuevas 1723* (WIS-2 sheets, ZEA); Mpio. Tolimán, 40 km al NO de Colima, 3–4 km al NO de Cerro Grande, 19°26'24"N, 103°58'33"W, 2300–2350 m, 11 Feb 1988 (fl), *Cuevas & Briseño 2229* (IBUG, WIS); Mpio. Tolimán, 15–16 km al NE de Minatitlán, 1 km al S de Cañadas Vanas, 19°29'17"N, 103°57'00"W, 2350 m, 18 Dec 1988 (fl, fr), *Cuevas & Núñez 3459* (IBUG, WIS, ZEA-2 sheets); Mpio. Tolimán, 38.5 km al NO de Colima, 19° 31'15"N, 103°57'30"W, 2450 m, 21 Sep 1987 (fl), *Cuevas & Rosales 2424* (IBUG, WIS, ZEA); 32 km al NO de Colima, 1–2 km al SO de El Terrero, 19º26'15"N, 103º 57'30"W, 2150 m, 22 Sep 1987 (im fr), *Cuevas & Rosales 2465* (IBUG, WIS, ZEA); Rancho el Terrero, 1.5 km adelante del Aserradero, el camino a microondas, 2000 m, 14 Jun 1991 (fr), *Flores et al. 2653* (MEXU); Cerro Grande, El Terrero-La Laguna, 19º26'59"N, 103º56'43"W, 2293 m, 7 Dec 2008 (fl, fr), *González et al. 242* (IBUG, MEXU, ZEA); Cerro Grande, 1 km N of El Terrero, 19º26'40"N, 103º56'W, 2250 m, 13 Mar 1987 (fr), *Iltis et al. 29467* (WIS-6 sheets, ZEA); Cerro Grande, above La Laguna, 19°31'N, 103°56'30"W, 2000 m, 14 Mar 1987 (fr), *Iltis et al. 29559* (ENCB, MEXU, MICH, WIS-2 sheets, ZEA); Cerro Grande, 1.5 km al S de El Terrero, 19° 26'45"N, 103°57'W, 2100 m, 15 Mar 1987 (fr), *Iltis et al. 29600* (OS, UCR, WIS, ZEA); top of Cerro Grande, ca. 29 km NW of Colima, 3.5 km N of El Terrero on road to La Laguna, 19°28'N, 103°57'W, 2340 m, 18 Dec 1988 (fl, fr), *Iltis et al. 30160* (IBUG, MEXU, MICH-2 sheets, US, WIS-12 sheets); Cerro Grande, 2 km al NO de El Terrero, 19° 26'57"N, 103°57'00"W, 2300 m, 16 Mar 1993 (ster), *Muñoz & Vázquez 38* (WIS, ZEA); km 12 camino El Sauz-Lagunillas, cerca del límite con Colima, 2100 m, 29 Dec 1988 (fl), *Pérez et al. 1652* (IBUG); Cerro Grande, 3 km al W de El Terrero, 19°27'42"N, 103°57'48"W, 2300 m, 19 Nov 1993 (fl), *Santana & Benz 6561* (CAS, MO, WIS, ZEA).

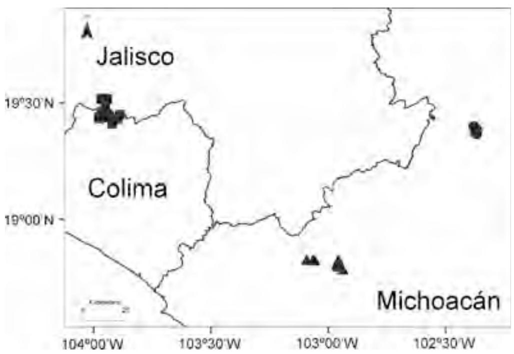

FIG. 3. Distribution of the *Salvia gravida* complex: *S. gravida* (triangles), *S. vazquezii* subsp. *vazquezii* (squares) and *Salvia vazquezii* subsp. *tancitaroensis* (dots).

Salvia vazquezii subsp. **tancitaroensis** J. G. González & A. Vázquez, **subsp. nov.** Type: Mexico. Michoacán: 200 m al norte de El Jazmín, Cerro de Tancítaro, 19º23'54.8"N, 102º22'45.5"W, 2360 m, 25 Jan 2009 (fl), *J. G. González G. 288a* (holotype: IBUG; isotypes: IEB, MEXU, NY, WIS). (Figs. 1, 2)

Salviam vazquezii subsp. *vazquezii* aemulans, a quo fructibus et bracteis longioribus, calycibus et bracteis omnino magenteis et floribus 6–10 in verticillastris dispositis (non calycibus et bracteis partim magenteis et floribus 6 in verticillastris dispositis) differt.

Perennial herbs to 3 m tall; inflorescences lax, sometimes dense, with 12 to 24 verticillasters, each verticillaster with 6–8 (10) flowers; floral bracts strongly purplish-red throughout (or exceptionally white); calyx entirely purplish-red, rarely white; nutlets elliptic-oblong (2.5–)3–3.3 X 1.8–2.2 mm.

Distribution and ecology.—*Salvia vazquezii* subsp. *tancitaroensis* is endemic to the western slopes of the dormant Pico de Tancítaro, Michoacán (Fig. 3), where it inhabits the cloud forest zone at elevations from 2000–2360 m. It is the most abundant understory component, growing together with *Cleyera integrifolia* (Benth.) Choisy, *Dendropanax arboreus* (L.) Decne. & Planch., *Ipomoea orizabensis* (Pelletan) Ledeb. ex Steud., *Cinnamomum hartmanii* (I. M. Johnston) Kostermans, *Lobelia laxiflora*, *Neobrittonia* *acerifolia* (G. Don) Hochr., *Oreopanax echinops* (Schltdl. & Cham.) Decne. & Planch., *Pinus* sp., *Quercus martinezii* C. H. Mull., *Q. rugosa* Née, *Salvia mexicana* L., *S. thyrsiflora* Benth., *S. elegans* Vahl, *S. mocinoi* Benth., *Styrax argenteus* C. Presl and *Symplocos citrea* Lex. It is geographically restricted and poorly represented in herbaria, but like *S. gravida* and *S. vazquezii* subsp. *vazquezii*, it is locally very abundant.

Phenology.—Flowering from the middle of October to February, peaking during November and December; fruiting from late November to February.

Etymology.—The subspecies is named after the Pico de Tancítaro, a floristically rich mountain that is not only home to at least nine other species of *Salvia* (*S. albo-caerulea* Linden, *S. clinopodioides* Kunth, *S. elegans* Vahl, *S. gesneraeflora* Lindl. & Paxton, *S. iodantha* Fernald, *S. lavanduloides* Kunth, *S. mexicana* L., *S. mocinoi* Benth., and *S. thyrsiflora* Benth.), but it is also the site where all collections of subsp. *tancitaroensis* have been made.

Additional specimens examined. MEXICO. Michoacán: Mpio. Tancítaro, Cerro Tancítaro, 27 km al W de Uruapan en línea recta, camino Tancítaro a El Jazmín, a 3–4 km por el Cerro La Cantera, 19º22’N, 102º22’W, 2140 m, 24 Oct 1996 (fl), *García et al. 4337* (CIMI, IEB); Mpio. Tancítaro, 27 km al W de Uruapan en línea recta, aproximadamente 2 km al SE de El Jazmín, 19º23’05”N, 102º22’00”W, 2300 m, 24 Oct 1996 (fl), *García & Acevedo 4400* (CIMI, IEB); Mpio. Tancítaro, 100–200 m al norte de El Jazmín, 19º23’54.8”N, 102º22’44.5”W, 2360 m, 30 Jan 2009 (fl, fr), *González et al. 292* (IBUG, IEB, MEXU, WIS); Mpio. Tancítaro, ladera oeste del Pico de Tancítaro, cara oeste del cerro de La Cantera, camino hacia El Jazmín desde el poblado de Tancítaro, 19°22’32.6”N, 102° 22’3.0”W, 2230 m, 20 Oct 2009 (fl), *González 382* (IBUG, IEB, MEXU, WIS); Mpio. Tancítaro, 300 m al N de la población del Jazmín, 19°23’55.7”N, 102° 22’42.2”W, 2355 m, 20 Oct 2009 (fl), *González 383* (IBUG, IEB, MEXU, WIS); District of Uruapan, Tancítaro, 2300 m, 13 Nov 1940 (fl), *Hinton 15677* (ENCB, IBUG, MEXU, MICH, MO, TEX, US, WIS, WTU); NW slopes of Cerro Tancítaro, 2 km below Apo, 2000 m, 30 Nov 1970 (fl), *McVaugh 24896* (MICH).

The differences between the Cerro Grande and Pico de Tancítaro populations are few and minor but nonetheless worth noting. Distinguishing features of the latter are the number of flowers per verticillaster, the distribution of the reddish color of the bracts and calyces, shape and size of the bracts and overall nutlet size (see key above and Fig. 2). Furthermore, within populations from Tancítaro of 200–250 individuals some (8 individuals in January 2009, *J. González 382*; *Hinton 15677*) present white floral bracts and calyces, suggesting a recurrent mutation or an intrinsic character in the population occurring at low frequency. A distance of 160 kilometers separates the two localities; although not great, it tends to substantiate their discreteness (Fig. 3). Given our present knowledge, it seems that taxonomic recognition at the subspecific level would be a reasonable suggestion for the Tancítaro volcano population.

Discussion

The *Salvia gravida* complex is characterized by the possession of two distinctive morphological traits, namely long pendulous inflorescences and resupinate flowers. The three taxa are further united by virtually all morphological characters, such as leaf distribution, shape and pubescence; pedicel length and length relative to calyx length; lobes of the calyx-lips conspicuous, uniform in shape and dimensions; corollas particularly large and showy and equivalent in color, structure and dimensions; and styles pilose. They are, in fact, extremely similar and obviously closely related, but they are easily keyed out in the key above. *Salvia gravida* differs from *S. vazquezii* in having dense, entirely pale-green inflorescences with cordate floral bracts, contrasting with the loose, purplish-red inflorescences and oval to suborbicular bracts found in the latter.

The two *Salvia vazquezii* subspecies are distinguishable by one qualitative and three quantitative, albeit overlapping, characters: the color pattern of the inflorescence, size of the basal bracts, flower number per verticillaster and overall size of the nutlets. Otherwise, they are identical in every way.

Nothing is known about the degree to which these taxa are related at the molecular level or ultimately, the rate at which they are evolving. The morphological data support a proposal that they are closely related and have perhaps recently evolved. Apparently the secondary isolation of populations on mountain "islands" has resulted in the rapid evolution of three closely related taxa found in nearly identical habitats at equivalent altitudes but at different localities in the mountain system, localities on geologically young formations isolated by warmer drier lowlands. The idea of an independent origin is untenable because of their unique shared characters within *Salvia*; but it is not known whether the three taxa retain, at least to some extent, the ability to interbreed.

Epling (1940) considered *Salvia regnelliana* Briq. to be the closest relative of *S. gravida*. He placed both species in sect. *Skeptostachys* Epling of subgenus *Calosphace* (Benth.) Epling, arguing that the two share similar floral structure and habit. However, *S. regnelliana* does not have a pendulous spiciform inflorescence but rather axillary erect cymes and hence does not have resupinate flowers. Furthermore, *Skeptostachys* is characterized by glabrous styles and is restricted to South America (Epling, 1939). These observations lead us to doubt Epling's proposal, especially in view of the suspected recent divergence and narrowly restricted distributions of these three Mexican endemics. Instead, we regard the *S. gravida* complex as belonging to sect. *Nobiles* Epling. The main characters that define sect. *Nobiles* according to Epling (1939) are ovate or elliptic-lanceolate, glabrous or more or less villous leaves; showy inflorescences; deciduous or persistent bracts; upper lip of calyx with 5 to 7 veins; corolla red or scarlet, the tube expanding unequally toward the apex (ventricose), without internal papillae; corolla lips subequal or the upper one shorter than the lower one; stamens included; and style villous. The *Salvia gravida* complex agrees with every one of these characters.

Resupination in flowers can result from the twisting of the pedicel, the ovary or both (Nyman et al., 1984, 1985). Although an important phenomenon, it has rarely been studied in a phylogenetic context. Clark and Zimmer (2003) and Clark et al. (2006) demonstrated that this character can be important in the definition of monophyletic groups in a recent phylogenetic study of the genus *Alloplectus* Mart. (Gesneriaceae) based on molecular data. However, in other taxa, for example, *Bulbophyllum* Thouars (Orchidaceae), it can also be evolutionarily fairly labile (Fischer et al., 2007). The most conspicuous example of the worth of this character is the delimitation of the family Lobeliaceae, the species of which have resupinate flowers with few exceptions, e.g., *Downingia laeta* (Greene) Greene and *Stylidium petiolare* Sonder (Lammers, 1992). Resupination is also common in the Orchidaceae and is considered to be a diagnostic character of the family (van der Pijl & Dodson, 1966; Dressler, 1981; Ernst & Arditti, 1994). The development of this character has been proposed as the product of a gravitropic effect on pendulous inflorescences with auxin as a regulator (Nyman et al., 1984, 1985). Such a gravitropic effect fits well with the *Salvia gravida* complex, given the orientation of its inflorescences relative to the ground (Fig. 1; Wester & Classen-Bockhoff, 2007: 404, Fig. 3K). Resupination would change the direction in which the flowers are oriented to restore their relative position with respect to their hummingbird pollinators, in other words, so they can be pollinated in the usual nototribic way (Wester & Classen-Bockhoff, 2007); otherwise, the pollination process would have to be modified. In the *S. gravida* complex the only non-resupinate flowers are those borne at the base of the inflorescence below the curvature of the pendulous inflorescence axis (P. Wester, pers. comm.).

Featuring as they do intensely aromatic foliage and spectacular pendulous inflorescences with large bracts and colorful flowers, all three taxa have outstanding potential as winter ornamentals; for example, *Salvia vazquezii* has been cultivated on the western side of the Santa Cruz Mountains, California, since 2006, where it blooms from late November to the end of December (although snow can interrupt flowering). Even when it does not produce seeds, it can easily be propagated by cuttings (B. Clebsch, pers. comm.).

Because they are so conspicuous, all three have been given folk names by nearby villagers: *S. gravida* is called "chupón" or "chuponcillo" (pacifier), because not only are its flowers visited by hummingbirds (personal observation), but every winter children suck on them for the sweet nectar within; *S. vazquezii* subsp. *vazquezii*, "tápalo" (meaning unclear); and *S. vazquezii* subsp. *tancitaroensis*, "cola de borrego" (lamb's-tail), for its long pendulous inflorescence (García-Ruiz, 1998).

The two *Salvia vazquezii* subspecies grow in protected natural areas, Cerro Grande (Reserva de la Biósfera Sierra de Manantlán) and El Jazmín (Parque Nacional Pico de Tancítaro), respectively, where they prosper despite being exposed to intense human disturbance.

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Note

"*Salvia vazquezii* sp. nov. ined." was cited in the *Flora de Manantlán* (J. Antonio Vázquez G. et al., 1995, p. 175), also with a color photograph of the species in plate xxxiii. An illustration of the species is also featured in the 1995 "Happy New Year" card that the first author (HGH) distributed to friends and colleagues.

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Salvia albicalyx and *Salvia topiensis* (Lamiaceae), two new species from Durango, Mexico

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Abstract

Two new species of *Salvia*, exclusively endemics to Durango, Mexico, are described and illustrated. *Salvia albicalyx* is similar to *Salvia leucantha*, especially in habit, but it can be distinguished by floral bracts, pedicel, calyx and corolla size, corolla color, and lower corolla lip shape. *Salvia topiensis* resembles *Salvia decora*, but differs in various aspects: cuneate to long-attenuate blade bases; larger floral bracts, calyces, corollas and fruits; more crowded inflorescences; and internally epapillate corolla tubes.

Resumen. Se describen e ilustran dos especies nuevas de *Salvia*, endémicas exclusivas a Durango, México. *Salvia albicalyx* es similar a *Salvia leucantha*, especialmente en hábito, pero puede distinguirse por el tamaño de la bráctea floral, pedicelo, cáliz y corola, color de la corola, y la forma del labio inferior. *Salvia topiensis* se asemeja a *Salvia decora*, pero difiere en varios aspectos: base cuneada a largo-atenuada de sus láminas; brácteas florales, cálices, corolas y frutos más grandes; inflorescencias más compactas; y tubos de la corola epapilados en el interior.

Key words: Sage, *Salvia* sect. *Albolanatae*, *Salvia* sect. *Farinaceae*, *Salvia* sect. *Peninsulares*, *Salvia* sect. *Polystachyae*

Introduction

Salvia Linnaeus (1753: 23) is one of 57 so-called big plant genera with about 900 species worldwide (Frodin 2004). The extent of this richness is mirrored in Mexico, which harbors almost 300 species (Ramamoorthy & Elliott 1998; Villaseñor 2004), making it the country with the greatest number of sages. However, the exact number of *Salvia* species in Mexico is still uncertain. In the last three decades, publications on *Salvia* added 40 new species to the country (Ramamoorthy 1983, 1984a, 1984b, 1984c, Ramamoorthy & Lorence 1987, Levin & Moran 1989, Espejo & Ramamoorthy 1993, Turner 1995a, 1995b, 1995c, 1996, 2008a, 2008b, 2008c, 2009a, 2009b, 2010, 2011, Klitgaard 2007, Bedolla-García *et al.* 2011, Martínez-Gordillo & Lozada-Pérez 2011, González-Gallegos & Castro-Castro 2012, González-Gallegos *et al.* 2012a, 2012b, Iltis et al. 2012), which indicates the need for a revision of the genus. The taxonomic treatment of *Salvia* for the Flora Mesoamericana project (Klitgaard 2012) is a significant contribution; unfortunately, for Mexico, it only deals with the southeastern species.

The recent examination of Lamiaceae of Western Mexico in the herbaria CIIDIR (Unidad Durango, Instituto Politécnico Nacional), IBUG (Instituto de Botánica, Universidad de Guadalajara) and MEXU (Instituto de Biología, Universidad Nacional Autónoma de México) revealed the presence of two undescribed *Salvia* species. They belong to the subgenus *Calosphace* (Bentham 1833: 198, 245) Epling (1939: 4), due to its two stamens with distally connate connectives, and each one bearing only one fertile theca. *Calosphace* corresponds to one of three major clades found within *Salvia* (Walker *et al.* 2004, Walker & Sytsma 2007). It is a New World group that occurs from southern Canada to northern Chile, Argentina and Uruguay, with its

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main center of diversity in Mexico and Central America. Most of the Mexican species of *Salvia* belong to this subgenus (Ramamoorthy & Elliott 1998).

Salvia albicalyx J.G. González, *sp. nov.* (Figs. 1, 2)

S. leucanthae affinis sed bracteis floralibus, pedicellis, calycibus et corollis brevioribus; corollis magenteis; et labiis deflexis differt.

Type:—MEXICO. Durango: El Mezquital, Candelarita Chico, aproximadamente 4 km, 22º46'N 104º37'W, 21 August 1988 (fl), *I. Solís 957* (holotype CIIDIR!, isotype IBUG!).

Perennial shrubs up to 2 m tall; stems with short appressed hairs and glandular-punctate. Leaves with petioles 13–24 mm long, with short appressed hairs and glandular-punctate; blade oblong-lanceolate, 10.7–15 × 1.8–3.0 cm, apex acuminate to long-attenuate, base slightly cordate to rounded, margin crenate-serrate, densely pilose and finely glandular-punctate in both surfaces. Inflorescence in racemes 7–10 cm long, with 10–11 verticillasters, 6–10-flowered, the lowermost 1.2–1.5 cm apart, floral axis densely pilose and glandular-punctate. Floral bracts ovate-lanceolate, (2.9–)4.0–6.1 × (0.8–)1.2–2.0 mm, deciduous, apex acuminate and caudate (the cauda 1.5–2.3 mm long), base truncate, margin entire, the outer surface pilose and glandular-punctate, the inner one glabrous. Pedicel 2.8–3.2 mm long (up to 4.6 mm in fruit), densely pilose and glandular-punctate. Calyx 7.0–7.6 × 3.9–4.4 mm, densely white wooly, internally covered with short pyramidal hairs, lobes acute although hidden by the pubescence, upper lip 3-veined and entire. Corolla magenta, the upper lip and the ventral margin of the lower one moderately pilose; tube 13.7–14.9 × 3.4–4.2 mm, base ventricose and straight, internally epapillate; upper lip 7.0–7.7 mm long, lower lip 8.4–9.2 × 7–8 mm, deflexed. Stamens included; filament 2.9–3.0 mm long; connective 10.4–11.3 mm long, ornate with a retrorse acute tooth at the middle of its ventral portion; theca 1.7–2.0 mm long; two staminodes present, above and behind the insertion of the filaments, filiform, 1.0–1.2 mm long. Gynobasic horn 1.2–1.4 mm long, apex truncate; style 19–20 mm long, apex pilose, the lower branch acute. Immature nutlet ovoid, 1.4 × 1.0 mm, brown, glabrous and smooth; mature nutlets not seen.

Distribution, habitat and phenology:—*Salvia albicalyx* is a strict Mexican endemic, known exclusively from the type locality: Candelarita, El Mezquital, Durango (Fig. 2). It inhabits ecotones between oak and tropical deciduous forests, on stream banks. As far as we know, it is only found between 1500 and 1600 m elevation. It shares habitat with several species of *Quercus* L., *Bursera* Jacq. ex L., and *Opuntia* Mill. It probably flowers from August to October.

Etymology:—The name of *Salvia albicalyx* alludes to its very conspicuous white wooly calyces.

Additional specimens examined:—No other specimen was available for examination.

Salvia albicalyx resembles species of sections *Albolanatae* (Epling 1936: 111) Epling (1939: 336), *Farinaceae* (Epling 1935: 87) Epling (1939: 186) and *Peninsulares* Epling (1939: 319). They share some general characters: ovate-lanceolate to oblong-lanceolate blades, 6–24 flowers per verticillaster, deciduous floral bracts, white wooly calyces, 3–7-veined upper calyx lip, epapillate corolla tubes, dentate connectives and pilose styles. However, this new species differs from section *Farinaceae* by its larger leaves and flowers, profusely crenate-serrate leaves, and magenta rather than sky-blue corollas; from section *Peninsulares* in its profusely crenate-serrate leaves, not invaginated corolla tubes, and lower corolla lips evidently longer than the upper ones; and it differs from section *Albolanatae* by having magenta rather than white to pale-violet corollas, and deflexed lower corolla lips.

Salvia leucantha Cavanilles (1791: 16), from section *Albolanatae*, is the species morphologically most similar to *S. albicalyx*, particularly with regard to vegetative appearance. They differ in inflorescence length, floral bract, pedicel, calyx, and corolla size, corolla color, and lower corolla lip shape (Table 1).

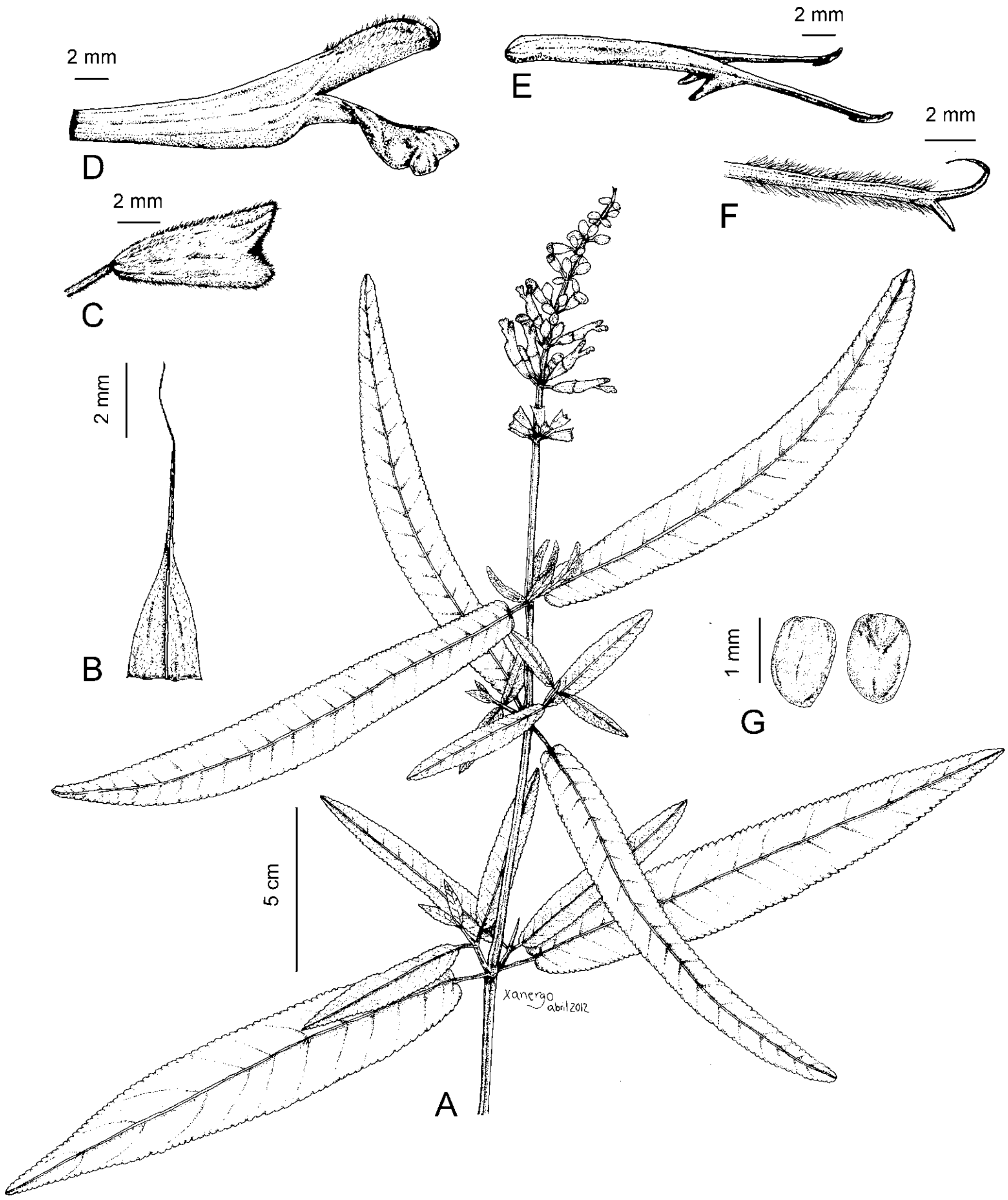

FIGURE 1. Salvia albicalyx A. Habit. B. Floral bract, outer surface. C. Calyx. D. Corolla. E. Connectives and thecae. F. Apex of the style. G. Nutlets, dorsal (left) and ventral (right) surfaces. Illustration based on I. Solís 957; drawn by J.G. González-Gallegos.

TABLE 1. Character, habitat and distribution comparison between *Salvia albicalyx* and *Salvia leucantha*.

	S. albicalyx	*S. leucantha*
Leaves		
petiole length (cm)	1.3–2.4	0.5–2.2
blade shape	oblong-lanceolate	narrow-lanceolate to oblong-lanceolate
blade size (cm)	10.7–15 × 1.8–3	(4–)7–12(–15)× (0.4–)1.2–2.8
apex shape	acuminate to long-attenuate	acute to attenuate
base shape	slightly cordate to rounded	rounded to truncate
margin	crenate-serrate	crenate-serrate
Inflorescence		
length (cm)	7–10	20–36(–50)
Floral bract		
shape	ovate-lanceolate	ovate-lanceolate
size (mm)	(2.9–)4–6.1 × (0.8–)1.2–2	(6.9–)9–13.2(–16) × (2.5–)3–4.4
apex shape	acuminate and caudate	acuminate and caudate
base shape	truncate	truncate
margin shape	entire	entire
duration	deciduous	deciduous
Pedicel		
length (mm)	2.8–3.2	(2.9–)3.2–4.8
Calyx		
size (mm)	7–7.6 × 3.9–4.4	8.4–9.6(–9.9) × 4.2–5.5
number of veins in the upper lip	3	3
pubescence	densely white tomentose	densely violet tomentose or rarely white tomentose
Corolla		
color	magenta	white
tube size (mm)	13.7–14.9 × 3.4–4.2	(14–)15.5–16 × 3.5–5.2
number of internal papillae	0	0
upper lip length (mm)	7–7.7	3–5(–6.4)
lower lip size (mm)	8.4–9.2 × 7–8	3–6 × 3–6.6
shape of the lower lip	deflexed	incurved
Androecium		
filament length (mm)	2.9–3	2.5–2.7
connective length (mm)	10.4–11.3	9–10
theca length (mm)	1.7–2	2–3
Fruit		
nutlets size (mm)	1.4 × 1 (immature)	1.7–1.8 × 1–1.1
Habitat	ecotones between oak and tropical deciduous forests	pine-oak forest and subtropical shrub
Elevational range (m elevation)	1500–1600	1200–2200
Distribution	El Mezquital, Durango. Mexico	worldwide cultivated as ornamental. Its wild distribution is unclear; although, presumably originated in Mexico.

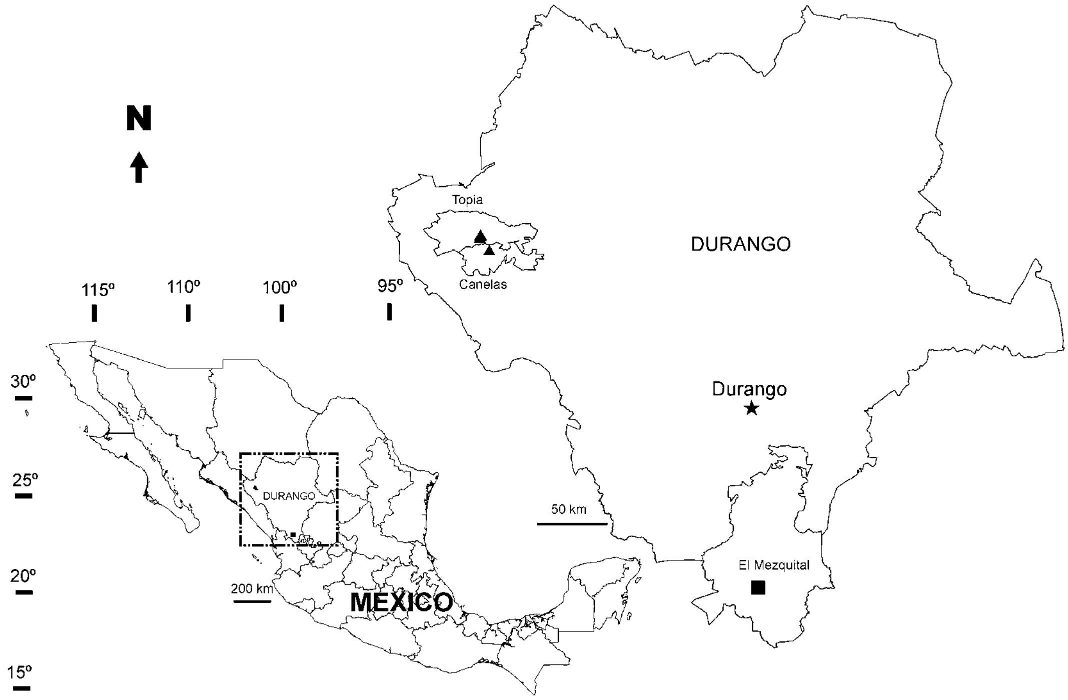

FIGURE 2. Distribution map of Salvia albicalyx (square) and Salvia topiensis (triangles); municipal boundaries of Topia, Canelas and El Mezquital are shown.

Salvia topiensis J.G. González, *sp. nov.* (Figs. 2, 3)

A S. decora laminis cuneatis; bracteis floralibus, calycibus, corollis et fructibus brevioribus; inflorescentiis confertioribus; et corollarum tubis epapillatis statim diagnoscenda.

Type:—MEXICO. Durango: Topia, 3 km de Topia, 2050 m, 28 September 1990 (fl, fr), *A. Benítez-P. 2426* (holotype CIIDIR!, isotype MEXU!).

Perennial shrubs 1–2 m tall; stems densely pilose. Leaves with petioles (0.9–)1.0–2.2 cm long, densely pilose; blade ovate to ovate-lanceolate, 6.2–17.5 × 3–6 cm, apex acute to acuminate, base cuneate to long-attenuate, margin serrate, moderately pilose in the above and densely white tomentose below, aromatic. Inflorescence in racemes 6.3–15.0 cm long, 11–25 verticillasters, these (6–)8–12(–20)-flowered, the lowermost 4.7–12.0 mm apart, floral axis densely pilose. Floral bract ovate, 4.7–5.7 × 2.2–3.3 mm, deciduous, apex acuminate and caudate (cauda up to 2 mm long), base truncate, margin entire, outer surface pilose, the inner glabrous. Pedicel 1.4–2.7 mm long, sparsely pilose and covered with short glandular-capitate hairs. Calyx 4.5–6.3 × 2.1–3.2(–3.8) mm, pilose on the veins and covered with short glandular-capitate hairs, lips acute, the upper 3-veined and entire. Corolla white, upper lip pilose, the lower glabrous; tube 6.8–7.4 × 2.4–3.2 mm, slightly ventricose, base straight, internally epapillate; upper lip 4.6–5.4 mm long, lower lip 3.0–3.7(–5.7) × 4.0–4.6(–6.2) mm. Stamens included; filament 2.1–2.8 mm long; connective 6.9–7.3 mm long, ornate with a short acute tooth at the middle of its ventral portion; theca 1.4–1.7 mm long; two staminodes present, above and behind the insertion of the filaments, filiform and irregularly capitate (up to 1.4 mm long). Gynobasic horn 1.1–1.5 mm long, apex truncate; style 11.1–11.9 mm long, apex pilose, the lower branch acute. Nutlet ovoid, 1.1–1.2 × 0.7–0.8 mm, tan, glabrous, smooth.

Distribution, habitat and phenology:—*Salvia topiensis* is known only from the municipalities of Topia and Canelas, Durango, Mexico (Fig. 2). It grows in oak and pine-oak forests, from (1450–)1900–2320 m elevation, and shares habitat with *Pinus maximinoi* H.E. Moore, several especies of *Quercus*, and *Juniperus* L.

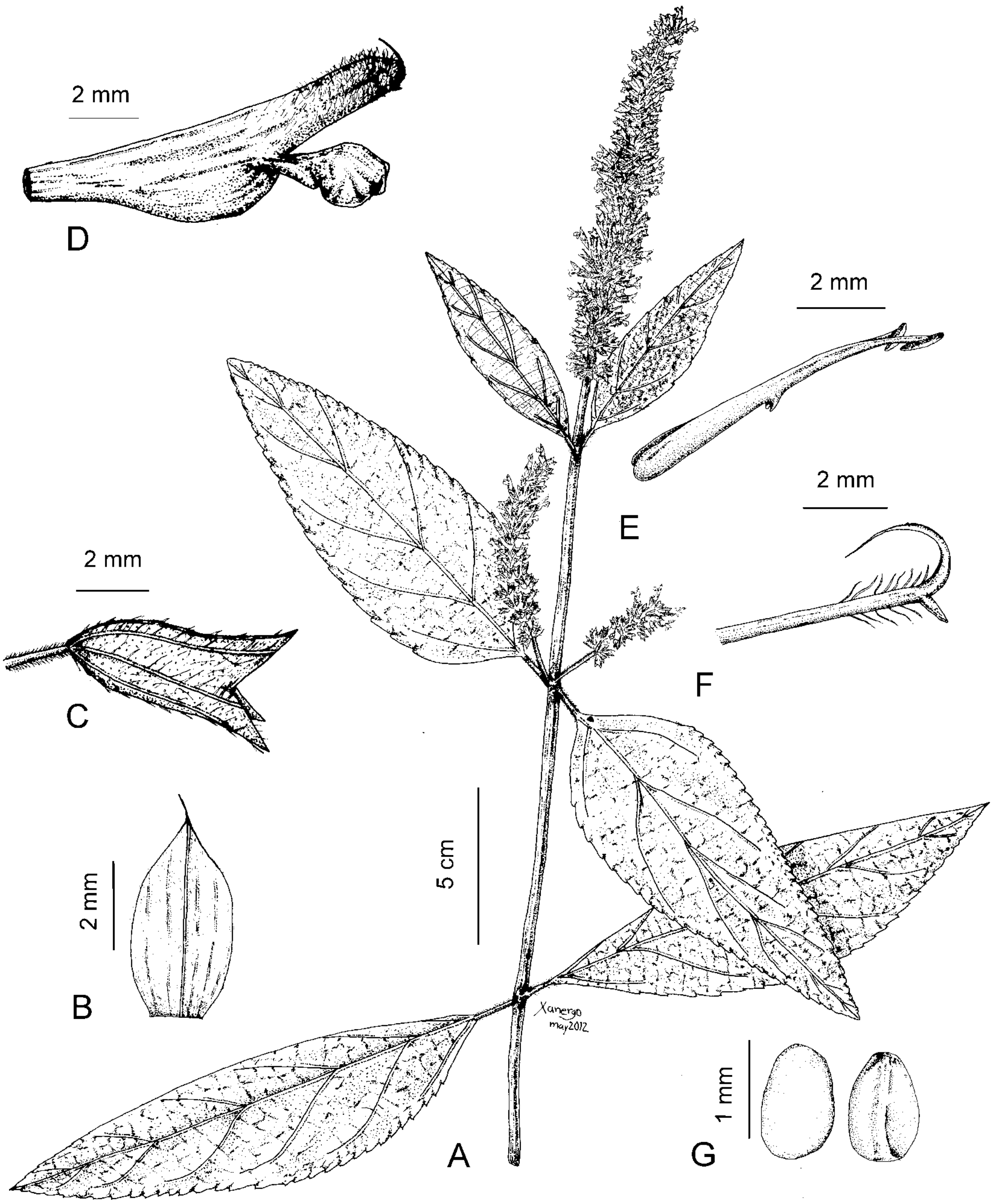

FIGURE 3. Salvia topiensis A. Habit. B. Floral bract, outer surface. C. Calyx. D. Corolla. E. Connectives and thecae. F. Apex of the style. G. Nutlets, dorsal (left) and ventral (right) surfaces. Illustration based on A. Benítez-P. 2426 and S. Acevedo 196 & D. Bayona; drawn by J.G. González-Gallegos.

TABLE 2. Character, habitat and distribution comparison between *Salvia topiensis* and *Salvia decora.*

	Salvia topiensis	*Salvia decora*
Leaves		
petiole length (cm)	(0.9–)1–2.2	(0.9–)2.3–3(–4)
blade shape	ovate to ovate-lanceolate	ovate to ovate-lanceolate
blade size (cm)	6.2–17.5 × 3–6	(4–)6.3–10.4 × 1.9–5.6
apex shape	acute to acuminate	acuminate
base shape	cuneate to long-attenuate	rounded
margin shape	serrate	serrate
Inflorescence		
length (cm)	6.3–15	(4–)8–15
Floral bract		
shape	ovate	ovate-lanceolate
size (mm)	4.7–5.7 × 2.2–3.3	2–2.3 × 0.9–1.3
apex shape	acuminate to caudate	caudate
base shape	truncate	truncate
margin shape	entire	entire
duration	deciduous	deciduous
Pedicel		
length (mm)	1.4–2.7	1.2–1.5(–2)
Calyx		
size (mm)	4.5–6.3 × 2.1–3.2(–3.8)	1.6–3.3(–4.4) × 1–2.5
number of veins in the upper lip	3	3
pubescence	pilose and with short glandular-capitate hairs	pilose and glandular-punctate
Corolla		
tube size (mm)	6.8–7.4 × 2.4–3.2	5.2–6(–6.5) × 2.1–3
number of internal papillae	0	2 or 4, rarely absent
upper lip length (mm)	4.6–5.4	4.4–4.9
lower lip size (mm)	3–3.7(–5.7) × 4–4.6(–6.2)	2.7–3.7 × 3.4–4.6
Androecium		
filament length (mm)	2.1–2.8	1.5–1.6
connective length (mm)	6.9–7.3	4–5.5
theca length (mm)	1.4–1.7	0.7–0.9
Fruit		
nutlet size (mm)	1.1–1.2 × 0.7–0.8	0.6–0.7 ×0.3–0.4
Habitat	oak and pine-oak forests	pine-oak and montane cloud forests
Elevational range (m elevation)	1450–2320	1300–1400(–2100)
Distribution	northwestern Durango. Mexico	Nayarit, Jalisco, Michoacán, Guerrero and Oaxaca. Mexico

Etymology:—The species is named after the municipality of Topia, Durango.

Additional specimens examined (paratypes):—MEXICO. Durango: Topia, 1450 m, 19 September 1985 (fl, fr), *P. Tenorio-L 9822, C. Romero de T. & P. Dávila* (MEXU!); Canelas, 10 km por el camino a

Cuevecillas, [2320 m], 25º7' N, 106º30' W, 10 March 1987 (fl), *S. Acevedo 196 & D. Bayona* (CIIDIR!, IBUG!); Topia, Los Molinos, al S, Arroyo del Agua, 1530 m, 25º12'05" N, 106º34'00" W, 15 March 1987 (fl), *S. Acevedo 332 & D. Bayona* (CIIDIR!, IBUG!); 2 km al N de Topia, 1930 m, 4 August 1990 (fl), *A. Benítez-P. 1771* (MEXU!).

The characters of *Salvia topiensis* do not exactly agree with any of the sections within the subgenus *Calosphace* as defined by Epling (1939, 1940, 1941, 1944, 1947, 1951), Epling & Mathias (1957), and Epling & Játiva (1966). Trying to find the section where *S. topiensis* fits well based on the keys provided by Epling and coworkers, does not lead to any clear answer due to the incongruence of some characters. Nonetheless, the morphologically most similar section is *Polystachyae* Epling (1939: 213). Both are similar in their herbaceous to suffrutescent habit, ovate, lanceolate to elliptic blades, 12–24 flowers per verticillaster, deciduous floral bracts, 3-veined upper calyx lip, dentate connectives, and pubescent styles. However, those species included in section *Polystachyae*, as opposed to *S. topiensis*, present rounded blade bases, and 2–4-papillate corolla tubes. Among the species of section *Polystachyae*, the most similar is *Salvia decora* Epling (1939: 222); however, this differs in its rounded blade bases; smaller floral bracts, calyces, corollas and fruits; usually less crowded inflorescences; and internally papillate corolla tubes (Table 2). It should be noted that some authors rejected the name *S. decora*, and submerge it within *Salvia filipes* Bentham (1848: 309) (Epling 1941, Govaerts *et al.* 2012); but, for the comparison purpose in this paper, both names have been retained as distinct species. In this approach, *S. filipes* can be recognized by means of its cordate blade bases and blue to pale-blue corollas, and for its distribution limited to the Sierra Madre Oriental in Hidalgo, Mexico.

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4.6 González-Gallegos, J. G. y A. Castro-Castro. 2013. New insights on *Salvia platyphylla* (Lamiaceae) and description of *S. pugana* and *S. albiterrarum*, two new species from Jalisco. Mexico. *Phytotaxa* 93: 47-60

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New insights on *Salvia platyphylla* (Lamiaceae) and description of *S. pugana* and *S. albiterrarum*, two new species from Jalisco, Mexico

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Abstract

An expanded description of *Salvia platyphylla* with new insights based on the examination of recent herbarium specimens and observations made in the field is provided. Additionally, are included descriptions and illustrations of two new species morphologically similar to *S. platyphylla*. The first, *S. pugana*, can be distinguished from *S. platyphylla* by its larger calyces, magenta corollas with larger and internally epapillate tubes, longer filaments and connectives, and wider nutlets. The second, *S. albiterrarum*, differs from the latter by its longer corolla tubes, absence of patent white nectar guides on the lower lip, longer filaments, longer and not geniculate connectives, longer styles, with the branches and 3–5.3 mm of the apical portion exserted from the upper lip, and lower stigmatic branch straight rather than sigmoid or arquate. The three taxa are sympatric and represent western Mexico endemisms. Lastly, floral morphology differences between these species suggest valuable considerations on pollination syndromes.

Resumen

Se incluye una descripción ampliada de *Salvia platypylla* con base en la revisión de especímenes de herbario recientes y observaciones hechas en campo. Además se incluyen descripciones e ilustraciones de dos especies nuevas mofológicamente similares a *S. platyphylla*. La primera de ellas, *S. pugana*, puede distinguirse de *S. platyphylla* por sus cálices más largos, corolas magenta con tubos más largos y epapilados, filamentos y conectivos más largos, forma del conectivo y núculas más anchas. La segunda, *S. albiterrarum*, difiere de la anterior por el tubo de la corola más largo, ausencia de guías nectaríferas blancas evidentes sobre el labio inferior, filamento más largo, conectivo más largo y no geniculado, estilo más largo, con las ramas y una porción apical de 3–5.3 mm de largo exsertas del labio superior, y la rama inferior del estilo recta en lugar de sigmoide o arqueada. Los tres taxa viven en simpatría y son endémicos del occidente de México. Por último, las diferencias morfológicas en las flores de estas especies sugieren consideraciones relevantes sobre síndromes de polinización.

Key words: melithophily, ornithophily

Introduction

Salvia Linnaeus (1753: 23) represents a cosmopolitan lineage that radiated in three regions of the world (Walker *et al.* 2004). The richest region is in America (Mexico to South America), with at least 500 species (Walker & Sytsma 2007). Mexico alone embraces about 300 species, with more than 80% of them restricted to and narrowly distributed in the country (Ramamoorthy 1984, Ramamoorthy & Elliott 1998), and it is postulated as the center from which South American lineages would have arisen after several independent dispersal events (Jenks *et al.* 2008). The species growing in Mexico belong mainly to subgenus *Calosphace* (Bentham 1833: 198) Epling (1939: 4); which plus section *Audibertia* Benth. in Lindley (1829: sub t. 1282)

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Epling (1938: 98) equate one of the clades recovered in phylogenetic analysis, the most diversified (Walker *et al.* 2004; Walker & Sytsma 2007; Jenks *et al.* 2011).

According to Ramamoorthy & Elliott (1998) western and southeastern Mexico, along the Sierra Madre Occidental, Transvolcanic Belt and Sierra Madre del Sur, concentrate the largest number of *Salvia* species in Mexico. Among the Mexican states, Jalisco is one of those that harbor a larger amount of endemic species (Ramamoorthy & Elliott 1998). Recent botanical explorations in Jalisco, revealed a wider occurrence and morphological variation of some of the species growing in there, and *Salvia* populations that have been recently described as new species (González-Gallegos & Castro-Castro 2012, González-Gallegos *et al.* 2012a, 2012b, 2013, Iltis *et al.* 2012). Here it is presented a contribution in the same context where *Salvia platyphylla* description is expanded to include characters and morphological variation previously disregarded. *Salvia pugana* and *S. albiterrarum* are also described and illustrated, and its morphological similarities and differences to the former are discussed.

Taxonomic treatment

Salvia platyphylla Briquet (1898: 150). **Type:**—MEXICO. Jalisco: hillsides near Guadalajara, 3 July 1889 (fl, fr), *C.G. Pringle 2560* (holotype G-DEL!, isotypes BR!, CAS!, F!, GH!, GOET!, K!, MEXU!, MO!, NY!, P!, PH!, UC!, US!). (Figs. 1 A–B, 2 A, and 3).

= *Salvia palmae* Epling in Jones (1933: 52). **Type:**—Mexico, Jalisco, La Palma, 9 June 1892 (fl), *M.E. Jones 380* (holotype RSA!, isotypes MO!, US!).

Perennial herb, erect or sometimes procumbent, 50–60 cm tall, sparsely pilose. Leaves with petioles 0.2–2.6(–6.0) cm long, pilose; leaf blade broadly ovate to ovate-deltoid, (1.2–)2.2–5.6(–6.8) × 1.5–3.9(–4.8) cm, acute, obtuse to rounded at apex, truncate to cordate at base, broad serrate to crenate margin, both surfaces pilose, chiefly on the veins, or glabrous, lower one covered with glandular dots. Inflorescence (8–)16–52 cm long, with (4–)6–10 verticillasters, these 4–8(–12)-flowered or rarely 2-flowered, 2.0–5.2 cm apart from each other toward the base, floral axis hispidulous and covered with glandular-capitate hairs in the portion between the last leaves and the first verticillaster. Floral bract ovate-lanceolate, (1.0–)4.0–5.3(–8.0) × (0.5–)1.0–1.3(–2.1) mm, deciduous, acute to caudate at apex, truncate at base, entire margin, outer surface pilose, the inner glabrous; bracteoles present at the base of each pedicel, linear, 0.9–2.7(–4.8) × 0.2–0.4(–1.0) mm, usually deciduous, pilose and glandular-dotted. Pedicel 2.0–3.4 mm long, up to 4 mm long in fruit, dense to sparsely pilose. Calyx 5.4–6.8(–7.3) mm long, 2.8–3.8 mm wide at the throat, glandular-dotted, hispidulous to pilose on the veins, internally glabrous, sometimes verrucose toward the apex, lips acute and ciliate at the margins, the upper one 7-veined and entire. Corolla sky blue with white guides on the lower lip, upper lip and ventral portion of the lower one pilose; tube (4.7–)6.0–8.3 mm long, ventricose, 2.9–3.2 mm wide at the widest portion, invaginated at the base and internally ornate with two bolds; upper lip 3.3–5.1 mm long, lower lip 6.7–12.2 × 9.4–11.3 mm. Stamens included; filament 1.8–3.2 mm long; connective 4.0–6.0 mm long, slightly curved and geniculate, with one ventral acute tooth; theca 1.2–1.6 mm long; staminodes present above and behind the insertion of the filaments, filiform. Gynobasic horn 0.8–1.5 mm long; style 8.7–10.8 mm long, pilose at the apex and before the branches, only the upper branch arquate and exserted from the upper lip, the lower branch clearly sigmoid. Nutlet ovoid, 2.5–2.9 × 1.4–1.7 mm, dark brown marbled with light brown, glabrous, smooth.

Distribution, habitat and phenology:—*Salvia platyphylla* is endemic to western Mexico, it grows mainly in the state of Jalisco, and some populations in the municipality of Juchipila in the state of Zacatecas (Table 1, Fig. 3). It occurs in pine-oak and oak forests from (1000–)1480–2200 m a.s.l. It lives together with the threes *Alnus jorullensis* Kunth, *Juniperus flaccida* Schltdl., *Pinus douglasiana* Martínez, *P. oocarpa* Schiede ex Schltdl., *Quercus castanea* Née, *Q. deserticola* Trel., *Q. magnoliifolia* Née, *Q. obtusata* Bonpl., *Q.*

resinosa Liebm., *Q. rugosa* Née; and the shrubs and herbs *Asclepias contrayerba* Sessé & Moc., *Bletia adenocarpa* Rchb.f., *B. ensifolia* L.O.Williams, *Cosmos jaliscensis* Sherff, *Dahlia coccinea* Cav., *Euphorbia sphaerorhiza* Benth., *Hyptis rhytidea* Benth., and *Ipomoea capillacea* (Kunth) G.Don. It flowers and fructifies from July to December.

TABLE 1. Characters, habitat and distribution comparison between *Salvia platyphylla*, *S. pugana*, and *S. albiterrarum*.

	S. platyphylla	***S. pugana***	***S. albiterrarum***
Leaves			
petiole length (cm)	0.2–2.6(–6.0)	0.3–1.3(–2.4)	(1.0–)1.8–4.6
blade shape	broadly ovate to ovate-deltoid	broadly ovate to ovate-deltoid	ovate-deltoid
blade size (cm)	(1.2–)2.2–5.6(–6.8) × 1.5–3.9(–4.8)	2.0–5.5 × 2.1–4.6	2.4–5.7 × 1.8–5.2
apex shape	acute and then obtuse to rounded	acute to rounded	acute to acuminate and then obtuse to rounded
base shape	truncate to cordate	truncate to cordate	truncate to cordate or sometimes oblique
margin shape	broad serrate to crenate	broad serrate to crenate	broad serrate to crenate
Inflorescence			
length (cm)	(8–)16–52	19–38	19–40
verticillasters			
number per inflorescence	(4–)6–10	4–9	4–15
number of flowers	4–8(–12)	2–4(–6)	2(–6)
distance between them toward inflorescence base (cm)	2.0–5.2	3.3–5.5	2.0–6.5
Floral bract			
shape	ovate-lanceolate	ovate-lanceolate	lanceolate to elliptic-lanceolate
size (mm)	(1.0–)4.0–5.3(–8.0) × (0.5–)1.0–1.3(–2.1)	2.8–4.9 × 0.7–1.0	3.8–5.6 × 0.5–1.0
apex shape	acute to caudate	acute	acute
base shape	truncate	truncate	truncate
margin shape	entire	entire	entire
duration	deciduous	deciduous	deciduous
presence/absence of bracteoles	present	present	present
Pedicel			
length (mm)	2.0–3.4	2.8–4.6	(2.2–)3.0–4.0
Calyx			
size (mm)	5.4–6.8(–7.3) × 2.8–3.8	(7.0–)8.8–10.2(–10.7) × 4.6–5.2	(6.3–)7.8–9.8 × 4.0–5.2

...... *continued on the next page*

TABLE 1 (*continued*)

	S. platyphylla	*S. pugana*	*S. albiterrarum*
number of veins in the upper lip	7	7	7
Corolla			
color	sky blue	pale magenta	magenta
tube size (mm)	(4.7–)6.0–8.3 × 2.9–3.2	8.7–9.6(–12.7) × (3.4–)4.0–4.6(–5.8)	(17.3–)18.6–23.5 × 5.0–6.8
number of internal bolds	2	0	0
upper lip length (mm)	3.3–5.1	4.7–6.4(–7.5)	(7.2–)9.0–13.0
lower lip size (mm)	6.7–12.2 × 9.4–11.3	(8.0–)11.0–14.0 × 10.0–12.2	9.6–14.3 × (8.2–)9.8–12.4
presence/absence of white nectar guides	present	present	absent (vestigial)
Androecium			
filament length (mm)	1.8–3.2	3.8–5.2	6.8–8.6
connective length (mm)	4.0–6.0	6.3–11.2	(16.7–)20.0–28.5
connective shape	slightly curved, and geniculate, with a acute acute tooth	slightly curved, and slightly geniculate, with a ventral acute tooth	straight, not geniculate, sometimes with a tiny acute tooth at midportion
theca length (mm)	1.2–1.6	1.4–1.7(–3.3)	2.0–3.2
Gynoecium			
style length (mm)	8.7–10.8	13–15	26.4–37.0
exsertion grade of the style	only upper stigmatic branch	only upper stigmatic branch	3.0–5.3 mm and stigmatic branches
Fruit			
nutlets size (mm)	2.5–2.9 × 1.4–1.7	2.7–2.8 × 1.9–2.2	2.9–3.4 × 2.1–2.8
Vegetation	pine-oak and oak forests	oak, oak-pine and pine-oak forests	oak-pine forests
Altitude range (m a.s.l.)	(1000–)1480–2200	(1577–)1830–2150	1900–2000
Distribution	MEXICO. Jalisco: Ahualulco del Mercado, Atenguillo, Autlán de Navarro, Ixtlahuacán del Río, Poncitlán, Tapalpa, Tequila, Valle de Guadalupe, Zapopan; Zacatecas: Juchipila	MEXICO. Jalisco: Atenguillo, Cuautla, Mixtlán, Tecolotlán	MEXICO. Jalisco: Cuautla

Taxonomic relationships:—*Salvia platyphylla* belongs to section *Sigmoideae* Epling (1939: 42). This section includes perennial herbs and shrubs with shortly petiolate to subsessile leaves, 2–12-flowered verticillasters, usually deciduous floral bracts, 5–7-veined upper calyx lips, invaginated and ventricose corolla tubes, internally ornate with two folds just above the invagination, included stamens in the corolla, toothed connectives at ventral mid-portion, pubescent styles, and sigmoid lower stigmatic branches. Section *Sigmoideae* is endemic to Mexico and includes 11 species according to the taxonomical revision made by

Espejo & Ramamoorthy (1993). In this revision is highlighted that *S. platyphylla* has been scarcely collected, and they report his presence only in three municipalities in Jalisco: Tecolotlán, Tequila and Zapopan. However, since their revision, new specimens document a wider distribution of the species (Fig. 3, Table 1). We observed some characters that disagree or were not included in any of the the published descriptions available for *S. platyphylla*. Briquet (1898) describes its leaves as subsessile with petioles up to 0.4 mm long, and glabrous styles. Epling (1939) indicates petioles 2–6 mm long, and although he did not describe the styles of any species within section *Sigmoideae*, he defined the section as integrated by species with setose styles. In contrast, Espejo and Ramamoorthy (1993) mention petioles 0.5–6 cm long, and glabrous styles. The holotype and isotypes of *S. platyphylla* exhibit only petioles in agreement with the observations made by Epling (1939). However, the specimens analyzed in this paper show a broader variation in petiole length, from 0.2 to 3 cm long. None of the specimens shows petioles up to 6 cm long as Espejo and Ramamoorthy (1993) state; however, we include their measurement as an extreme variation within parenthesis in our description. The styles are pilose at the apex and before the stigmatic branches, the hairs are scarce, usually 4–6(–20) in number. Thus, it is likely that these passed unnoticed by Briquet (1898) and Espejo & Ramamoorthy (1993). Briquet (1898) mentioned the calyces as more or less glandular-stipitate; nonetheless, in the specimens here examined, we did not observe such hairs, the calyces have only sessile glands (glandular-dotted). Neither Epling (1939) nor Espejo & Ramamoorthy (1993) describes glandular-stipitate calyces in *S. platyphylla*.

A further interesting character we observed is the presence of bracteoles at the base of each pedicel, in addition to the pair of bracts surrounding the verticillasters. This character is not quoted in any of the previous descriptions of *Salvia platyphylla* (Briquet 1898; Epling 1939; Espejo & Ramamoorthy 1993), or in the definition of section *Sigmoideae* (Epling, 1939). Nevertheless, after examining specimens of the other species in *Sigmoideae*, we confirmed the presence of bracteoles in all *Sigmoidea* taxa. Moreover, we have not observed bracteoles in any species outside *Sigmoideae* in a revision of *Salvia* for western Mexico (in prep.), except in *Salvia ibugana* J.G.González (a name in course of publication), and some specimens of *Salvia semiatrata* Zuccarini (1832: 298) of section *Atratae* Epling (1939: 211) from Oaxaca can also present bracteoles (*González-Gallegos & Santos 1406*, IBUG!, *Torres-C. et al. 5294*, IBUG!); so it would be rewarding to study this character and its distribution within subgenus *Calosphace*.

Material examined:—MEXICO. **Jalisco**. Ahualulco del Mercado: Reserva Natural Piedras Bolas, 20º39’3.02”N, 104º3’13.17”W, 1861 m, 5 July 2012 (fl), *D. Juárez & M.A. García 36* (IBUG!). Atenguillo: 3.0–3.5 km al E de Los Volcanes, en una ladera de un cerro junto a la carretera, 20º19’56.70”N, 104º34’16.57”W, 1560 m, 14 July 2011 (fl), *J. González-Gallegos & A. Castro-Castro 1026* (IBUG!); cerro justo en frente del cerro La Campana, por la carretera Guadalajara a Mascota, 5–6 km al SE de Los Jacales, 20º22’8”N, 104º35’58”W, 1920 m, 27 July 2011 (fl, fr), *J. González-Gallegos et al. 1056* (IBUG!); lomeríos al SW del vertedero municipal de basura de Atenguillo, entrada a 9.1 km al SW de Atenguillo por la carretera a Talpa y 1.7 km al W del crucero a Los Volcanes, 20.372798ºN, 104.554981ºW, 1571 m, 31 July 2012 (fl, fr), *J. González-Gallegos et al. 1229* (IBUG!, IEB!, MEXU!). Autlán de Navarro: Ahuacapán, camino de terracería a los Corralitos, 1000 m, 2 December 1981 (fl), *J.A. Vázquez-G. 965-3* (IBUG!); de las Galeras a la Cascada Grande, 1600–1650 m, 3 August 1986 (fr), *R. Cuevas-G. 1434b* (ZEA!); cerro Las Juntas, Las Joyas, 1690 m, 3 August 1986 (fr), *R. Cuevas-G. 1473* (ZEA!); 12–13 km al S de Autlán, 4 km al S de Ahuacapán, 19º38’37”N, 104º20’0”W, 1500 m, 24 July 1988 (fl), *F.J. Santana-M. & D. De Niz 3673* (ZEA!). Ixtlahuacán del Río: 10 km al N de Ixtlahuacán del Río, 1700 m, 8 August 1984 (fl), *R. Hernández-M. et al. 9488* (MEXU!); Cerro Alto, al NW de Ixtlahuacán del Río, 2000–2300 m, 6 July 1986 (fr), *L.M. González-V. & J.A. Pérez de la Rosa 2563* (IBUG!). Poncitlán: a 1 km al S del poblado de Casablanca, arroyo el Tigre, 1480 m, 8 August 1976 (fr), *L.M. Villarreal de Puga 9211* (IBUG!). Tapalpa: La Joya, predio Rincón Viejo, 3.5 km al WSW de Ferrería de Tula, arroyo con cañadas húmedas, 20º3’20”N, 103º45’50”W, 2200 m, 15 July 2001 (fl), *P. Carrillo-Reyes 2178* (GUADA!, IBUG!). Tecolotlán: 500 m adelante de Los Ailes, 2 km adelante de Los Cuartos, rumbo a Cocula, 1770 m, 28 July 1989 (fl), *A. Espejo-S. & A.R. López-F. 3757* (CIIDIR!, ENCB!, Herbario de la Universidad Autónoma de Nayarit!, IEB!, MEXU!); Tequila: km 4 Cerro de Tequila, 1500 m, 13 July 1978 (fl), *L.M. González-V. 419* (CREG!), 961 (IBUG!), 968 (IBUG!, MEXU!); Cerro de Tequila, 6 km sobre la desviación a la estación de microondas, a partir de Tequila, 1620 m, 31 July 1989 (fl), *A.R. López-F. & A. Espejo-S. 943* (CIIDIR!, IEB!, Herbario de la Universidad Autónoma de Nayarit!, MEXU!). Valle de Guadalupe: Rancho Tepozanes (cerro Ramblas), 7 km al WNW de Valle de Guadalupe, laderas basálticas de exposición NNW, 21º1'50"N, 102º40'30"W, 1900–1980 m, 1 August 2001 (fl), *P. Carrillo-Reyes 2375* (IBUG!). Zapopan: Río Blanco, June-October 1886 (fl), *E. Palmer 183* (MEXU!); km 3 carretera a Tesistán, 1 km de la desviación al hospital Angel Leaño, 1635 m, 4 August 1985 (fl), *Guzmán 10* (IBUG!). ZACATECAS. Juchipila: Sierra de Morones, al W de Pueblo Viejo, Cerro de Piñones, ladera E, camino al rancho de Lorenzo Magallanes, 21º20'18"N, 103º13'14"W, 1802 m, 22 July 1998 (fl), *J.J. Balleza-C. & M. Adame-G. 8588* (Herbario de la Unidad Académica de Agronomía de la Universidad Autónoma de Zacatecas!, MEXU!).

Salvia pugana J.G.González & Art.Castro, *sp. nov.* (Figs. 1 C–D, 3, and 4 B)

A Salvia playphyllae affinis sed calyces grandioribus (7.0–)8.8–10.2(–10.7) × 4.6–5.2 vs. 5.4–6.8(–7.3) × 2.8–3.8 mm), corollis magenteis (vs. caeruleis), corollarum tubis grandioribus (8.7–9.6(–12.7) × (3.4–)4.0–4.6(–5.8) vs. (4.7–)6.0–8.3 × 2.9–3.2 mm) et interne nudis (vs. rugis binis ornatis), filis longioribus (3.8–5.2 vs. 1.8–3.2 mm), gubernaculis longioribus (6.3–11.2 vs. 4.0–6.0 mm) et nuculis latioribus (1.9–2.2 vs. 1.4–1.7 mm) differt.

Type:—MEXICO. **Jalisco**: Cuautla: 12.8 km al SE de Los Volcanes por la carretera rumbo a Cuautla, entre el crucero de Fresno Hueco y Tierras Blancas, 20.251337ºN, 104.485552ºW, 1888 m, 31 July 2012 (fl, fr), *J. González-Gallegos, A. Castro-Castro & M.A. Carrasco-Ortiz 1245* (holotype IBUG!, isotypes IEB!, MEXU!).

Perennial herb, erect or sometimes procumbent, 50–60 cm tall, sparsely pilose. Leaves with petioles 0.3–1.3(–2.4) cm long, pilose or glabrous; leaf blade broadly ovate to ovate-deltoid, 2.0–5.5 × 2.1–4.6 cm, acute, obtuse to rounded at apex, truncate to cordate at base, broad serrate to crenate margin, both surfaces pilose, chiefly on the veins, or glabrous, lower one covered with glandular dots. Inflorescence 19–38 cm long, with 4–9 verticillasters, these 2–4(–6)-flowered, 3.3–5.5 cm apart from each other toward the base, floral axis hispidulous and covered with glandular-capitate hairs in the portion between the last leaves and the first verticillaster. Floral bract ovate-lanceolate, 2.8–4.9 × 0.7–1.0 mm, deciduous, acute at apex, truncate at base, entire margin, outer surface pilose, the inner glabrous; bracteoles present at the base of each pedicel, linear, 0.5–1.0(–1.9) × 0.1–0.3 mm, deciduous, pilose and glandular-dotted. Pedicel 2.8–4.6 mm long, up to 5.3 mm long in fruit, dense to sparsely pilose. Calyx (7.0–)8.8–10.2(–10.7) mm long, 4.6–5.2 mm wide at the throat, glandular-dotted, hispidulous to pilose on the veins, internally glabrous, sometimes verrucose or hispidulous toward the apex, lips acute and ciliate at the margins, the upper one 7-veined and entire. Corolla light magenta with white guides on the lower lip, upper lip and ventral portion of the lower one pilose; tube 8.7–9.6(–12.7), ventricose, (3.4–)4.0–4.6(–5.8) mm wide at the widest portion, slightly invaginated to straight at base and internally naked; upper lip 4.7–6.4(–7.5) mm long, lower lip (8.0–)11.0–14.0 × 10.0–12.2 mm long. Stamens included; filament 3.8–5.2 long; connective 6.3–11.2 mm long, slightly curved and geniculate, the tooth irregular; theca 1.4–1.7(–3.3) mm long; staminodes present above and behind the insertion of the filaments, filiform. Gynobasic horn 0.8–1.1 mm long; style 13–15 mm long, pilose at the apex and before the branches, only the upper branch arquate and exserted from the upper lip, the lower stigmatic branch slightly sigmoid to acute and slightly curved at apex. Nutlet ovoid, 2.7–2.8 × 1.9–2.2 mm, dark brown marbled with light brown, glabrous, smooth.

Distribution, habitat and phenology:—*Salvia pugana* grows exclusively in the state of Jalisco, in the municipalities of Atenguillo, Cuautla, Mixtlán and Tecolotlán (Fig. 3). It inhabits oak, oak-pine and pine-oak forests from (1577–)1830–2150 m a.s.l. (Table 1). It shares habitat with the trees *Agarista mexicana* (Hemsl.) Judd., *Juniperus flaccida*, *Pinus oocarpa*, *Quercus magnoliifolia*, *Q. obtusata*, *Q. resinosa*, and the herbs *Bletia ensifolia*, *Dahlia pugana* Aarón Rodr. & Art.Castro, *Ipomoea capillaceae*, *Mandevilla foliosa* Hemsl., *Oplismenus burmanni* (Retz.) P.Beauv., *Scutellaria dumetorum* Schltdl., *Verbesina linearis* (McVaugh) B.L.Turner. It flowers and fructifies in July and August.

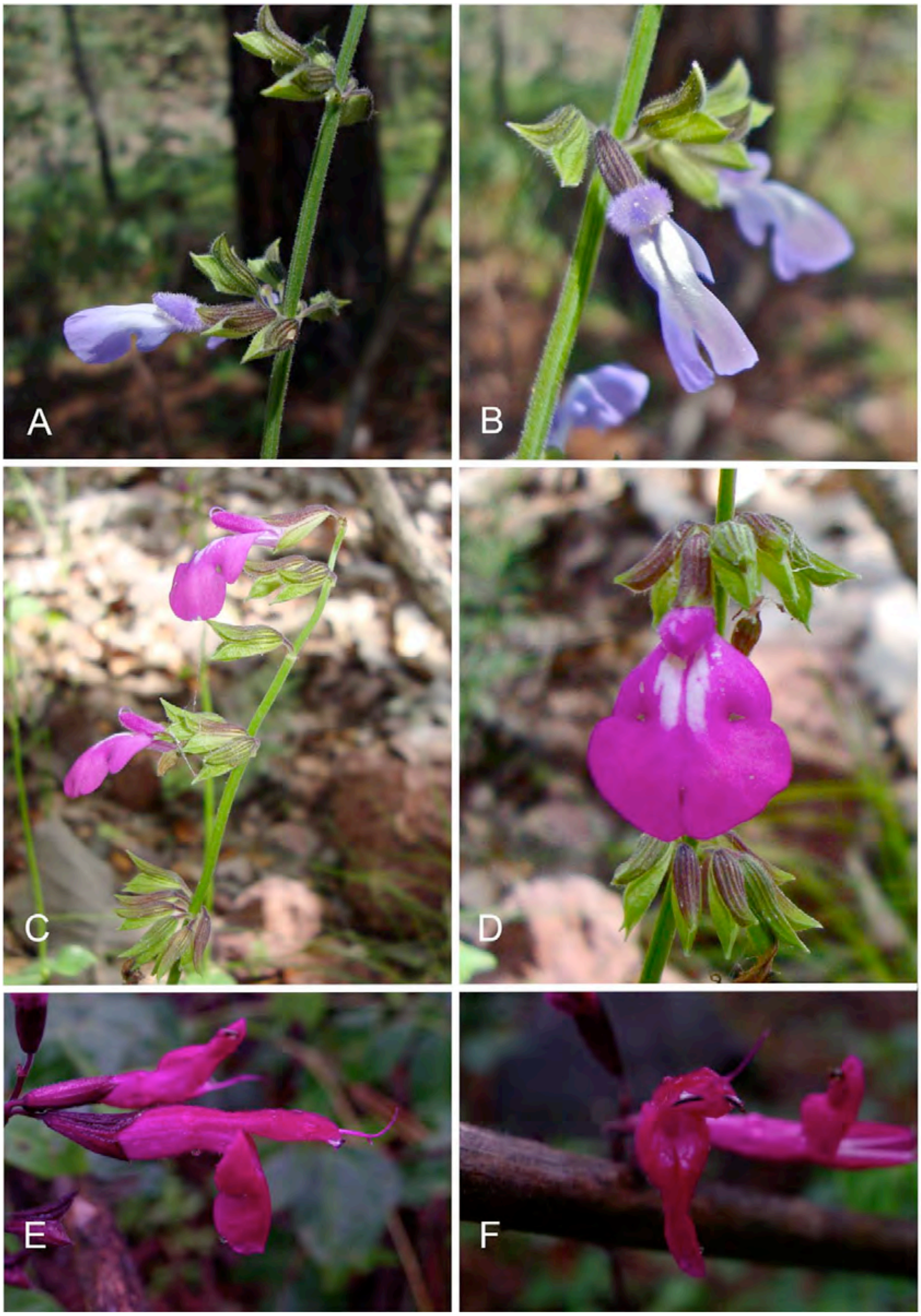

FIGURE 1. *Salvia platyphylla* flowers. A) lateral view, B) frontal view; *S. pugana* flowers. C) lateral view, D) frontal view; *S. albiterrarum* flowers. E) lateral view, F) frontal view. A–B taken in La Campana, Atenguillo, Jalisco, and C–D taken in Santa Cruz del Roble, Atenguillo, Jalisco, by J.G. González-Gallegos; E–F taken in Tierras Blancas, Cuautla, Jalisco, by A. Castro-Castro.

Etimology:—This species is named to honor Luz María Villarreal de Puga, one of those rare persons who appear from time to time and that, with tenacity, succeed in a positive and significant transformation of the surroundings. She has fostered arduously the study and conservation of Mexican flora and vegetation. The Instituto de Botánica (Botanical Institute) from Guadalajara, and IBUG herbarium owe their existence to her.

Taxonomic relationships:—*Salvia pugana* matches well within *Salvia* sect. *Sigmoideae*. It is quite morphologically similar to *S. platyphylla*; however, it differs in having bigger calyces, (7.0–)8.8–10.2(–10.7) × 4.6–5.2 vs. 5.4–6.8(–7.3) × 2.8–3.8 mm), pale magenta corollas (vs. sky blue; Fig. 1A-B vs. 1C-D), bigger corolla tubes (8.7–9.6(–12.7) × (3.4–)4.0–4.6(–5.8) vs. (4.7–)6.0–8.3 × 2.9–3.2 mm), longer filaments (3.8–5.2 vs. 1.8–3.2 mm), longer connectives (6.3–11.2 vs. 4.0–6.0 mm) and with ventral teeth less developed (Fig. 4A vs. 4B), and wider nutlets (1.9–2.2 vs. 1.4–1.7 mm; Table 1, Fig. 4). *Salvia platyphylla* and *S. pugana* grow in similar habitats in terms of vegetation type and altitude range (Table 1); however, the latter manifests a narrower geographical distribution, it is restricted to three contiguous mountain ranges in Jalisco: Sierra de Quila, Sierra Verde and Sierra de Jolapa; while, *S. platyphylla*, besides being present in these mountain ranges, extends its distribution to south and east of Jalisco, and south of Zacatecas (Table 1, Fig. 3), and it is more frequent.

Additional material examined (paratypes):—MEXICO. **Jalisco**: Mixtlán: Sol de Oro, 23 km al N de Los Volcanes-Atenguillo, 20º23’N, 104º33’W, 1830 m, 8 July 1985 (fl, fr), *P. Tenorio-L. & P.T. Ramamoorthy 9214* (CHAPA!, IBUG!, IEB!, XAL!); cerro de Santa Cruz de El Roble, 3.3 km al SE de La Estanzuela, carretera Guadalajara a Mascota, 20º30’13.79”N, 104º21’18.74”W, 1577 m, 21 July 2011 (fl, fr), *J. González-Gallegos et al. 1050* (IBUG!); Santa Cruz del Roble, carretera Ameca a Talpa de Allende, 3.3 km al SW de La Estanzuela, 20º30’13.5”N, 104º21’16.8”W, 1579 m, 27 July 2011 (fl, fr), *J. González-Gallegos et al. 1053* (IBUG!). Tecolotlán: Sierra de Quila, Quila El Grande, 3 km al S al cruzar el arroyo El Ahogado, camino al Paraje El Columpio, 30 July 1989 (fl), *J.J. Guerrero-N. et al. 226* (IBUG!, IEB!); Sierra de Quila, ladera sur del cerro Huehuentón, 5 August 1989 (fl, fr), *J.J. Guerrero-N. 277* (IBUG!). Tenamaxtlán: ladera sur del segundo Picachito, Sierra de Quila, 2000 m, 22 July 2000 (fl, fr), *J.A. Machuca-N. & M.J. Cházaro-B. 8461* (IBUG!, IEB!).

Salvia albiterrarum J.G.González J.G.González & Art.Castro, *sp. nov.* (Figs. 1 E–F, 2 B, 3, 4 C, and 5)

A Salviae puganae corollarum tubis longioribus (17.3)18.6–23.5 vs. 8.7–9.6(–12.7) mm), signis nectariferis nullis vel reductis, filis longioribus (6.8–8.6 vs. 3.8–5.2 mm), gubernaculis longioribus (16.7)20.0–28.5 vs. 6.3–11.2 mm) et sine dentibus, stylis longioribus (26.4–37.0 vs. 13.0–15.0 mm) et longe exsertis, ramis stigmatiferis inferioribus rectis (vs. sigmoideis vel arcuatis) statim dignoscenda.

Type: —MEXICO. **Jalisco:** Cuautla: 12.8 km al SE de Los Volcanes por la carretera rumbo a Cuautla, entre el crucero de Fresno Hueco y Tierras Blancas, 20.249ºN, 104.484ºW, 1967 m, 31 July 2012 (fl, fr), *J. González-Gallegos, A. Castro-Castro y M.A. Carrasco-Ortiz 1246* (holotype IBUG!, isotypes CIIDIR!, CIMI!, ENCB!, GUADA!, HUAA!, HUMO!, IEB!, MEXU!, OAX!, SERO!, UAGC!, XAL!, ZEA!).

Perennial herb, erect, 25–60 cm tall, stems sparsely pilose to glabrous. Leaves with petioles (1.0–)1.8–4.6 cm long, sparsely pilose; blade ovate-deltoid, 2.4–5.7 × 1.8–5.2 cm, acute to acuminate, obtuse to rounded at apex, truncate to cordate or sometimes oblique at base, broad serrate to crenate margin, surface bullate and lustrous above, paler beneath and covered with glandular dots, both pilose on the veins, otherwise glabrous. Inflorescence terminal, 19–40 cm long, with 4–15 verticillasters, these 2-flowered, or rarely up to 6-flowered, the lowermost 2.0–6.5 cm apart from each other toward the base, floral axis hispidulous and covered with short glandular-capitate hairs between the last leaves and the first verticillaster, and sparsely pilose upward. Floral bract lanceolate to elliptic-lanceolate, 3.8–5.6 × 0.5–1.0 mm, deciduous, acute at apex, truncate at base, entire margin, outer surface pilose, inner one glabrous; bracteoles present at the base of each pedicel, linear, 1–2 × 0.1–0.2 mm, deciduous, pilose. Flower with pedicel (2.2–)3.0–4.0 mm long, up to 7.2 mm long in fruit,

FIGURE 2. Comparison of vegetative appearance of A) *Salvia platyphylla*; B) *Salvia albiterrarum.* A taken in Santa Cruz del Roble, Atenguillo, Jalisco, and B in Tierras Blancas, Cuautla, Jalisco by J.G. González-Gallegos.

dense and sparsely pilose. Calyx (6.3–)7.8–9.8 mm long, 4.0–5.2 mm wide at the throat (up to 11 × 7.5 mm in fruit), glandular-dotted, externally pilose on the veins, internally glabrous and sometimes verrucose toward the apex, lips acute and ciliate at the margin, the upper one 7-veined and entire. Corolla magenta, color guides above the lower lip absent to scarcely developed, light magenta but not white, tube, upper lip and ventral portion of the lower one pilose; tube (17.3–)18.6–23.5 mm long, not ventricose, 5.0–6.8 mm wide at mid-portion, straight at the base, internally epapillate and without bolds; upper lip (7.2–)9.0–13.0 mm long, lower lip 9.6–14.3 × (8.2–)9.8–12.4 mm. Stamens included; filament 6.8–8.6 mm long; connective (16.7–)20.0–28.5 mm long, straight, not geniculate, sometimes with a tiny acute tooth at ventral midportion; theca 2.0–3.2 mm long; staminodes present above and behind the insertion of the filament, filiform. Gynobasic horn 0.8–1.0 mm long; style 26.4–37.0 mm long, pilose at apex and before the branches, exserted 3.0–5.3 mm plus the branches from the upper lip, the lower branch acute. Nutlet ovoid, 2.9–3.4 × 2.1–2.8 mm, uniformely dark brown, glabrous and smooth.

Distribution, habitat and phenology:—*Salvia albiterrarum* is known only from the municipality of Cuautla, Jalisco, in a hill at west of Tierras Blancas (Fig. 3). It inhabits oak-pine forests, from 1900–2000 m a.s.l. It shares habitat with the threes *Arbutus xalapensis* Kunth, *Agarista mexicana*, *Pinus oocarpa*, *Quercus castanea*, *Q. eduardii* Trel., *Q. magnoliifolia*, and the shrubs and herbs *Dahlia coccinea*, *D. pugana*, *Eriosema diffusum* (Kunth) G.Don, *Euphorbia sphaerorhiza*, *Phaseolus coccineus* L., *P. pauciflorus* Sessé & Moc. ex G.Don, *Salvia lavanduloides* Kunth, *S. platyphylla*, *S. prunelloides* Kunth, *Scutellaria dumetorum*, *Verbesina linearis*, *Cyperus* sp., *Habenaria* sp., *Odontotrichum* sp., and *Oxalis* sp. It flowers and fructifies from June to August.

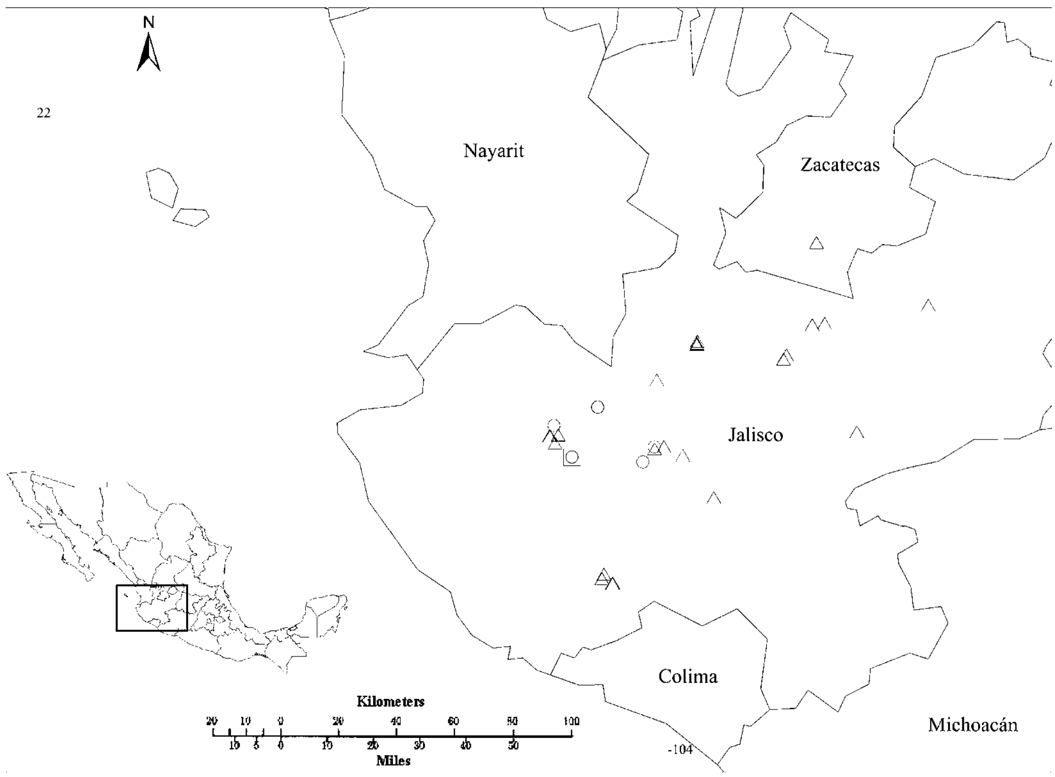

FIGURE 3. Distribution map for *Salvia platyphylla* (triangles), *S. pugana* (circles) and *S. albiterrarum* (single square).

Etymology:—The species epithet is the latinized name of Tierras Blancas, honoring the place where it was found and which embraces the known distribution of the taxon.

Taxonomic relationships:—If it is followed the key for the sections of *Salvia* subgenus *Calosphace* provided by Epling (1939), *S. albiterrarum* matches better with sect. *Nobiles* Epling (1939: 280) and sect. *Sigmoideae*, though there are some characters that disagree with sectional circunscription. Species of sect. *Nobiles* differ in several ways from *S. albiterrarum*, they are shrubs more than 1 m tall (vs. perennial herbs up to 60 cm tall), without bracteoles, their flowers are bright red without color guides above the lower lip (vs. magenta with absent to poor developed light magenta guides), corolla tubes are expanded toward the apex or rarely ventricose (vs. straight and not ventricose), lower corolla lips are as long as, or shorter than upper lips (vs. upper corolla lips shorter than the lower), and with lateral lobes poor developed to absent (vs. patent lateral lobes). Species of sect. *Sigmoideae* differ in having invaginated corolla tubes at base and usually internally ornate with two bolds (vs. straight and naked), geniculate connectives (vs. entire), and sigmoid lower stigmatic branches (vs. acute). However, if it is considered the presence of bracteoles additionally to floral bracts in *S. albiterrarum* and sect. *Sigmoideae*, and morphological similarity in vegetative characters between the first and *S. platyphylla* (Table 1, Fig. 2), it results a more supported idea to conceive *S. albiterrarum* as part of sect. *Sigmoideae* instead of sect. *Nobiles*. It is also noteworthy that the use of Epling's proposal should be considered provisional as there is little evidence about the monophyly most of his sections (Standley & Williams, 1973; Jenks et al. 2008).

Salvia albiterrarum resembles *S. pugana*, but it differs from the latter by its longer corolla tubes [(17.3–)18.6–23.5 vs. 8.7–9.6(–12.7) mm], absence of white nectar guides on the lower lip (Fig. 1F), longer filaments (6.8–8.6 vs. 3.8–5.2 mm), longer [(16.7–)20.0–28.5 vs. 6.3–11.2 mm long] and not geniculate (vs. geniculate) connectives, longer styles (26.4–37.0 vs. 13.0–15.0 mm), with branches and an apical portion of 3.0–5.3 mm exserted from the upper lip (vs. with only the upper branch exserted), and lower stigmatic branch straight (vs. sigmoid or arquate; Table 1, Figs. 4B vs 4C and 5). *Salvia albiterrarum* is known only from the municipality of Cuautla in the limits with the municipality of Atenguillo, Jalisco, where it is sympatric with *S. pugana* (Fig. 3).

The differences remarked between the corollas of *Salvia albiterrarum* and *S. pugana*, and even *S. platyphylla* (Table 1, Figs. 1A–D vs. 1E–F and 4A–B vs. 4C), seem to reflect the two general pollination syndromes in *Salvia*: melithophily and ornithophily. *Salvia* melithophilous corollas, in contrast with ornithophilous, are distinguished by wider and extended lower corolla lips, shorter distance between nectar position and corolla tube entrance, shorter connective arms (Wester & Claßen-Bockhoff 2007), nectar guides often found on the flower entrance, presence of distinctive ventral teeth or barriers at the connectives (Wester & Claßen-Bockhoff 2011), and pollen sacs usually hidden in the upper corolla lip (Wester & Claßen-Bockhoff. 2006). This set of morphological characters is exhibited by *S. pugana* and *S. platyphylla* (Figs. 1 A–D, 4 A–B), while *S. albiterrarum* presents longer corolla tubes and hence a longer distance between flower entrance and nectar position, longer connective arms, nectar guides lacking or reduced and restricted to flower entrance, and teeth or outgrowths at the connectives lacking (Figs. 1 E–F, 4 C); such that it coincides with the ornithophilous syndrome described in the genus (Wester & Claßen-Bockhoff 2006a, 2006b, 2007, 2011). Moreover, in both species the pollen sacs are hidden in the upper corolla lip suggesting and active lever mechanism (Wester & Claßen-Bockhoff 2006b), which can be confirmed introducing a mechanical pressure on the posterior portion of the connectives; however, in *S. platyphylla* the connectives occlude the corolla tube near flower entrance to mid-portion (Fig. 4 A), whereas in *S. albiterrarum* the occlusion is distally located (5–8 mm from corolla base; Fig. 4 C), so we can assume that lever mechanism in *S. albiterrarum* cannot be turn on by bees (Wester & Claßen-Bockhoff 2011). Claßen-Bockhoff *et al.* (2004) indicates that minute changes in lever arm length, shape and orientation, and relative morphometric proportions of staminal levers and pollinators might have significant effects on flower pollinator interaction, because these changes can promote reproductive isolation between sympatric species facilitating pollen deposition on some spots of the pollinator's bodies while excluding others. Therefore, if a phylogenetic relatedness were corroborated between these species or between *S. albiterrarum* and any other species from sect. *Sigmoideae* (which also exhibit melitophilous syndrome as *S. playphylla*), it would be a good model to evaluate pollinator shift from bees to birds as a force conducting speciation within this lineage.

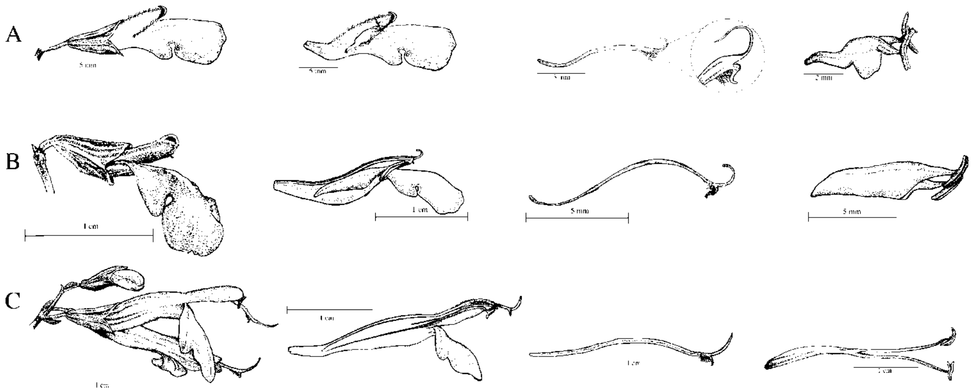

FIGURE 4. Comparison of floral morphology from left to right: flower, corolla showing the position of connectives inside, style, and connective with theca. *S. platyphylla*, row A (based on *J. González-Gallegos & A. Castro-Castro 1026*); *S. pugana*, row B (based on type material *J. González-Gallegos et al. 1245*); and *S. albiterrarum*, row C (based on type material *J. González-Gallegos et al. 1246*). Drawn by Daniel Barba-López.

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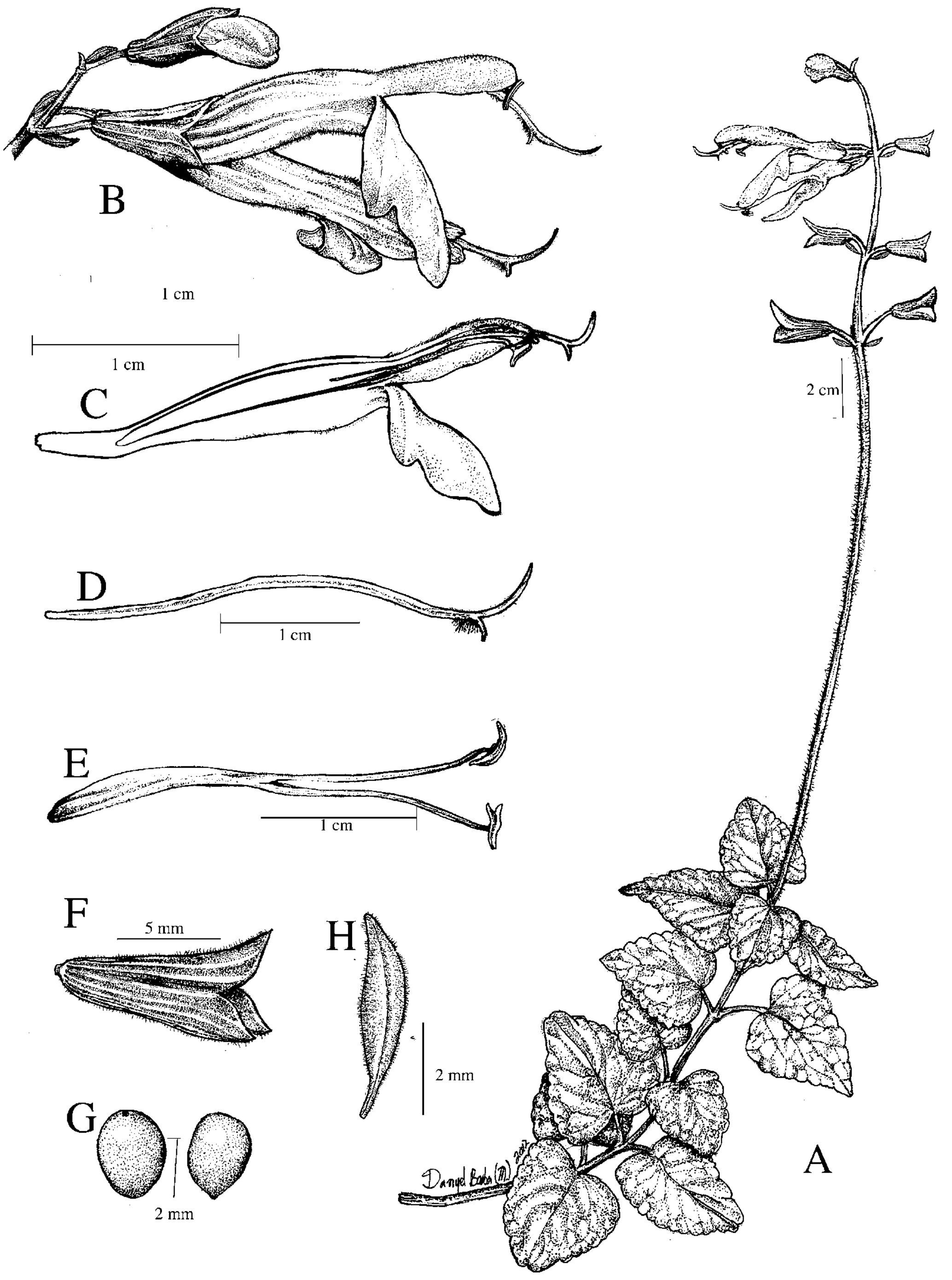

FIGURE 5. *Salvia albiterrarum.* A) general aspect; B) verticillaster detail; C) corolla showing the position of the connectives inside; D) style; E) connectives and thecae; F) calyx; G) nutlets; H) floral bract. (drawn by Daniel Barba-López based on type material *J. González-Gallegos et al. 1246*).

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4.7 González-Gallegos, J. G. y J. A. Vázquez-García. 2013. *Scutellaria cuevasiana* and *Scutellaria sublitoralis* (Lamiaceae), two new species from Jalisco and Nayarit, Mexico*. Revista Mexicana de Biodiversidad* 84: 20-29

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Scutellaria cuevasiana and *Scutellaria sublitoralis* (Lamiaceae), two new species from Jalisco and Nayarit, Mexico

Scutellaria cuevasiana y *Scutellaria sublitoralis* (Lamiaceae), dos especies nuevas de Jalisco y Nayarit, México

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Abstract. *Scutellaria cuevasiana* J. G. González et A. Vázquez and *Scutellaria sublitoralis* J. G. González are described and illustrated. *Scutellaria cuevasiana* fits best within section *Uliginosae* (Epling) Epling. It is morphologically close to *S. blepharophylla* Epling, *S. rosei* Fernald and *S. seleriana* Loes. It differs from them by its magenta corollas, small and sessile floral bracts, longer petioles and bigger leaves. *Scutellaria sublitoralis* does not manifest any clear morphological affinity with species of the sections enumerated by Epling. It could be related to species in sections *Pallidiflorae* Epling or *Uliginosae*, particularly with the "*Scutellaria ovata"* or "*Scutellaria caerulea"* species groups defined by Paton. It is morphologically similar to *S. pallidiflora* Epling; however, it can be recognized by wider leaves with usually cordate to subcordate bases, persistent floral bracts, floral axis and calyces without glandular-capitate hairs, longer corollas, and narrower toward the throat.

Key words: *Scutellaria caerulea* group, *Scutellaria ovata* group, section *Pallidiflorae*, section *Uliginosae*.

Resumen. Se describen e ilustran *Scutellaria cuevasiana* J. G. González et A. Vázquez y *Scutellaria sublitoralis* J. G. González. *Scutellaria cuevasiana* se ajusta mejor a la sección *Uliginosae* (Epling) Epling; es cercana en su morfología a *S. blepharophylla* Epling, *S. rosei* Fernald y *S. seleriana* Loes. Difiere de las mismas debido a sus corolas magenta, brácteas florales más pequeñas y sésiles, peciolos más largos y hojas más grandes. *Scutellaria sublitoralis* no muestra una clara afinidad con las especies de las secciones establecidas por Epling; podría estar relacionada con las especies de las secciones *Pallidiflorae* Epling o *Uliginosae*, particularmente con los grupos de especies de "*Scutellaria ovata*" y "*Scutellaria caerulea*" definidos por Paton. Es morfológicamente similar a *S. pallidiflora* Epling; sin embargo, puede reconocerse por sus hojas más anchas con bases por lo usual cordadas a subcordadas, brácteas florales persistentes, eje floral y cálices sin tricomas capitado-glandulares, corolas más largas, y estrechas hacia el ápice.

Palabras clave: grupo de *Scutellaria caerulea*, grupo de *Scutellaria ovata*, sección *Pallidiflorae*, sección *Uliginosae*.

Introduction

The genus *Scutellaria* includes approximately 360 species, and exhibits a subcosmopolitan distribution: absent or scarcely represented in the arctic, lowland tropical areas, deserts, southern Africa and the Pacific Islands; and present on temperate mountainous areas from the tropics and southern hemisphere, with Central Asia and China as the richest region (Paton, 1990a, 1990b).

The morphology of Mesoamerican species of genus *Scutellaria* was well synthesized by Pool (2006), her thorough descriptions may be also applicable for the Mexican species. In Mexico, *Scutellaria* is represented by 34 to 45 species (Ramamoorthy and Elliott, 1998; Domínguez et al., 2003; Villaseñor, 2004). The Mexican species of *Scutellaria* grow mainly in temperate mountainous areas (Ramamoorthy and Elliott, 1998).

A revision of the Lamiaceae family in the state of Jalisco, western Mexico, as part of the "Flora de Jalisco y Áreas Colindantes" project, brought us to the discovery of 2 forms of the genus *Scutellaria* L. (Lamiaceae), that do not belong to any of the currently recognized taxa. They are described and illustrated here as 2 new species morphologically similar to sections *Pallidiflorae* Epling and *Uliginosae* (Epling) Epling.

Recibido: 18 noviembre 2011; aceptado: 20 septiembre 2012

Descriptions

Scutellaria cuevasiana J. G. González et A. Vázquez sp. nov.
Figure 1.
Type: Villa Purificación, Villas de Cacoma, 19°49'15" N, 104°33'18" W, 1 607 m, 30 Apr 2010 (fl.), *J. L. Rodríguez, J. G. Morales and L. G. Medina 263* (holotype: ZEA; isotypes: IBUG, IEB, MEXU).
Scutellariae selerianae Loes. affinis sed petiolis longioribus (1.5-3.5 cm vs. 0.5-1.3 cm longis), laminis magnioribus (3-9.5 × 2-6 cm vs. 0.5-4.5 × 0.8-1.2 cm), bracteis floralibus sessilibus ob lanceolatis vel ovatis (vs. pedicellatis orbicularibus) et parvioribus (1-2.7(-5) × 0.2-0.8(-2.1) mm vs. 4-6 × 4-6 mm), nuculis sparse spinulosis, non squamosis (vs. tuberculatis; tubercula squamis stellato-peltatis) differt.

Perennial herbs (17-) 30-60 cm tall; erect; roots fasciculate; stems cylindrical or subquadrangular, moderately to densely covered by tiny appressed and retrorse hairs (also present on the floral axis, where occasionally are erect). Petioles (1.5-) 3-3.5 cm long, densely covered with retrorse and erect hairs. Blades variable, lanceolate, ovate-lanceolate to rhomboid, often asymmetric, (3-)5-7.5(-9.2) cm long, (2-)3.5-4.5(-6) cm wide, acute to acuminate at apex, rounded and abrupt and shortly cuneate, or cuneate at base, margin broad and irregularly crenate or sometimes serrate with simple hairs along its border, adaxial surface dark green with some appressed simple hairs, abaxial surface paler with appressed simple hairs only on the veins. Inflorescences in racemes, terminal and lax, 5-6 cm long; flowers alternate or subopposite (sometimes opposite), spirally arranged, nodes 4-6 mm apart at the inflorescence base. Floral bracts lanceolate to ovate, 1-2.7(-5) mm long, 0.2-0.8(-2.1) mm wide, persistent or late deciduous, glabrous or with some tiny hairs, mainly along the margin, rounded to acuminate at apex, truncate at base, margin entire. Pedicels 1.4-2.5 mm long, 3-5.1 mm long in fruit, moderately covered with tiny antrorse hairs. Calyces 2-2.3 mm long, 1.5-2 mm wide at throat (6 mm long, 3.5 mm wide in fruit), pale green, with appressed hairs on the middle vein, the scutellum rib and the base near the pedicel, sparsely covered with tiny translucent glandular dots, the margin of the lips reddish; scutellum 0.3-0.6 mm tall in flower, 3.8-4.5 mm tall in fruit, green with the dorsal margin reddish. Corollas magenta or rarely white; tube 1.9-2.1 cm long, straight or slightly bent basally at 3.7-4 mm, then again straight (1.1-1.2 mm wide), and gradually expanding to 3.2-3.5 mm wide at throat, glabrous inside, sparsely covered with erect tiny hairs outside; upper lip 2.7-3 mm long, lower lip 4-5 mm long, with glandular-capitate hairs along the margin of the lips, mainly on the upper one. Filaments of the upper stamens (3.5-) 4.5-5.2 mm long, filament of the lower stamens 6-6.5 mm long; anthers 1 mm long, white pilose on the slits. Style 2.1-2.2 cm long, glabrous. Nutlets subreniform to piriform, (1-)1.6-1.8 mm long, 1 mm wide, black, surface sparsely spinulose, glabrous.

Taxonomic summary
Distribution, habitat and phenology. Scutellaria cuevasiana is endemic to Jalisco (Fig. 2). It ranges between (1 000-) 1 400-1 800 (-2 090) m. It grows in montane cloud, pine-oak and riparian forests. It shares habitat with *Quercus laeta* Liebm., *Q. resinosa* Liebm., *Clethra rosei* Britton, *C. hartwegii* Benth., *Eugenia culminicola* McVaugh, *Alnus jorullensis* Kunth, *Symplocos novogaliciana* L. M. González, *Magnolia iltisiana* A. Vázquez, *M. pacifica* A. Vázquez, *Cedrela odorata* L., *Ardisia revoluta* Kunth, *Croton wilburi* McVaugh, *Euphorbia* aff. *palmeri* Engelm. ex S. Watson, *Sideroxylon cartilagineum* (Cronquist) T. D. Penn., *Trophis racemosa* (L.) Urb., *Oreopanax peltatus* Linden, *O. echinops* (Cham. et Schltdl.) Decne. et Planch., *Ficus velutina* Humb. et Bonpl. ex Willd., *Fraxinus uhdei* (Wenz.) Lingelsh., *Clusia salvinii* Donn. Sm., *Sipatuna thecaphora* (Poepp. et Endl.) A. DC., *Conostegia* sp., *Parathesis* sp. and *Leucaena* sp. This plant blooms and fructifies from August to middle December.
Etymology. Scutellaria cuevasiana is named in honor of Ramón Cuevas-Guzmán, from the Instituto Manantlán de Ecología y Conservación de la Biodiversidad, Universidad de Guadalajara, Mexico. He has contributed greatly to the exploration and knowledge of the flora of Jalisco, and to the formation of new botanists and ecologists.
Additional material examined. **Mexico.** Jalisco. Autlán de Navarro: Las Joyas, Sierra de Manantlán, 1 800 m, 20 Aug 1982 (fl., fr.), *Pérez 192* (IBUG); camino de Las Mantequillas a la cascada Las Juntas, Las Joyas, 1 600 m, 8 Dec 1985 (fr.), *Vázquez 3766* (ZEA); de Las Galeras a la cascada grande, 1 600-1 650 m, 3 Aug 1986 (fl.), *Cuevas 1442* (MEXU); 12-13 km al S de Autlán, 1 500 m, 24 Jul 1988 (fl.), *Santana and De Niz 3670* (ZEA). Ayutla: Las Iglesias, 2 090 m, 24 Dec 2002 (fr.), *Cuevas et al. 7594* (ZEA). Casimiro Castillo: Sierra de Manantlán Occidental, 2 km E of the microondas tower above puerto Los Mazos, 9 km (by air) NE of Casimiro Castillo, 1 760 m, 16 Dec 1988 (fl., fr.), *Iltis and Santana 30109* (MEXU), *30123* (ZEA); Los Mazos, al W de Autlán, 1 800 m, 10 Sep 1989 (fr.), *Ramírez and González-T. 1570* (IBUG); Los Mazos, Sierra de Manantlán, 9-10 km al SSW de Autlán, 9-10 km al NNE de Casimiro Castillo, 1 750 m, 15 Jul 1992, *Santana et al. 11183* (ZEA); Los Mazos, Sierra de Manantlán, 9-10 km al SSW de Autlán, 9-10 km NNE de Casimiro Castillo, 24 Nov 2008 (fl.,

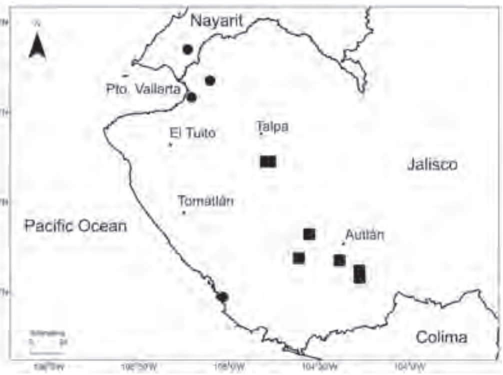

Figure 2. Distribution map of *Scutellaria cuevasiana* J. G. González (squares) and *S. sublitoralis* J. G. González (dots).

fr.), *Sigala et al. 23* (ZEA), *Mendoza 15* (ZEA). Talpa de Allende: km 19 del camino Talpa-La Cuesta, 1 400 m, 17 Nov 1989 (fl., fr.), *Ramírez et al. 1857* (IBUG); brecha Talpa-La Cumbre, 1 400 m, 28 Jul 1990, *R. Ramírez D.2121* (IBUG); brecha de Talpa a La Cuesta, en Paso Hondo, 1 550 m, 15 Oct 1995 (fl., fr.), *Machuca and Cházaro 7517* (IBUG); Talpa-La Cuesta, 20°12'58.5" N, 104°46'27.4" W, 1 426 m, 8 Aug 2009 (fl.), *Quedensely and Arroyo 10160* (CIIDIR).

Remarks. We agree with Pool (2006) and Cuevas (2010) considering the infrageneric classifications proposed by Epling (1939, 1940) and Paton (1990) as unsatisfactory in the circumscriptions of their groups. However, their proposals are still the basis for the study of the genus, until an exhaustive revision and a new natural classification are developed.

Scutellaria cuevasiana J. G. González et A. Vázquez fits within section *Uliginosae* (Epling) Epling, which is equivalent to section *Scutellaria* and "*Scutellaria uliginosa*" species group of Paton (1990), because the magenta corollas (purplish), small (less than 60 cm tall) herbaceous habit, fibrous or fasciculate roots, slightly hirsute leaves on the adaxial surface, and with appressed hairs on the vein of the abaxial one, alternate or subopposite flowers, spirally arranged in terminal racemes (Epling, 1939, 1942; Pool, 1998). However, the corollas are slightly longer than those exhibited by the members of section *Uliginosae*: 2.2-2.4 cm vs. 1.1-1.8 cm long (measurements including the upper lip length).

Scutellaria blepharophylla Epling, *S. rosei* Fernald and *S. seleriana* Loes. are morphologically similar with *S. cuevasiana*. They share similar habit, leaf size and shape, terminal lax inflorescences, generally persistent floral bracts, flowers spirally arranged, corollas with reddish colors (magenta, pale to deep red-purple, rose-purple), except for *S. blepharophylla* which possess dark blue corollas, and overlapping corolla tube length (Table 1). It differs from *S. blepharophylla* in having much longer petioles (15-35 mm vs. 3-4 mm long), shorter floral bracts (1-2.7(-5) mm vs. 7 mm long), shorter pedicels (2-2.4 mm vs. 3-4 mm long), and magenta corollas instead of dark blue ones (Table 1). It is different from *S. rosei* because of its longer petioles (15-35 mm vs. 1-3 mm long), shorter inflorescences (5-6 cm vs. 20-30 cm long), shorter floral bracts (1-2.7(-5) mm vs. 5-8 mm long), shorter pedicels (2-2.4 mm vs. 3-7 mm long), absence of glandular-capitate hairs on the calyces, and smaller lower corolla lip (4-5 mm vs. 9-10 mm long) (Table 1). Finally, it differs from *S. seleriana* in having longer petioles (15-35 mm vs. 5-13 mm long), larger leaves (3-9.5 cm long and 2-6 cm wide vs. 0.5-4.5 long and 0.8-1.2 cm wide), floral bracts lanceolate to ovate vs. orbicular, sessile vs. pedicellate, and smaller (1-2.7(-5) mm long and 0.2-0.8(-2.1) mm wide vs. 4-6 mm long and 4-6 mm wide), and nutlets sparsely spinulose without scales vs. tuberculate with stellate-peltate scales (Table 1).

It should be noticed that the specimen *Cuevas 1442* (MEXU) includes both *Scutellaria dumetorum* Schltdl., and *S. cuevasiana* in the same sheet. The first one can be easily distinguished by means of its flowers disposed in the axils of the leaves rather than in terminal racemes. On the other hand, Iltis and Santana collected 2 specimens of *S. cuevasiana* with the numbers *30109* and *30123*, and they wrote on the labels that one plant had purple corollas and the other white ones; apart from this, there are not more differences between the specimens, indicating that this species can have magenta corollas and less frequently white ones (this can be partially observed in the holotype and isotypes, because dried flowers have 2 different colors).

Scutellaria sublitoralis J. G. González sp. nov.
Figure 3.

Type: **Mexico.** Jalisco. Puerto Vallarta, 3.5 km al SE por la brecha de Puerto Vallarta a Cuale a partir del puente del Remance, 500-700 m al SE del arco del ejido Jorullo, junto a una cascada que vierte en el río Cuale, 20°34'53.8" N, 105°12'28.4" W, 92 m, 24 Oct 2010 (fl., fr.), *J. G. González-Gallegos 754* (holotype: IBUG; isotype: MEXU).

Species habitus *Scutellariae pallidiflorae* Epling optima congruens, sed laminis latioribus (3.5-6 cm vs. 3-3.5 cm longis), bracteis floralibus lanceolatis persistentibus (vs. linearibus deciduis), axe inflorescentiae et calycibus sine pilis glanduliferis, tubis corollarum angustis at apicem (vs. ampliatis at apicem), intus nudis (vs. intus annulis pilorum ornatis) differt.

Table 1. Character comparison between *Scutellaria cuevasiana* J. G. González et A. Vázquez and its most morphologically similar species

Character	*S. cuevasiana*	*S. blepharophylla*	*S. rosei*	*S. seleriana*
Habitat	Perennial herb, erect	Perennial herb, erect	Perennial herb, erect	Perennial herb, erect
Height (cm)	(17-)30-60	25-35	60-70	10-50
Leaves				
Petiole length (mm)	(15-)30-35	3-4	1-3	5-13
Blade shape	Lanceolate, ovate-lanceolate to rhomboid	Widely ovate	Ovate	Widely ovate
Blade size (cm)	(3-)5-7.5(-9.2) × (2-)3.5-4.5(-6)	3-4.2 × 3.1-3.3	(3.5-)4-6 × (2.8-)3-4	(0.5-)1.2-1.8(4.5) × 0.8-1.2
Base of the blade	Rounded and abrupt and shortly cuneate	Rounded	Rounded to subtruncate	Widely cuneate to subtruncate
Apex of the blade	Acute to acuminate	Obtuse to acute	Acuminate	Obtuse to acute
Margin	Broad and irregularly crenate or sometimes serrulate	Sinuate-dentate	Crenate to dentate	Crenate to subentire
Inflorescence				
Length (cm)	5-6	3-8(-15)	20-30	2-5 (sometimes the flowers in the axils of the uppermost leaves)
Floral bract				
Shape	Lanceolate to ovate	Lanceolate	Lanceolate	Orbicular
Size (mm)	1-2.7(-5) × 0.2-0.8(-2.1)	7 × 3	5-8 × 2.5-4	4-6 × 4-6
Apex	Rounded to acuminate	Acuminate to acute	Acuminate to acute	Rounded
Base	Truncate	Cuneate	Truncate	Rounded to slightly cuneate
Duration	Persistent to late deciduous	Persistent	Persistent	Persistent
Pedicels				
Length in flower (mm)	1.4-2.5	3-4	3-7	3-4
Calyces				
Size (mm)	2-2.3 × 1.5-2	3-4 × 2.5-3	3-5 × 4-5	1.5-2 × 2.5-3
Pubescence	Sparsely covered with appressed eglandular hairs	Glabrous to glabrescent	Glandular-capitate	Densely covered with appressed simple hairs
Corolla				
Color	Magenta	Dark blue	Rose-purple to red-purple	Pale to deep red-purple
Tube size (mm)	19-21	17-19	19-25	(10-)12-15(-18)
Upper lip length (mm)	2.7-3	3-4	6-7	2
Lower lip length (mm)	4-5	6-7	9-10	3.5
Nutlets				
Shape	Subreniform to piriform	Not seen	Not seen	Ovoid
Surface	Sparsely spinulose	Not seen	Not seen	Tuberculate with stellate-peltate scales

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Table 1. Continues

Character	*S. cuevasiana*	*S. blepharophylla*	*S. rosei*	*S. seleriana*
Length (mm)	(1-)1.6-1.8	Not seen	Not seen	1.25-1.75
Habitat	Montane cloud, pine-oak and riparian forests	Grasslands	Unknown	Montane cloud forests
Phenology	Blooms and fructifies from August to middle December	Blooms and fructifies in July	Blooms and fructifies in July	Blooms and fructifies from July to December
Distribution	Mexico: Jalisco	Mexico: Guerrero, Estado de México, and Michoacán	Mexico: Sinaloa	Guatemala: Huehuetenango, Petén, Quiché. Mexico: Chiapas, Veracruz, Puebla, Oaxaca, San Luis Potosí

Perennial herb 20-50 cm tall; erect, roots thin and fasciculate; stem cylindrical to quadrangular, moderately to densely covered with tiny appressed and retrorse hairs, these hairs are present also on the floral axis. Petioles 2.5-4 cm long, covered with appressed and retrorse hairs. Blades ovate, slightly asymmetric, (4-) 5-6.5 cm long, (3.5-) 4-6 cm wide, acute at apex, cordate to subcordate or truncate at base, margin irregularly and sparsely crenate or undulated, adaxial surface dark green, abaxial surface slightly paler, both surfaces glabrous or with some patent hairs along the margin. Inflorescences in racemes, terminal and lax, 6-15 cm long, flowers alternate to opposite, spirally arranged, nodes 7-12 mm apart from each other. Floral bracts linear, 1.5-2.7 mm long, 0.1-0.2 mm wide, persistent, with tiny erect hairs concentrated at base and along the margin, acuminate at apex, truncate at base, margin entire. Pedicels 2-3 mm long, 3.5-4 mm in fruit, covered with tiny retrorse hairs. Calyces (2-) 2.7-3.2 mm long, 1.4-1.7 mm wide at apex (3.5 mm long, 2.2 mm wide in fruit), green, margin of the lips with a fine purple line invisible to the naked eye, sparsely covered with erect tiny hairs, those concentrated at base and the margin of the lips, scutellum 1 mm tall and wide in flower, 1.5-2 mm tall and 3 mm long in fruit, green with the dorsal margin bordered with a narrow purple line. Corollas white; tube (1.3-) 1.4-2 cm long, slightly bent at 3.5-5 mm long, then straight and consistently narrow (1.1-1.2 mm wide) for 4.7-6 mm long, and gradually expanding to 3-3.3 mm wide at throat, glabrous inside, with sparse glandular-capitate and glandular simple hairs outside; upper lip 3-4 mm long, lower lip 5-6 mm long, tiny glandular-capitate hairs along the margin of the lips. Filaments of the upper stamens 3-4 mm long, filaments of the lower stamens 5.5-6.5 mm long; anther 0.3-1 mm long, white pilose on the slits. Styles 1.4-2.4 cm long, glabrous. Nutlets orbicular to subreniform, 1.5 mm long, 1.2-1.5 mm wide, black, the surface densely tuberculate (tubercules truncate at the apex), glabrous, covered with bright and tiny glandular dots.

Taxonomic summary

Distribution, habitat and phenology. Scutellaria sublitoralis grows in tropical subdeciduous forests, in wet and shady ravines, near the coasts of Jalisco and Nayarit (figure 2). It grows in a narrow altitudinal range, from 50-125 m, together with *Hura polyandra* Baill., *Brosimum alicastrum* Sw., *Ficus insipida* Willd., *Euphorbia mexiae* Standl., *Begonia plebeja* Liebm., *Achimenes* sp. Collected in flower and fruit from August to late November.

Etymology. The name of *S. sublitoralis* remarks its subcoastal distribution, always growing under 150 m and above 50 m altitude.

Additional material examined. **Mexico.** Jalisco. La Huerta: arroyo Maderas, 22 Aug 1985 (fl.), *Solís 4410* (MEXU); 500 m sobre el arroyo Tepeixtles, km 55.5 de la carretera Barra de Navidad-Puerto Vallarta, 3 km al SE de la entrada de la Estación de Biología Chamela, UNAM, 70 m, 12 Sep 1997 (fl.), *Téllez et al. 13244* (MEXU), *Téllez and Domínguez 13228* (MEXU). Puerto Vallarta: La Palapa (Las Peñas), 20°40’30” N, 105°6’20” W, 125 m, 21 Feb 1993 (fr.), *Castillo et al. 9968* (XAL). Nayarit. Bahía de Banderas: faldas de la sierra de Vallejo, entre Valle de Banderas y San Juan de Abajo, 20°50’53” N, 105°13’45” W, 55 m, 25 Nov 1997 (fl.), *Ramírez et al. 4642* (IBUG).

Remarks. Scutellaria sublitoralis is morphologically similar to *Salvia pallidiflora* Epling in sect. *Pallidiflorae* Epling. It shares with these, perennial herbaceous habit, fasciculate roots, ovate or elliptic petiolate blades, flowers arranged in short racemes, pale or essentially

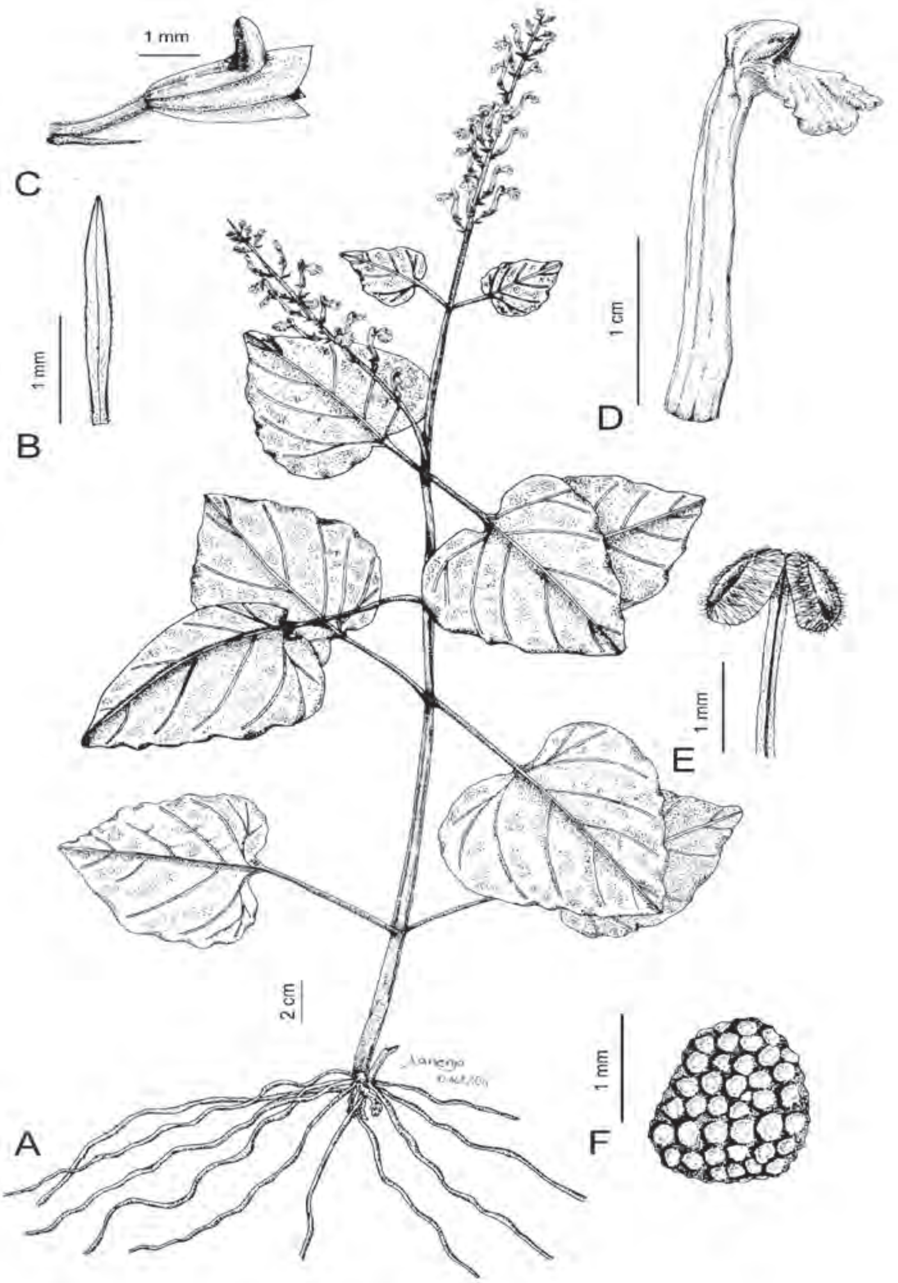

Figure 3. *Scutellaria sublitoralis* J. G. González. A, general appearance; B, floral bract, dorsal view; C, calyx with a fragment of the petiole and floral bract; D, corolla; E, anther; F, nutlet (A-F based on *J. G. González-Gallegos 754*; drawn by J. G. González-Gallegos).

white corollas, and narrow tube. However, it shows some small discrepancies: the bracts are persistent instead of mostly deciduous, and the tube is not internally pilose. Furthermore, *S. sublitoralis* can be distinguished by its wider leaves (3.5-6 cm vs. 3-3.7 cm wide), generally cordate at base vs. rounded, calyx and floral axis without glandular-capitate hairs, pedicel as long as calyx in flower (vs. twice or more in length than the calyx in flower), and white corolla.

There is also an abrupt difference between the habitat preference of *S. pallidiflora* and *S. sublitoralis*. The first one is known exclusively by the type specimen (*Rose 2487*, seen in a natural sized photograph), where the locality is written as "near Huejuquilla". McVaugh (1972) adds more information to the locality data of this

Table 2. Character comparison between *Scutellaria sublitoralis* J. G. González and *S. pallidiflora* Epling

Character	*S. sublitoralis*	*S. pallidiflora*	*S. vitifolia*
Habitat	Perennial herb, erect	Perennial herb, erect	Perennial herb, erect
Leaves			
Petiole length (cm)	2.5-4	1.5-2.5	2-7
Blade shape	Ovate	Ovate	Ovate to deltoid
Blade size (cm)	(4-)5-6.5 × (3.5)4-6	5-5.5 × 3-3.7	2.5-12 × 2-10
Base of the blade	Cordate to subcordate to truncate	Rounded	Cordate to subcordate
Apex of the blade	Acute	Obtuse	Acute to acuminate
Margin	Irregular and sparsely crenate to undulated	Subentire	Crenulate
Inflorescence			
Length (cm)	6-15	5-9	2-7
Floral bract			
Shape	Linear	Ovate	Narrow elliptic
Size (mm)	1.5-2.7 × 0.1-0.2	1.5-2 × 0.5	6-8 × 2-3
Apex	Acuminate	Acuminate	Acute
Base	Truncate	Truncate	Truncate
Duration	Persistent	Deciduous	Persistent
Pedicels			
Length (mm)	2-3	3-4	5-8
Calyces			
Size (mm)	(2-)2.7-3.2 × 1.4-1.7	2-3 × 2-3	7-10 × 5-7
Pubescence	Sparsely covered with erect tiny hairs	Covered with glandular-capitate hairs	Sparsely covered with erect hairs
Corolla			
Color	White	White	Blue to rarely purple
Tube size (mm)	(13-)14-20	13-16	15-17
Upper lip length (mm)	3-4	4-5	5-8
Lower lip length (mm)	5-6	6-7	12-13
Nutlets			
Shape	Orbicular to subreniform	Not seen	Not seen
Surface	Tuberculate	Not seen	Not seen
Size (mm)	1.5 ×1.2-1.5	Not seen	Not seen
Altitudinal range (m)	50-125	1000-1700	60-2 100

Table 2. Continues

Character	*S. sublitoralis*	*S. pallidiflora*	*S. vitifolia*
Habitat	Tropical subdeciduous forests	Pine-oak forests	Montane cloud or pine-oak forests
Phenology	Blooms and fructifies from August to late November	Blooms and fructifies in August	Blooms and fructifies from July to September
Distribution	Mexico: coast of Jalisco and southwestern Nayarit	Mexico: Jalisco	Mexico: Chiapas; Guatemala: Quetzaltenango

collection: between San Juan Capsitrano (Zacatecas) and Huejuquilla (Jalisco). In this area, according to Vázquez et al. (2004), there are several patches mainly composed of pine-oak and tropical deciduous forests, crassicaule bush and Chihuahuan desert, in an altitudinal range from 1 000-1 700 m. In contrast, *S. sublitoralis* grows in tropical subdeciduous forest under 150 m altitude. This kind of habitat is remarkably unusual among the Mexican *Scutellaria*, most of which occupy temperate mountainous areas above 1 500 m altitude.

Scutellaria vitifolia Brandegee also shares some characters with *S. sublitoralis*. The habit and height, petiole length, blade shape and size, apex and base of the blade, inflorescence length, tube and upper lip length. However, *S. sublitoralis* can be distinguished by stems and calyces without glandular-capitate hairs, white corolla (vs. blue to rarely purple), corolla tube internally glabrous (vs. pubescent internally in the central middle portion), nutlets ornate with tubercules truncate at the apex (vs. nutlets with tubercules ornate with stellate-peltate scales at apex) (Table 2). Moreover, *S. sublitoralis* is exclusive of Jalisco and Nayarit lowlands from 50-125 m altitude; while, *S. vitifolia* is known from Chiapas (Mexico) and adjacent areas of Guatemala, and it grows in a wider altitudinal range, from 60 to 2 100 m altitude (Table 2).

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Salvia carreyesii, *Salvia ibugana* and *Salvia ramirezii* (Lamiaceae), three new species from Jalisco, Mexico

Salvia carreyesii, *Salvia ibugana* y *Salvia ramirezii* (Lamiaceae), tres nuevas especies de Jalisco, México

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Abstract. Three new species from Jalisco, Mexico, are described and illustrated. These species grow in tropical or in tropical and temperate transitional forests. The 3 species belong to *Salvia* L. subgenus *Calosphace* (Benth.) Benth. *Salvia carreyesii* J. G. González is morphologically similar with section *Briquetia* Epling. It is characterized by the contrasting vegetative morphology between mature and immature individuals, its relatively large and sessile or sub-sessile leaves (the uppermost amplexicaul), glandular-capitate hairs on the floral axis and calyx, and dark violet corollas. The characters of *Salvia ibugana* J. G. González correspond to those of the species of section *Angulatae* (Epling) Epling, within which *S. ibugana* is distinguished by the digitiform papillae disperse on its stems, petioles and floral axis. *Salvia ramirezii* J. G. González fits well within section *Sigmoideae* Epling by means of the sigmoid shape of the lower branch of its style. It is morphologically similar to *Salvia crucis* and *S. quercetorum*, from which it can be distinguished by the triangular, slightly succulent, shorter, glabrous, lustrous leaves.

Key words: digitiform papillae, endemic, Jalisco, section *Angulatae*, section *Briquetia*, section *Sigmoideae*, *Salvia* subgenus *Calosphace*.

Resumen. Se describen e ilustran 3 especies nuevas de Jalisco, México. Estas especies crecen en bosques tropicales o en bosques transicionales entre tropicales y templados. Las 3 especies pertenecen a *Salvia* L. subgénero *Calosphace* (Benth.) Benth. *Salvia carreyesii* J. G. González es morfológicamente similar a la sección *Briquetia* Epling. Se caracteriza por la morfología vegetativa contrastante entre individuos maduros e inmaduros, sus hojas relativamente grandes, sésiles o subsésiles (las superiores amplexicaules), tricomas capitado-glandulares sobre el eje floral y el cáliz, y corolas violeta oscuro. Las características de *Salvia ibugana* J. G. González corresponden a aquellas de las especies de la sección *Angulatae* (Epling) Epling, dentro de la que *S. ibugana* se distingue por las papilas digitiformes que presenta en el tallo, peciolo y eje floral. *Salvia ramirezii* J. G. González se ubica bien dentro de la sección *Sigmoideae* Epling debido a la forma sigmoide de la rama inferior del estilo. Es morfológicamente similar a *Salvia crucis* Epling y *S. quercetorum* Epling, de las que se distingue principalmente por las hojas triangulares, ligeramente suculentas, más cortas, glabras y lustrosas.

Palabras clave: papilas digitiformes, endémico, Jalisco, sección *Angulatae*, sección *Briquetia*, sección *Sigmoideae*, *Salvia* subgénero *Calosphace*.

Introduction

A revision of the Lamiaceae family in the state of Jalisco (western Mexico) as part of the project "Flora de Jalisco y Áreas Colindantes", allowed us to uncover 3 distinct populations of *Salvia* that were not referable to any of the previously described species in the genus. We therefore describe 3 new species, one related to section *Briquetia* Epling, and the others belonging to sections *Angulatae* (Epling) Epling and *Sigmoideae* Epling, respectively, according to the classification proposed by Epling and coworkers (Epling, 1940, 1941, 1944, 1947, 1951; Epling and Mathias, 1957; Epling, 1960; Epling and Játiva, 1963, 1966, 1968).

Specimens of the new species were collected and recorded their morphological variability, distribution and habitat requirements. From January to March 2011, some individuals of each species were dug up and cultivated

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at the botanical garden of the Instituto de Botánica, Universidad de Guadalajara, Zapopan, Jalisco.

Descriptions

Salvia carreyesii J. G. González sp. nov. Type: **Mexico.** Jalisco. Municipio de Puerto Vallarta: La Laja stream, 0.75 km WNW of Las Mesas, 20º30'39" N, 105º6'28" W, 1 100 m, 11 Nov 2009 (fl.), *P. Carrillo R.*, *D. Cabrera T. and C. Gallardo 5842* (holotype: IBUG; isotype: IEB). Fig 1.

Salviae sectione *Briquetiae* aemulans, sed corollarum labio inferior quam superior longior; *S. mexicanae* affinis sed habitu prostrato, petiolis 0-3.5 mm (vs 1-10 cm) longis, foliis juvenilibus dense albo-tomentosis, pedicellis 3-4 mm (vs 3-20 mm) longis et glandulosis, calycibus 8-9 mm (vs 8-20 mm) longis et glandulosis, corollis atroviolaceis (vs atrocaeruleis), filis 2-3 mm (vs. 4-7 mm) longis, connectivis 7-8 mm (vs. 8-30 mm) longis, thecis 2-2.2 mm (vs. 3.6-5 mm) longis, stylis 2-2.2 mm (2.8-4 mm) longis notabilis.

Perennial herbs, erect when young and gradually inclined till reach a prostrate habit which roots a the nodes, 30-80 cm long, stem sparsely puberulent to glabrous in mature individuals (puberulent to densely hirsute with white or often yellow hairs in immature ones), internodes 6-12 cm long. Petioles 0-3.5 mm long (the uppermost leaves always sessile), usually glabrous or sometimes puberulent. Leaf blades ovate to broadly oblong-lanceolate, (6-)11-18cm × (3-)6-8.5 cm, green, acuminate at the apex, rounded, slightly cordate or sometimes oblique at the base (the uppermost leaves occasionally amplexicaul), the margin serrate, both surfaces essentially glabrous or sparsely puberulent, and smooth (in immature individuals the leaves are densely covered with erect yellow or white hairs in the adaxial surface, and bullate, the abaxial surface densely covered with whitish-silver appressed hairs). Inflorescences arranged in terminal racemes, (2-)4.5-10.5 cm long, with 4-9 verticillasters, each verticillaster 6 to 12-flowered, floral axis with erect simple hairs and sparsely shorter glandular capitate ones. Floral bracts deciduous, ovate, (6-)11-18 × (3-)6-8.5 mm, green, glabrous except at the margin which is short and sparsely ciliated, acuminate to cuspidate at the apex, truncate at the base, the margin entire. Pedicels 3-4 mm long, hirtellous and with tiny glandular capitate hairs. Calyces 8-9 × 5-6 mm, not accrescent, green, hirtellous and with glandular capitate hairs on the veins, sparsely covered with conical tiny hairs at the inner surface, upper lip 3-veined, lips equal in length and acute. Corollas dark violet with white nectar guides on the lower lip at the throat, sparsely pilose in the upper lip and in the abaxial surface of the lower one, tube 1.7-1.8 × 4-5 mm, ventricose, not invaginated, internally naked; upper lip 5-6 mm long, lower one 5-8 × 6 mm. Stamens included; filaments 2-3 mm long; connective 7-8 mm long, not geniculate, not evidently dentate; theca 1-2 mm long; staminodes present, represented by a tiny papilla above and behind the insertion point of each filament to corolla tube. Gynobasic horn 1-1.2 mm long; styles 2-2.2 cm long, slightly sigmoid (the curves follow the shape of the corolla), sparsely pilose at the apex, lower branch acute. Nutlets ovoid, 1.5-1.8 × 1-1.3 mm, pale brown marbled with dark brown stains, glabrous and smooth.

Taxonomic summary

Distribution, habitat and phenology. Salvia carreyesii is only known from the dirt road between Puerto Vallarta and El Cuale, near to El Nogalito stream, Jalisco, Mexico (Fig. 2). It inhabits in ecotones between tropical subdeciduous and oak forests from 980 to 1 100 m, generally near to perennial watercourses. It shares habitat with *Ardisia compressa* Kunth, *Cecropia obtusifolia* Bertol., *Croton suberosus* Kunth, *Hedyosmum mexicanum* C. Cordem., *Myrica cerifera* (L.) Small, *Podocarpus reichei* J. Buchholz et N. E. Gray, and *Euphorbia peritropoides* (Millsp.) V. W. Steinm. *Salvia carreyesii* probably blooms and sets fruits from September to early December.

Etymology. The specific epithet of this plant is a fusion of surnames that honors the first collector: Pablo Carrillo Reyes, long distance runner and photographer by hobby, and botanist by profession, as describes himself; but above all, he is a good friend and an enthusiastic botanist.

Additional material examined. **Mexico.** Jalisco. Municipio de Puerto Vallarta: Las Lajitas stream, south of Las Mesas, dirt road form Puerto Vallarta to El Cuale, 20°30'36.3" N, 105°6'29.7" W, 1 049 m, 30 Dec 2010 (ster.), *González et al. 798* (IBUG); by a stream on dirt road Puerto Vallarta to El Cuale, ahead of El Nogalito stream, 22 km from El Remance bridge, 20°31'42.84" N, 105°5'51.32" W, 980 m, 12 Feb 2011 (ster.), *González et al. 871* (IBUG).

Remarks. Salvia carreyesii is not clearly related to any of the sections defined by Epling and co-workers (Epling, 1940, 1941, 1944, 1947, 1951; Epling and Mathias, 1957; Epling, 1960; Epling and Játiva, 1963, 1966, 1968). However, most of the characters exhibited by *S. carreyesii* are shared by the species included in section *Briquetia* Epling. This section is characterized by wide leaves, rounded to attenuated, sometimes truncate or cordate at the base, lips of the calyces subequal in length, 3-veined upper lips, dark blue corollas, ventricose and mostly invaginated tubes, internally naked, upper corolla lip longer than the lower one, stamens included, connectives with a small ventral tooth or subentire, pilose styles, upper branch of the style longer than the lower one. Nevertheless, there is only one divergent character; the upper lip of the corolla is equal or shorter than the lower one in *S. carreyesii*.

Salvia carreyesii is distinctive by the 2 striking different vegetative morphologies between mature and immature plants. Young individuals are erect, possess puberulent to densely hirsute stems, leaves bullate and densely covered with yellow or white hairs above and whitish appressed hairs below. Mature (flowering) individuals are declined and tend to be prostrate, lack of hairs, and the leaves are smooth. Other characters that help to distinguish *S. carreyesii* are the relatively large and sessile or subsessile leaves (the uppermost amplexicaul), glandular-capitate hairs on the floral axis and calyces, and dark violet corollas. The unique member of section *Briquetia* growing in Jalisco is *S. mexicana* L., which can be distinguished by longer petioles, cuneate to attenuated leaf base, longer floral structures (pedicel, calyx, corolla (the tube and upper lip length), corolla lips, filament, connective, theca and style), and the absence of glandular capitate hairs in pedicel and calyx (Table 1). Furthermore, *S. carreyesii* has a tendency to grow in more tropical forests and warmer lowlands than *S. mexicana.*

Key for *Salvia mexicana* and *S. carreyesii*

1a. Base of the leaf blades cuneate or long attenuated, petioles 1-10 cm long; pedicels 3-20 mm long, moderate to densely covered with eglandular hairs; calyces sparse to densely covered with eglandular hairs; corolla upper lip 13-14(-19) mm long, lower one 12-17 mm long; filaments 4-7 mm long, connectives 8-30 mm long, thecae 2.8-4 mm long; style 3.6-5 cm long..*S. mexicana*
1b. Base of the leaf blades rounded, slightly cordate or sometimes oblique, petioles 0-0.35 cm long; pedicel 3-4 mm long, covered with glandular capitate hairs; calyces covered with glandular capitate hairs; corolla upper lip 5-6 mm long, lower one 5-8 mm long; filaments 2-3 mm long, connective 7-8 mm long, thecae 1-2 mm long; style 2-2.2 cm long................ ....*S. carreyesii*

Table 1. Character comparison between *Salvia mexicana* and *S carreyesii*

Characters	*S. mexicana*	*S. carreyesii*
Leaves		
Petiole length (cm)	1-10	0-0.35
Leaf blade shape	Ovate to ovate-elliptic	Ovate to oblong-lanceolate
Leaf blade size (cm)	6-18(-20) × 2.5-12	(6-)11-18 × (3-)6-8.5
Apex shape	Acute or acuminate	Acuminate
Base shape	Cuneate to attenuated (rarely subcoradate)	Rounded, slightly cordate or sometimes oblique
Inflorescence		
Flowers per verticillaster	10 to 12	6 to 12
Floral bract		
Shape	Ovate	Ovate
Size mm	6-12 (-20) × 3-5	(6-)11-18 × (3-)6-8.5
Pedicel		
Length (mm)	3-20	3-4
Glandular capitates hairs	Absent	Present
Calyx		
Length (mm)	8-17(-20)	8-9
Glandular capitates hairs	Absent	Present
Corolla		
Color	Dark blue	Dark violet
Tube length (mm)	15-25	17-18
Upper corolla lip length (mm)	13-14(-19)	5-6

Table 1. Continues

Characters	*S. mexicana*	*S. carreyesii*
Lower corolla lip length (mm)	12-17	5-8
Androecium		
Filament length (mm)	4-7	2-3
Connective length (mm)	8-30	7-8
Theca length (mm)	2.8-4	1-2
Gynoecium		
Style (cm)	3.6-5	2-2.2
Vegetation	Pine, pine-oak, oak, montane cloud, and tropical deciduous forests	Ecotones between tropical subdeciduous and oak forests
Geographical range	Mexican Pacific slope from Durango, Zacatecas and San Luis Potosí to Oaxaca and Puebla	Jalisco
Altitudinal range (m)	(800-)1 000-2 900	900-1 100

Salvia ibugana J. G. González sp. nov. Type: **Mexico.** Jalisco. Municipio de Cabo Corrientes: road from Refugio de Suchitán to El Chimo, 20°26’52.49” N, 105°35’11.4” W, 605 m, 13 Mar 2011 (fl., fr.), *J. G. González, J. A. Vázquez and E. De Castro. 939* (holotype: IBUG; isotypes: IEB, MEXU, ZEA, ENCB). Fig. 3.

Salviae sectione *Angulatae* adscribenda, species insignis caulibus, petiolis et axibus inflorescentiarum suis papillatis distincta (papillae habitum lichenis viridis leniter referentia), a speciebus nobis notis bene.

Perennial herb or subshrub, erect, 1.5-2 m tall, stems sparsely puberulent, profusely ornate with digitiform or lichenoid papillae, 1-2 mm long (such papillae also present on petioles and in lesser extent on floral axis). Petioles (1-)4-6(-8.5) cm long, puberulent and sparsely covered with appressed hairs. Leaf blades ovate, 6-12(-15.5) × 4-7(-10.5) cm, green, acuminate at the apex, slightly truncate or rounded and then abruptly cuneate at the base, the margin serrate (entire near the base), both surfaces glabrous except for the primary and secondary veins which are covered with tiny appressed hairs, abaxial surface densely covered with glandular dots. Inflorescences arranged in terminal and subterminal racemes, (5-)10-18(-30) cm long, with 18-35 verticillasters, 0.7-1.5 cm apart towards the base, each verticillaster 10 to 18-flowered. Floral bracts deciduous, ovate, (1-)1.3-1.5(-2.4) × 1-1.7 mm, green, puberulent, attenuated at the apex, truncate at the base, margin entire, venation not obvious. Linear bracteoles present at the base of each pedicel, 1-2 mm long. Pedicels 1.5-3.1 mm long, covered with short conical hairs. Calyces 3.1-3.8(-5)× (1.7-)2.3-2.5 mm, slightly accrescent, reaching up to 5.2 × 3.3 mm during fructification, green and bluish towards the apex, puberulent or hispidullous mainly on the veins and internally glabrous, the upper lip 3-veined, lips equal in length, the upper lip and the lobes of the lower one acute. Corolla sky blue with white nectar guides on the lower lip and paler tube towards its base, essentially glabrous except the upper lip which is moderately to densely pilose; tubes 5-5.5 × 2 mm, ventricose and invaginated, internally naked at the base; upper lip 4-4.5 mm long, lower one 4-5.6 × 4-5 mm. Stamens included; filaments 1.4-1.5 mm long; connectives 4.5-5.5 mm long, with a triangular retrorse tooth at its middle portion; thecae 1-1.3 mm long; staminodes present above and behind the insertion point of each filament to the corolla tube. Gynobasic horn 1-1.1 mm long, obtuse at the apex; styles 7-9 mm long, pilose towards the apex, slightly exerted (only the branches). Nutlets ovoid, 1.2-1.3 × 0.7-1 mm, pale ocher, concolor, sometimes pilose when immature, with the hairs concentrated towards the junction with the gynophore, smooth and sparsely covered with dark amber and black glandular dots.

Taxonomic summary

Distribution, habitat and phenology. Salvia ibugana is endemic to Jalisco, Mexico (Fig. 2). It grows in tropical subdeciduous forest or secondary palm grove, from 550 to 600 m. It shares habitat with *Begonia jaliscana* Burt-Utley, *Brosimum alicastrum* Sw., *Calophyllum brasiliense* Cambess., *Cecropia obtusifolia*, *Clusia salvinii* Donn. Sm., *Cryosophila nana* (Kunth) Blume, *Dalechampia scandens* L., *Hura polyandra* Baill., *Ipomoea neei* (Spreng.) O’Donell, *Orbignya guacuyule* (Liebm. ex Mart.) Hern.-Xol., *Oreopanax peltatus* Linden, *Piper hispidum* Kunth, *Ardisia* sp., *Miconia* sp., *Peperomia* sp., *Russelia* sp. and *Bursera* spp. This species blooms and fructifies from middle February to March.

Etymology. *Salvia ibugana* is named after the acronym of Herbario *Luz María Villarreal de Puga* del Instituto de Botánica (IBUG), Universidad de Guadalajara, Mexico. This Institution has been conducive to the formation of new botanists and to increase the knowledge and documentation of the flora of western Mexico.

Additional material examined. **Mexico.** Jalisco. Municipio de Cabo Corrientes: road down from La Pitarilla, between Guázima and Agua Caliente, 20º27'10" N, 105º34'30" W, 550 m, 2 Mar 1993 (fl.), *Castillo et al. 10630* (XAL); road Refugio de Suchitán-Chimo, 20º27'2.8" N, 105º35'24.2" W, 560-600 m, 19 Feb 1998 (fr.), *Ramírez et al. 5076* (IBUG). Municipio de Puerto Vallarta: Las Guacas, 600 m, 22 Feb 1998 (fl.), *Ramírez et al. 5239* (IBUG); Las Guacas (San Sebastián del Oeste), 5 Mar 2000, *Villarreal 17782* (IBUG-2 sheets).

Remarks. *Salvia ibugana* is well enclosed into the definition of section *Angulatae* (Epling) Epling. However, it is worth to highlight that this section is one of the richest and most complicated defined by Epling within the subgenus *Calosphace* (1939, 1940, 1941, 1963). He included 48 species, most of them difficult to delineate and several probably will prove to be conspecific. The characters shared by these species, which define the section, are: ovate, elliptic or sometimes deltoid-ovate leaves, cuneate to long attenuated at base or sometimes rounded and abruptly and shortly cuneate, 3-veined upper lip of the calyx, white or sky blue corolla, ventricose tube, internally naked, lower corolla lip longer than the upper one, stamens included, connective with a retrorse tooth in the middle, pubescent or rarely glabrous style. A relevant factor that is hard to deal with is the relatively broad geographical range of this group. They spread from northern Mexico to northern Argentina through the Andean Mountain Range, and southern Brazil. This can partially explain the absence of a recent taxonomic treatment particularly for this section. Fortunately, *S. ibugana* is strikingly different in having the digitiform or lichenoid papillae throughout its stems, petioles and floral axis, and bracteoles present together with the typical floral bracts. These characters clearly differentiate it from its closest similar species, *S. longispicata* M. Martens and Galeotti and *S. roscida* Fernald (Table 2). The green papillae that characterize this species are unique in the genus.

The habit and general aspect of this new taxon resemble those of what we consider as the *S. roscida* complex, which includes the formerly valid species *S. fallax* Fernald, *S. muscidiflora* Fernald, *S. remissa* Epling, and *S. roscida.* In the local area this complex occupies mainly temperate habitats like pine-oak, oak and cloud montane forests. It is highly probable that *S. ibugana* has diverged from the core of this complex by means of the pressure of warmer and wetter environments.

Salvia ibugana was collected near *S. ramirezii* at Las Guacas zone in Puerto Vallarta Municipality by *R. Ramírez Delgadillo et al. 5239* (Feb. 1998). However, we could not find any of them in such locality during 2 different expeditions (22 Oct 2010 and 11 Feb 2011). No other sage has been observed growing together with *S. ibugana.*

Key for *Salvia ibugana* and morphologically similar taxa

1a. Papillae digitiform or lichenoid present in the stems, petioles and floral axis; floral bract always deciduous and bracteoles present; calyces 3.1-3.8(-5) mm long; corolla tubes 5-5.5 mm long...*S. ibugana*
1b. Papillae absent throughout the plant surface; floral bracts deciduous or persistent and bracteoles absent; calyces 4-7(-9) mm long; corolla tubes 6-9.7 mm long
2a. Verticillasters 10 to 24-flowered; floral bracts generally deciduous..*S. longispicata*
2b. Verticillasters 4 to 12-flowered; floral bracts always persistent...*S. roscida*

Table 2. Character comparison between *Salvia ibugana* and morphologically most similar taxa

Characters	*S. longispicata*	*S. roscida*	*S. ibugana*
Digitiform or lichenoid papillae	Absent	Absent	Present in the stems, petioles and floral axis
Leaves			
Petiole length (cm)	3-5	1-4(-7)	(1-)4-6(-8.5)
Leaf blade shape	Ovate to ovate-lanceolate	Ovate	Ovate
Leaf blade size (cm)	4-7(-10) × 2.5-4(-6.5)	7.5-12 × 5-6	6-12(-15.5) × 4-7(-10.5)
Apex shape	Long acute	Acute to acuminate	Acuminate
Base shape	Cuneate to attenuated	Cuneate	Slightly truncate to rounded and then abruptly cuneate

Table 2. Continues

Characters	*S. longispicata*	*S. roscida*	*S. ibugana*
Margin shape	Serrate	Serrate	Serrate
Inflorescence			
Flowers per verticillaster	10 to 24	(4-)8 to 12	10 to 18
Floral bract			
Shape	Ovate to ovate-lanceolate	Triangular, ovate or narrow lanceolate	Ovate
Size (mm)	(1.7-)2-3(-6.8) × 0.5-1.2(-3.7)	1.1-2.6 × 1-2	(1-)1.3-1.5(-2.4) × 1-1.7
Pedicel			
Length (mm)	1.5-2.3	2-3	1.5-3.1
Calyx			
Length (mm)	5-7(-9)	4-5.5	3.1-3.8(-5)
Corolla			
Color	Sky blue to dark blue with white macules at the throat	Sky blue with white macules at the throat	Sky blue with white macules at the throat
Tube length (mm)	6-7(-9.7)	(6.8-)7-8	5-5.5
Upper lip length (mm)	4-5.5	4-5	4-4.5
Lower lip length (mm)	5-6.5	5.2-7	4-5.6
Androecium			
Filament length (mm)	1.2-1.6(-2)	1.2-1.5	1.4-1.5
Connective length (mm)	4.5-5(-9)	4-5	4.5-5.5
Theca length (mm)	1.1-1.3	1-1.3	1-1.3
Gynoecium			
Style length (mm)	9-10	8-9	7-9
Nutlet			
Length (mm)	1.1-1.2 × 0.7-0.8	1-1.1 × 0.6	1.2-1.3× 0.7-1
Vegetation	Tropical deciduous, secondary vegetation of pine-oak and pine forests, and subtropical shrub	Pine-oak, oak, montane cloud and tropical subdeciduous forests	Tropical subdeciduous forests and secondary palm grove
Geographical range	Almost all the Mexican states except for those from the California and Yucatán Peninsulas	Sinaloa, Durango, Nayarit, Jalisco, Michoacán, Guerrero and Oaxaca	Along the cost of Bahía de Banderas, Jalisco
Altitudinal range (m)	400-200(-3 050)	(600-)1 000-1 950(-2 637)	550-600

Salvia ramirezii J. G. González sp. nov. Type: **Mexico,** Jalisco. Municipio de Mascota: by El Cabro hill, 9.7-9.9 km SW of San Juan del Mosco on dirt road to Puerto Vallarta, Los Sauces y Agujes, 20°31’37.2” N, 104°57’9.2” W, 1 628 m, 21 Jul 2011 (fl., fr.), *J. G. González-G., A. Castro-C., R. Guerrero-H., I. Guerrero and C. Beltrán 1042* (holotype: IBUG; isotypes: IEB, MEXU, ZEA, XAL). Fig. 4.

Salviae sectione *Sigmoideae* adscribenda, a *S. quercetorum* et *S. crucis* foliis sessilibus, brevioribus (6-23 × 5-8 mm vs. 9-30(-55) × (6-)12-22 mm), triangularibus, triangulo-lanceolatis vel lanceolatis, floribus 2 in verticillastris (vs. 2-12) differt.

Perennial herbs up to 1 m tall; stems emerging from a subterranean cylindrical tuber, highly branched, markedly quadrangular, sparsely pilose and sometimes farinaceous between the ribs and in the junction of the petioles and between them (particularly on the young branches and on the floral axis), sparsely ornate with orange or ocher glandular dots (invisible to the naked eye). Leaves subsessile or with petioles 0.3-1(-3.8) mm long; leaf blades triangular, triangular-lanceolate to lanceolate, (6-)9.4-15(-23) × (2.2-)5-13.3 mm, often slightly succulent, acuminate to acute at apex, slightly cordate at base, the margin entire or sparsely crenate, short revolute when dried, adaxial surface green, smooth and usually lustrous, abaxial surface paler and densely glandular punctate and sometimes densely farinaceous (then the secondary veins hidden by the granules), the glands ocher or dark orange. Inflorescence arranged in terminal and subterminal lax racemes, (2-)10-20 cm long, each floral axis with (5-)10-27 verticillasters, these 2-flowered, floral nodes 5-15 mm apart towards the base. Floral bracts late deciduous, lanceolate to ovate-lanceolate, (1.7-)2-2.5 × 0.5-1 mm, acute at the apex, truncate at the base, the margin entire, green, glabrous except the margin which is sometimes covered with erect short hairs (there are erect hairs also at the junction between the bract and the floral axis), densely glandular punctate and sometimes farinaceous, the glands dark orange or ocher. Pedicels 1-2(-3) mm long, densely covered with short conical hairs and farinaceous. Calyx 3-5 × 2-3.5 mm, poorly accrescent, it reaches 5-6 × 4-5 mm, green, heavily covered with dark orange or ocher glandular dots, essentially glabrous with short erect hairs on the margin of the lips, farinaceous, the upper lip 5 or 7-veined, lips acute and subequal in length. Corollas blue with white nectar guides, densely pilose and ornate with dark orange sessile glands toward the throat, tube (3-)5-6 × 2 mm, slightly ventricose and invaginated at the base, internally ornate with 2 ventral folds; upper lip (3-)4-5 mm long, lower lip 4-5 × 6.4-6.6 mm. Stamens included; filaments 1-1.5 mm long; connectives 1.8-2.5 mm long, geniculate; thecae (7-)1-1.3 mm long; staminodes present above and behind the insertion point of each filament to the corolla tube, globose at the apex. Gynobasic horn 1 mm long; styles 7-8 mm long, pilose, included except the style branches, the lower branch sigmoid. Nutlets ovoid, 1.5-2 × 1-1.3 mm, grayish-brown and dark-brown marbled, glabrous and smooth.

Taxonomic summary

Distribution, habitat and phenology. Salvia ramirezii is endemic to Jalisco, Mexico (Fig. 2). It inhabits tropical deciduous forests or ecotones of this vegetation with oak or oak-pine forests, from 600-1 640 m. It grows together with *Brosimum alicastrum*, *Cecropia obtusifolia*, *Clusia salvinii*, *Cryosophila nana*, *Euphorbia calcarata* (Schltdl.) V. W. Steinm., *Hura polyandra*, *Pinus oocarpa* Schiede ex Schltdl., *Quercus glaucescens* Humb. and Bonpl., *Q. glaucoides* M. Martens and Galeotti, *Q. uxoris* McVaugh, *Orbignya* sp., *Piper* sp., and *Ficus* sp. This species blooms and fructifies from late July to late April, as evidenced by the specimens collected.

Etymology. Salvia ramirezii is named in honor of Raymundo Ramírez Delgadillo (1968-2011), one of the few people who mastered the knowledge of the flora of Jalisco, Mexico. Dear friend for his students. He contributed greatly to the emergence of a new generation of Mexican botanists.

Additional material examined. **Mexico.** Jalisco. Municipio deMascota: El Cabro hill, by El Terrero, 31 Jul 2005 (fl., fr.), *Cházaro and Ascencio 8521* (XAL); 8.7-8.8 km SW of San José del Mosco on the dirt road to El Cabro-Zapotán, Los Sauces y Agujes, 20°31'32.9" N, 104°57'12.3" W, 1 640 m, 22 Apr 2011 (fl., fr.), *González* and *Guerrero 1002* (IBUG, IEB); 9.4 km SW of San José del Mosco dirt road to El Cabro-Zapotán, Los Sauces y Agujes, 20°31'39.2" N, 104°57'19.3" W, 1 638 m, 23 Apr 2011 (fl., fr.), *González and Guerrero 1005* (IBUG, MEXU). Municipio de Puerto Vallarta: Las Guacas, 600 m, 22 Feb 1998 (fl., fr.), *Ramírez et al. 5212* (IBUG); mountains of Puerto Vallarta towards El Cuale, 23 Sep 2009 (fl., fr.), *Romero s.n.* (IBUG); Ojo de Agua Ranch, 1 400-1 600 m, 11 Feb 2010 (fl., fr.), *Romero 72* (IBUG). Municipio de Talpa de Allende: on road from Talpa de Allende to Tomatlán, 26.2 km S of Talpa, 1 440 m, 9 Nov 1975 (fl., fr.), *Peterson and Broome 428* (IBUG).

Remarks. *Salvia ramirezii* corresponds undoubtedly to section *Sigmoideae* Epling because of the sigmoid shape of the lower branch of the style. This character is only present as far as we know in that section. *Sigmoideae* is endemic to Mexico. According to Espejo and Ramamoorthy (1993), it includes 11 species. They suggest the state of Jalisco as the possible center of diversification and dispersion of this group since 6 of the species grow there; so, the discovery of the new taxon in this Mexican state is not surprising and supports the Espejo and Ramamoorthy's hypothesis. The new species is morphologically similar to *S. crucis* Epling and *S. quercetorum* Epling. It differs from the first one in having evident triangular or narrow lanceolate leaves, generally shorter, sessile or rarely with petioles up to 3.8 mm long, glabrous, smaller floral bracts, verticillasters always 2-flowered and shorter lower corolla lips (Table 3). The following characters of *S. quercetorum* establish the difference from *S. ramirezii*: lanceolate to elliptic-lanceolate leaves, 1.3-7.4 × 1-1.8cm, cuneate at the base, margin serrate, petiole up to 2-9 mm long,

Table 3. Character comparison between *Salvia ramirezii* and morphologically similar taxa

Characters	*S. crucis*	*S. quercetorum*	*S. ramirezii*
Leaves			
Petiole length (cm)	(0.2-)1.6-2.3	0.2-0.5(-0.9)	0-0.1(-0.38)
Leaf blade shape	Ovate to rhombic-deltoid	Lanceolate to elliptic-lanceolate	Triangular, triangular-lanceolate to lanceolate
Leaf blade size (cm)	0.9-3(-4.56) × 0.2-2.5(-3.5)	(1.3-)3-5(-7.4) × 1-1.5(-1.8)	(0.6-)0.94-1.5(-2.3) × (0.22-)0.5-1.33
Apex shape	Acute to rounded	Acute	Acuminate to acute
Base shape	Truncate to slightly cordate	Cuneate	Slightly cordate
Margin shape	Serrate	Serrate	Entire or sparsely crenate and shortly revolute
Pubescence	Present	Absent	Absent
Inflorescence			
Flowers per verticillaster	2 to 12	2 to 10	2
Floral bract			
Shape	Ovate to lanceolate	Lanceolate to ovate-lanceolate	Lanceolate to ovate-lanceolate
Size (mm)	(2.7-)3-3.8(-5) × 1.5-2.1	1.9 × 0.8	(1.7-)2-2.5 × 0.5-1
Pedicel			
Length (mm)	2-2.1	2-3	1-2(-3)
Calyx			
Length (mm)	4.5-6	5-6	3-5
Corolla			
Color	Sky blue with white macules at the throat	Sky blue with white macules at the throat	Sky blue with white macules at the throat
Tube length (mm)	4-5	4.5-6	(3-)5-6
Upper lip length (mm)	2-2.9	3-3.1	(3-)4-5
Lower lip length (mm)	6-10	5.5-8	4-5
Androecium			
Filament length (mm)	0.8-1.5	2-2.5	1-1.5
Connective length (mm)	1.9-2.5	1.5-3.6	1.8-2.5
Theca length (mm)	1.5	1.2-1.4	(0.7-)1-1.3
Gynoecium			
Style length (mm)	5.2-7	6.5	7-8
Style pubescence	Glabrous	Glabrous	Pilose
Nutlet			
Length (mm)	1.6-2 × 1.4-1.6	1.2-1.8 × 0.9	1.5-2 × 1-1.3
Vegetation	Pine-oak forests	Oak forest	Tropical deciduous and ecotones with pine-oak and oak forests
Geographical range	Sinaloa, Durango and Northern Jalisco	Western Jalisco	Western Jalisco
Altitudinal range (m)	2 230-2 533	1 500-2 500	600-1 640

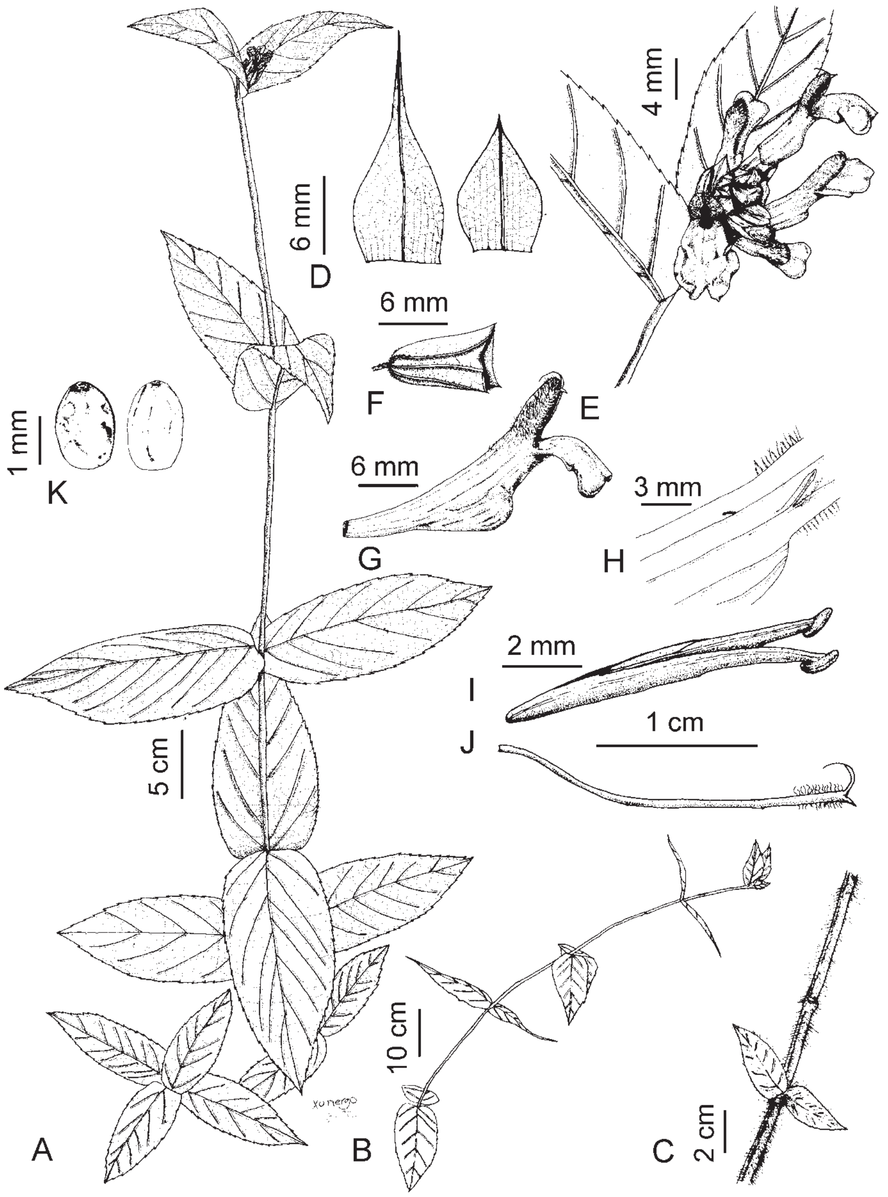

Figure 1. *Salvia carreyesii* J. G. González. A, general aspect, upper view; B, general aspect lateral view; C, fragment of a young stem; D, floral bracts; E, inflorescence; F, calyx; G, corolla; H, corolla dissection showing the filament toward the throat and minute staminodes behind; I, connectives and thecae; J, style; K, nutlets. (Drawn from the holotype and living plants at botanical garden del Instituto de Botánica, Universidad de Guadalajara).

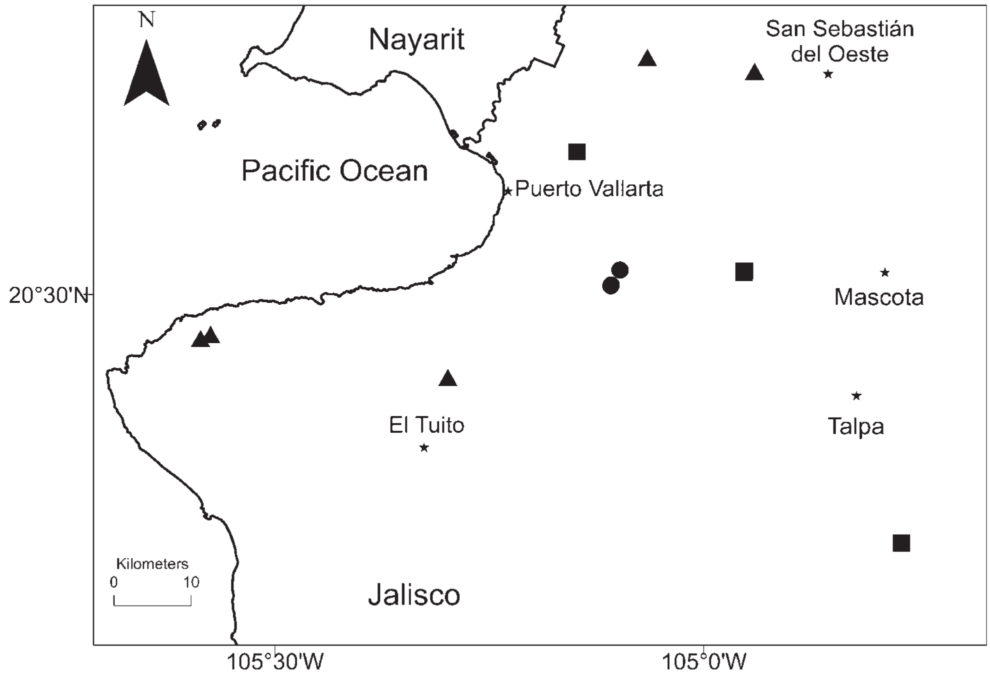

Figure 2. Distribution of the 3 new species: *Salvia carreyesii* J. G. González (dots); *S. ibugana* J. G. González (triangles), and *S. ramirezii* J. G. González (squares).

verticillasters 2 to 8-flowered, and 6-8 mm long calyces (Table 3).

The new taxon represents an interesting extension of the altitudinal and vegetational distribution of the species of section *Sigmoideae*. None of the 11 species recognized by Espejo and Ramamoorthy (1993) grows under 1 000 m and in tropical subdeciduous forest as *S. ramirezii* does.

The populations of this species from the municipality of Puerto Vallarta tend to exhibit lanceolate and longer leaves (up to 23 mm long), while the populations from Cabo Corrientes and Mascota have triangular and shorter leaves (up to 13 mm long). However, the variation in these characters between the populations is not discontinuous, so they cannot be clearly separated as to establish infraspecific taxa.

Key for *Salvia ramirezii* and allies

1a. Leaf blades cuneate at the base..*S. quercetorum*
1b. Leaf blades rounded or slightly cordate at the base
2a. Petioles 0-3.8 mm long; leaf blades triangular, triangular-lanceolate to lanceolate, up to 2.3 × 1.33 cm, glabrous, margin entire or sparsely crenate; verticillasters 2-flowered; lower corolla lips 4-5 mm long, style pilose........*S. ramirezii*
2b. Petioles (2-)16-23 mm long; leaf blades ovate to rhombic-deltoid, up to 4.56 cm × 3.5 cm, pubescent, margin serrate; verticillasters 2 to 6-flowered; lower corolla lips 6-10 mm long, style glabrous..*S. crucis*

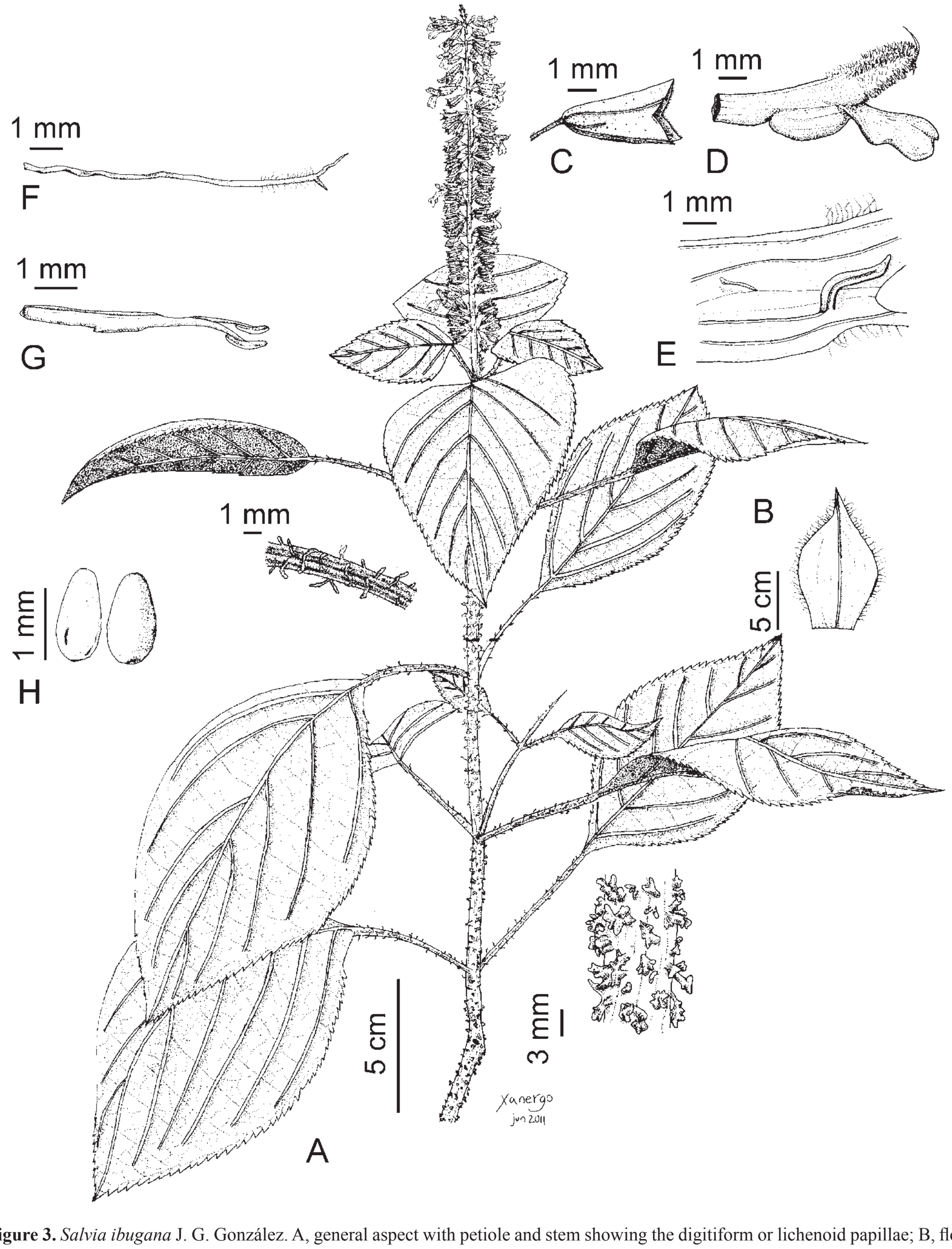

Figure 3. *Salvia ibugana* J. G. González. A, general aspect with petiole and stem showing the digitiform or lichenoid papillae; B, floral bract; C, calyx; D, corolla; E, corolla dissection showing the filament toward the throat and staminode above and behind the insertion point of the filament to the corolla tube; F, style; G, connectives and thecae; H, nutlets (drawn from the holotype).

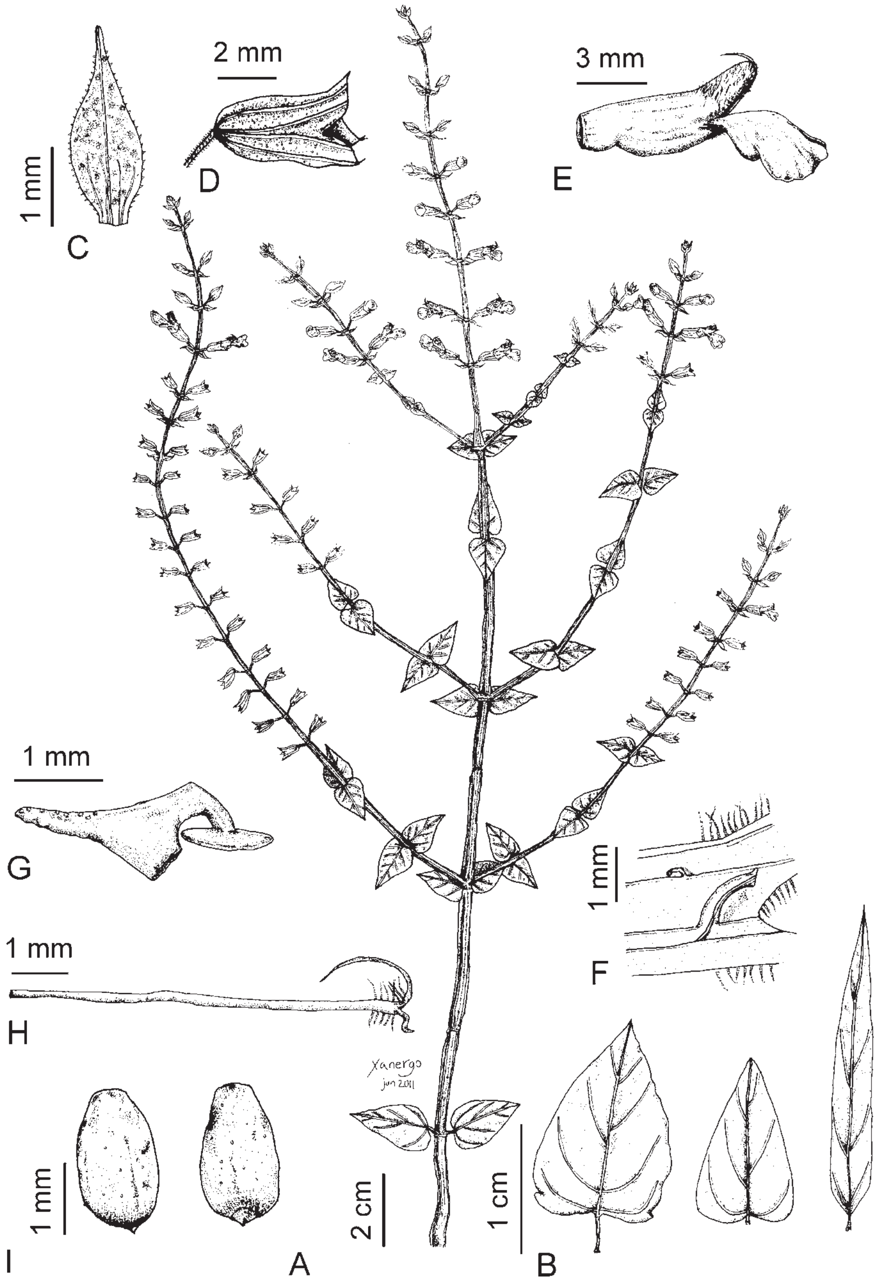

Figure 4. *Salvia ramirezii* J. G. González. A, general aspect; B, leaves; C, floral bract; D, calyx; E, corolla; F, corolla dissection showing the filament toward the throat and the staminode above and behind the insertion point of the filament to the corolla tube; G, stamen; H, style; I, nutlets (drawn from the holotype and *Ramírez et al. 5212*).

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Cunila jaliscana (Lamiaceae) a new species from Jalisco, Mexico

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Abstract

Cunila jaliscana, an endemic species to Jalisco, Mexico, is described and illustrated. Morphologically similar to *C. lythrifolia*, it differs by its divaricate branches, smaller leaf blades, narrower inflorescences, bracts shorter than calyx, and white and erect flowers.

Resumen

Se describe e ilustra *Cunila jaliscana*, especie endémica de Jalisco, México. Morfológicamente similar a *C. lythrifolia*, de la que difiere por las ramas divaricadas, hojas más pequeñas, inflorescencias más angostas, brácteas más cortas que el cáliz y flores erectas de color blanco.

Key words: disjunct distribution, poleo, Sierra de Manatlán, tribe Mentheae

Introduction

The Lamiaceae is a highly diverse family in Mexico with 32 genera and 591 species, and with 65.82 % of species endemic (Martínez-Gordillo *et al.* 2013). *Cunila* (Linnaeus (1759: 1359) is a New World genus within the tribe Mentheae Dumortier (1827: 48), which is included by Harley *et al.* (2004) in subfamily Nepetoideae Luerssen (1882: 1016). It is characterized by a tubular 10–14-nerved calyx, 5 free teeth and hairy throat, a sub-bilabiate corolla and 2 exserted stamens. Delimitation between *Cunila* species is based on inflorescence, calyx and nutlet morphology (García-Peña, 2008). The ca. 18 species of *Cunila*, as currently circumscribed, present an interesting disjunct distribution. One group of species occurs from eastern United States to Panama, and another group inhabits southeastern Brazil, northeastern Argentina, Uruguay and Paraguay. However, a recent phylogenetic analysis of *Cunila* supports, to some degree, the separation of South American species into 1 or 2 independent genera (Agostini *et al.* 2012). Further phylogenetic analyses of additional DNA sequence data are required to better understand the composition and biogeography of the genus *Cunila*. Mexico has five endemic species and one more extends its range to Central America. Ongoing taxonomic work in the genus *Cunila* has shown the existence of a distinctive species in Jalisco, Mexico, and this is here formally described and illustrated.

Cunila jaliscana García-Peña & J.G.González, *sp. nov*. (Figs. 1–4)

C. lythrifoliae similis, sed ramis divaricatis, inflorescentiis angustioribus, bracteis quam calyce brevioribus et floribus erectis albis differt.

Type:—MEXICO. **Jalisco**. Mascota: Laguna de Juanacatlán, 1960 m, 17 March 1971 (fl.), *R. González Tamayo 155* (Holotype IBUG!, isotypes CAS!, ENCB!, MICH!, TEX!).

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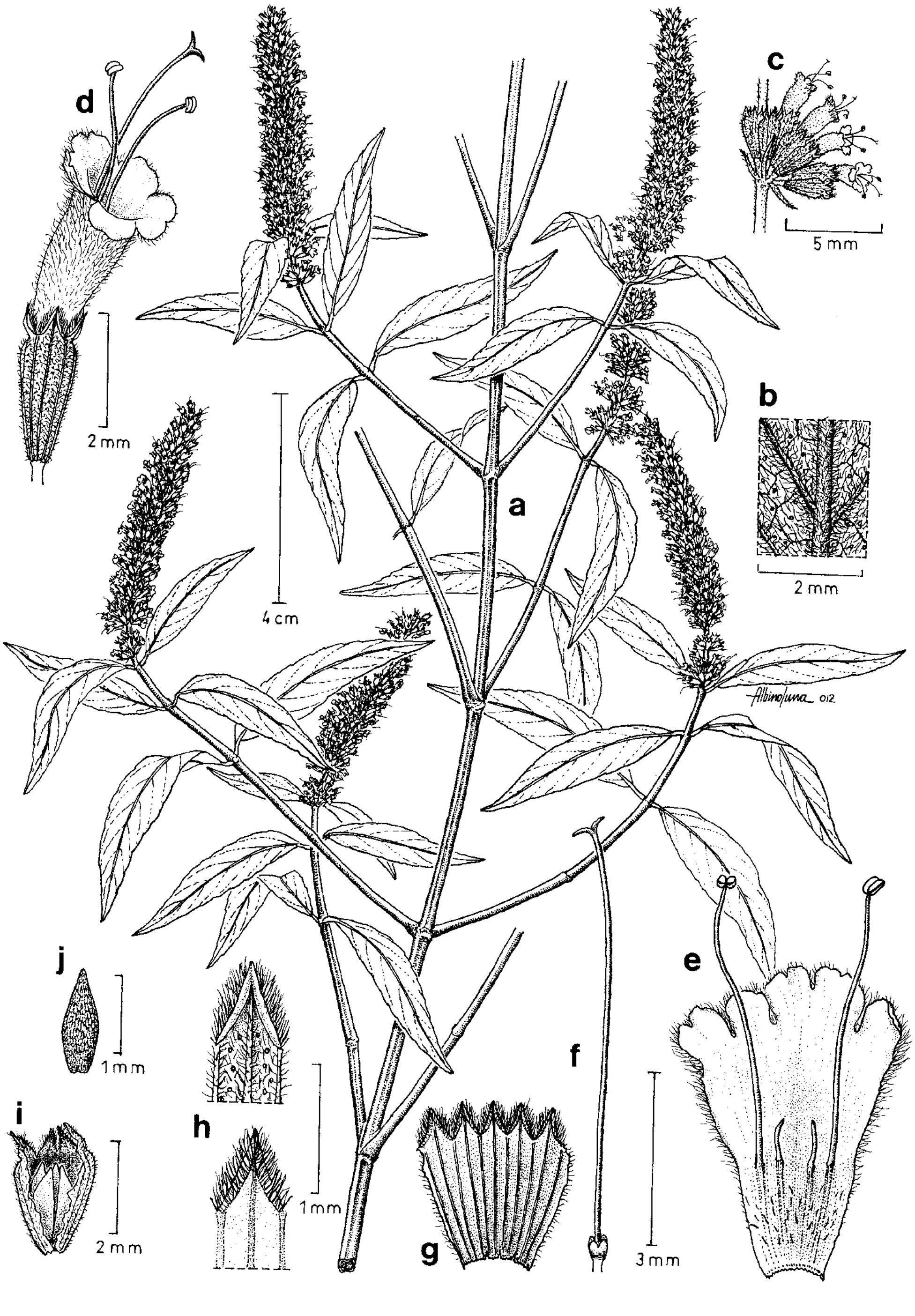

FIGURE 1. *Cunila jaliscana.* a) Habit, b) Detail of leaf surface beneath, c) Detail of inflorescence node, d) Flower, e) Corolla dissection showing stamens and staminodes, f) Ovary and style, g) Calyx dissection, h) Detail of calyx tooth, outer surface (up), inner surface (down), i) Dissection of mature calyx showing the nutlets, j) Nutlet (a–j based on *González-Tamayo 155*; drawn by Albino Luna).

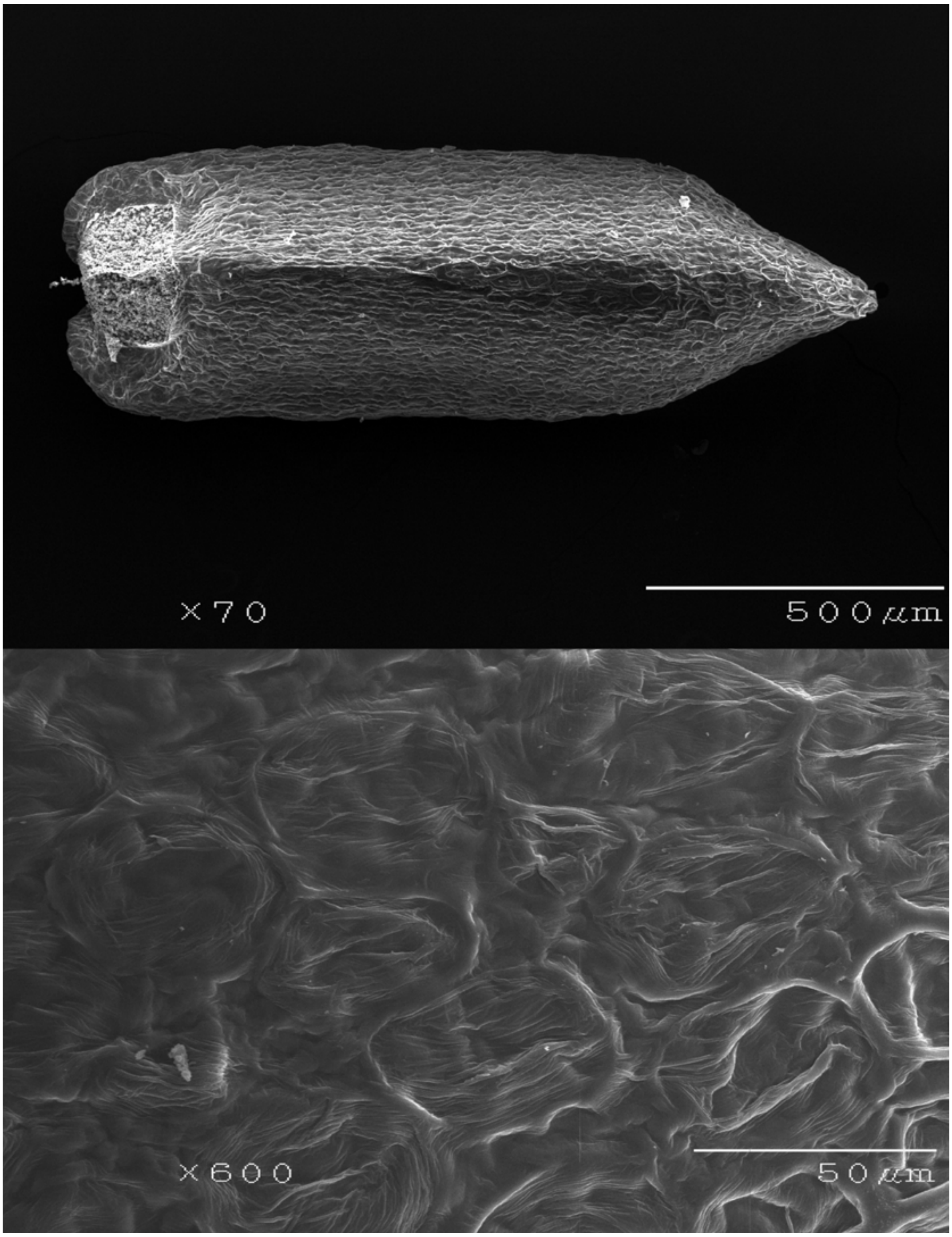

FIGURE 2 Scanning photograph of the nutlet; ventral portion showing the abscission scar (above), and detail of the surface (beneath; photogrphs taken by Berenit Mendoza Garfias; SEM Hitachi S-2460N).

Perennial herbs to subshrubs, erect, 1.0–2.3 m tall; stems with retracted pith, quadrangular, sulcate, antrorse short trichomes on the sulco, branches divaricate. Leaves with petioles (1.2–)3.0–9.3 mm long, pilose; blades lanceolate to ovate-lanceolate, 1.8–8.0 × 1.2–2.6 cm, acuminate at the apex, cuneate at the base, margins entire to finely and sparsely serrate, sparsely pilose above and tomentose beneath, with simple trichomes. Inflorescences terminal and axillary, spiciform, composed of cymes at each node, not secund, 5.0–8.5 cm long, 0.8–1.2 cm wide, 10–22 internodes, the first remote and then gradually crowded toward the apex; cymes sessile to subsessile, peduncles ca. 0.5 mm long, without secondary axes, bifurcation angles 0º, 8–9 flowers per cyme. Floral bracts linear, 1.3–1.9 mm long, ciliate, shorter than calyx. Flowers erect, sessile to subsessile, pedicels 0.0–1.0 mm long (up to 2.2 mm long in fruit). Calyx green, tubular, erect, 2.0–2.6(–3.0) × 0.8–1.2 mm, 13–14-nerved, pilose outside, covered with antrorse trichomes on the veins, glands only between the veins, throat hirsute, with trichomes along teeth contour no longer than the teeth, interlocking in the sinuses; teeth isomorphic, erect, deltoid, 0.6–0.8 mm long. Corolla white, (4.0–)5.0–6.5(–7.0) mm long, the tube exerted from the calyx, long trichomes on the outer surface, inner surface with some trichomes at mid-portion. Stamens 2, exerted, filaments 4.0–6.0 mm long, glabrous and not spotted; thecae white; staminodes conspicuous, 2.0–3.0 mm long. Ovary 4-lobed. Style 8.0–10.0 mm long, white, not spotted, lobes unequal. Nutlets 4, 1.0–1.4 × 0.4–0.5 mm, ocher, pyramidal-ovoid, glabrous, foveolate, with a sub-basal to ventral scar, 0.1–0.2 mm long.

FIGURE 3 Fruiting calyx throat showing the trichomes insertion (photograph taken by Susana Guzmán Gomez; Multifocal microscope LEICA 216 APOA).

FIGURE 4. *Cunila jaliscana*. From left inflorescence detail, inflorescence in bud and general aspect (photographs taken by J.G. González-Gallegos).

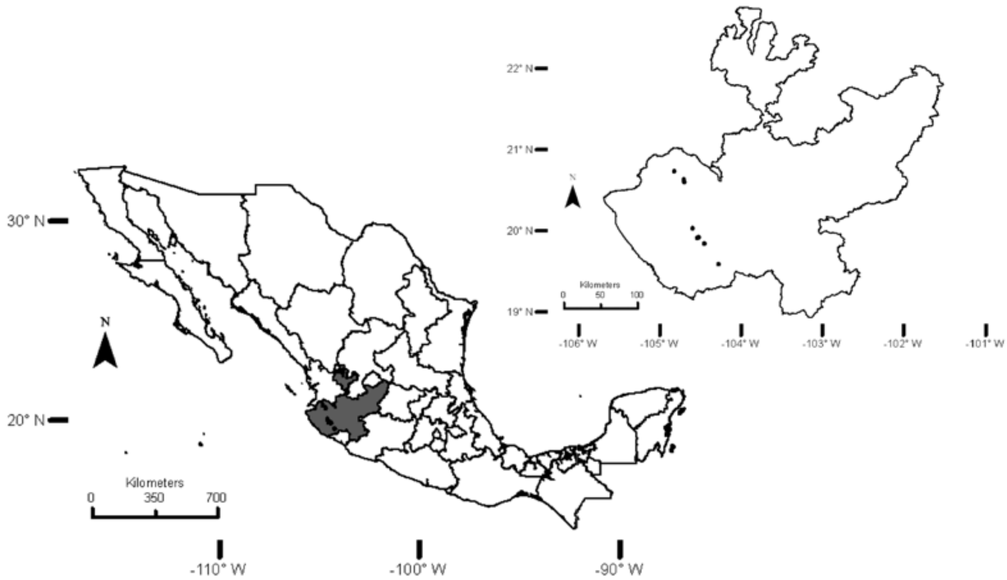

FIGURE 5. Distribution map of *Cunila jaliscana.*

Distribution and habitat:—*Cunila jaliscana* is endemic to Jalisco, Mexico (Fig. 5). It grows at edges or openings of pine-oak, pine-fir, oak, and montane cloud forests, sometimes found along dirt roads or crop fields, at 1500–2500 m of elevation. Associated with trees like *Carpinus caroliniana* Walter, *Crataegus* *mexicana* DC., *Juniperus flaccida* Schltdl., *Miconia glaberrima* (Schltdl.) Naudin, *Oreopanax xalapensis* (Kunth) Decne. & Planch., *Pinus lumholtzii* B.L.Rob. & Fernald, *Prunus serotina* subsp. *capuli* (Cav.) McVaugh, *Quercus candicans* Née, *Q. castanea* Née, *Q. obtusata* Bonpl., and herbs and shrubs like *Cirsium* sp., *Euphorbia schlechtendalii* var. *pacifica* McVaugh., *Lepechinia caulescens* (Ortega) Epling, *Heterotoma lobelioides* Zucc., *Phacelia platycarpa* (Cav.) Spreng., *Rubus coriifolius* Liebm., *Salvia gesneriflora* Lindl. & Paxton, and *S. mexicana* L.

Notes:—Flowering takes place from November to May. It is commonly known as "poleo", and its leaves are boiled to prepare tea to relieve respiratory conditions.

Additional specimens examined:—MEXICO. **Jalisco**. Autlán de Navarro: Sierra de Manantlán, 1950 m, 8 March 1987 (fl), *M. Cházaro et al. 4508a* (IBUG!, IEB!); Sierra de Cacoma, 1500 m, 10 November 1980 (fl), *M. Limón 11719 & L.M. Villarreal de Puga* (IBUG!, IEB!). Ayutla: cabañas Haciendas del Carmen, en La Cañada del Carmen, 17 April 2010 (fl, fr), *M.J. Cházaro-B. 9753 & R. Sánchez* (IBUG!); Sierra de Cacoma, 400 m al S del punto de Santa Mónica, 2100 m, 7 January 1995 (fl), *O. Vargas-P. s.n. & R. González-T.* (IBUG!, IEB!). Cuautitlán: flat valley bottoms at Las Joyas (cf. El Chante topo-sheet), 7.8 km W by WSW of Rincón de Manantlán, ca. 16 km SW of El Chante, 19.35ºN 104.17ºW, 1900 m, 6 January 1979 (fl), *H.H. Iltis et al. 1384* (IBUG!, MEXU!); El Zarzamoro, cerca de la Estación Científica Las Joyas, Sierra de Manantlán, 19º35'8"N 104º16'22"O, 1850 m, 5 May 2001, *F.J. Santana-M. 10492 & E. Jardel* (ZEA!). Mascota: 2.2 km al N de Juanacatlán y 2.9 al E de la laguna del mismo nombre, Sierra de Juanacatlán, 20º37'2.03"N 104º42'18.88"O, 2134 m, 21 April 2011(fl, fr), *J.G. González-G. 987 & R. Guerrero-H.* (IBUG!); 4–4.1 km en línea recta al N de Juanacatlán y 2.4–2.5 km al E de la laguna del mismo nombre, 20º37'55"N 104º42'26.5"O, 2225 m, 22 April 2011(fl, fr), *J.G. González-G. 989 & R. Guerrero-H.* (IBUG!); extremo N del pueblo de Juanacatlán, 20º36'5.3"N 104º42'0.0"O, 2242 m, 1 February 2013 (fl), *J.G. González-G. et al. 1440* (IBUG!); camino entre cerro El Molcajete y laguna de Juanacatlán, 1800 m, 30 December 1973 (fl), *L. M. Villarreal de Puga 5758* (IBUG!, MICH!). San Sebastián del Oeste: en la base de La Bufa, en la antena de microondas, 20º44'11"N 104º49'10"O, 2283 m, 7–8 March 2009 (fl, fr), *J.G. González-Gallegos 303* (IBUG!, MEXU!); 6.5 km por la brecha de San Sebastián del Oeste a La Bufa, 900 m en línea recta al O de Real Alto, 20.743ºN 104.824ºO, 16 March 2013 (fl), *J.G. González-Gallegos et al. 1486* (IBUG!); Real Alto, Sierra Madre Occidental, 2500 m, 29 January 1927 (fl), *Y. Mexia 1589* (CAS!, F!, GH!, MICH!, MO!, UC!, US!); camino entre las torres de microondas y El Llanito de los Hielitos, 2400 m, 26 March 1996 (fl, fr), *R. Ramírez-D. et al. 3514* (IBUG!); La Bufa, 20 February 2000 (fl), *L.M. Villarreal de Puga 17763* (IBUG!). Talpa de Allende: Sierra de Cacoma, 2.2 km al N de la Cumbre de Guadalupe (Cumbre de los Arrastrados), 20º10'01"N 104º43'09"O, 2000–2100 m, 24 February 2002 (fl, fr), *P. Carrillo-R. 2884 & E.M. Barba* (IBUG!); headwaters of río Mascota (ca. 20 km, airline, southeast of Talpa de Allende), 8–10 km above (south of) El Rincón, on the road to aserradero La Cumbre, steep mountain valley near rapid stream, 1600 m, 2 April 1963 (fl), *R. McVaugh 24434* (MICH!). Villa Purificación: campamento de la Universidad Autónoma de Chapingo, Las Iglesias, 2100 m, 23 March 1980 (fl), *S. Carvajal-H. et al. 2918* (CREG!); en Neverías, Sierra de Cacoma, 2195, 17 March 2007 (fl), *R. Cuevas-G. 9064 & L. Guzmán-H.* (ZEA!); al W de Las Iglesias (campo experimental de la Universidad Autónoma de Chapingo), 2200 m, 10 March 1980 (fl), *L.M. González-Villarreal 1768* (IBUG!, MEXU!).

Etymology:—The specific epithet honors Jalisco, a Mexican western state with high diversity in vascular plants (Villaseñor & Ortiz 2013, Ramírez-Delgadillo *et al.* 2010), particularly in labiates (Ramamoorthy & Elliott 1998)

Remarks:—*Cunila jaliscana* is easily recognized from *C. lythrifolia* Bentham (1829: sub. t. 1289) by a combination of characters: presence of divaricate branches, narrower inflorescences, bracts shorter than the calyx, white flowers and fewer flowers per cyme. Also, both species have different distributions, flower phenologies, and contrasting elevation ranges (Table 1).

TABLE 1. Comparison between *Cunila jaliscana* y *C. lythrifolia*

	C. jaliscana	*C. lythrifolia*
Branches	divaricate	mostly erect
Leaf blade shape	lanceolate to ovate-lanceolate	ovate-lanceolate,
Leaf blade length (cm)	1.8–8.0 × 1.2–2.6	2.5–12 × 1.8–3.0
Leaf indumentum	sparsely pilose above; tomentose beneath	both surfaces sparsely pubescent
Inflorescence length (cm)	5.0–8.5	4.0–12.0
Inflorescence width (cm)	0.8–1.2	1.5–2.0
Flowers per cyme	8–9	10–28
Internodes	10–22	3–10
Floral bracts length (mm)	1.3–1.9	2.0–6.0
Flower position	erect	declinate
Calyx length (mm)	2.0–2.6(–3.0)	2.0–3.5
Calyx color	green	green-reddish
Calyx teeth length (mm)	0.6–0.8	0.6–0.8
Corolla color	white	lavender
Staminode length (mm)	2.0–3.0	minute, less than 0.5
Nutlet size (mm)	1.0–1.4 × 0.4–0.5	1.0–1.1 × 0.35–0.40
Distribution	northern portions of Sierra Madre del Sur, in western Jalisco.	Trans-Mexican Volcanic Belt and in southern portions of the Sierra Madre Oriental (not in Jalisco)
Elevation range (m)	1500–2500	1500–3500
Flowering season	November–May	June–May

C. jaliscana is restricted to the woodlands on the northern portions of Sierra Madre del Sur, in western Jalisco. Its distribution ranges from Sierra de Manatlán along the mountains towards municipio of San Sebastián del Oeste, at 1500–2500 m of elevation, and with a flowering season from November to May. Whereas, *C. lythrifolia* also endemic to Mexico, occurs on the mountains of the Trans-Mexican Volcanic Belt and in southern portions of the Sierra Madre Oriental (Distrito Federal, Estado de México, Guanajuato, Guerrero, Hidalgo, Michoacán, Morelos, Puebla, Querétaro, Tlaxcala and Veracruz), at 1500–3500 m elevation, and with a flowering season from June to May.

There are two other species of *Cunila* occurring in Jalisco, *C. polyantha* Bentham (1834: 362) characterized by its paniculiform and secund inflorescences, pedunculate cymes, and pedicellate flowers, calyx throat hirsute with trichomes on a straight line under the teeth, and general distribution in the states of Aguascalientes, Colima, Guanajuato, Jalisco, Michoacán and Zacatecas. *Cunila pycnantha* Robinson & Greenman (1894: 391) is distinguished by its capituliform inflorescences, pedunculate cymes and pedicellate flowers, calyx throat hirsute, trichomes along teeth contour, and a broader distribution, inhabiting in Chiapas, Durango, State of Mexico, Guanajuato, Guerrero, Michoacán, Morelos, Nayarit, Oaxaca and Sinaloa.

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4.10 González-Gallegos, J. G. y R. Aguilar-Santelises. 201X. *Salvia tilantongensis* (Lamiaceae), una especie nueva de la Mixteca Alta de Oaxaca, México. *Acta Botanica Mexicana*

SALVIA TILANTONGENSIS (LAMIACEAE), UNA ESPECIE NUEVA DE LA MIXTECA ALTA DE OAXACA, MÉXICO

SALVIA TILANTONGENSIS (LAMIACEAE), A NEW SPECIES FROM THE MIXTECA ALTA OF OAXACA, MEXICO

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RESUMEN

Se describe e ilustra a *Salvia tilantongensis*, una especie nueva de la Mixteca Alta de Oaxaca, México. Esta especie es similar en su morfología a *Salvia fulgens* y *S. gesneriflora*. Se distingue de ambas por su corteza exfoliante, peciolos articulados en un engrosamiento del nudo, hojas más estrechas, brácteas florales de menor tamaño, pedicelos más largos durante la fructificación, los lóbulos del cáliz agudos y largamente aristados, lóbulo medio del labio inferior de la corola incurvado cóncavo, filamento y estilo más cortos. Además, difiere de *S. fulgens* por la ausencia de un par de papilas en la porción basal de la corola. También se provee de descripciones enriquecidas de *S. fulgens* y *S. gesneriflora.*

Palabras clave: endemismo, *Salvia fulgens*, *S. gesneriflora,* sección *Fulgentes*, sección *Nobiles*.

ABSTRACT

Salvia tilantongensis is described and illustrated, a new species from the Mixteca Alta of Oaxaca, Mexico. This species is morphologically similar to *Salvia fulgens* and *S. gesneriflora*. It differs from both by its exfoliating bark, petioles attached to a thicken base from the node, narrower leaves, smaller floral bracts, longer pedicels during fructification, acute and long aristate lobes of the calyx, middle lobe of lower corolla lip incurved-concave, and shorter filament and style. Furthermore, it is distinguished from *S. fulgens* by the absence of a pair of papillae inside the basal portion of the corolla. Enriched descriptions of *S. fulgens* and *S. gesneriflora* are also provided.

Key words: endemism, *Salvia fulgens*, *S. gesneriflora*, section *Fulgentes*, section *Nobiles*.

El género *Salvia* L. es uno de los más diversos dentro de la familia Lamiaceae, con 900 a 1000 especies a escala global (Standley y Williams, 1973; Harley et al., 2004). Exhibe una distribución casi cosmopolita, sin especies nativas únicamente en Australia y las regiones más frías de ambos hemisferios. Sus principales centros de diversificación se encuentran en México, la cuenca del Mediterráneo, China y Medio Oriente (Harley et al., 2004; Walker et al., 2004). La particular morfología del androceo de sus flores —un par de estambres con conectivo alargado que separa a las dos tecas, la posterior frecuentemente reducida o ausente y el conectivo modificado en una especie de timón— distingue y ha sido protagonista en la evolución y polinización de las flores del género (Claβen-Bockhoff et al., 2003; Walker et al., 2004; Walker y Sytsma, 2007; Wester y Claβen-Bockhoff, 2006a, 2006b, 2007a, 2007b, 2011). Sin embargo, la delimitación tradicional ha sido cuestionada ante los resultados obtenidos de análisis filogenéticos con base en secuencias de ADN; éstos han demostrado que se trata de un grupo polifilético debido a que otros géneros (*Dorystaechas* Boiss. & Heldr. ex Benth., *Meriandra* Benth., *Perovskia* Kar., *Rosmarinus* L. y *Zhumeria* Rech. f. & Wendelbo) han derivado de ancestros dentro del linaje de *Salvia* (Walker & Sytsma, 2004, Walker 2006, Walker et al., 2007, Jenks et al., 2011, Jenks et al., 2013). Esto demanda la necesidad de una recircunscripción en el futuro próximo, pero de momento se sigue respetando la definición tradicional.

México, con alrededor de 300 especies, es el país que alberga la mayor riqueza de *Salvia* (Martínez-Gordillo et al., 2013; Ramamoorthy y Elliott, 1998; Villaseñor, 2004). La mayoría de las especies mexicanas, incluyendo a los taxones que se describen en este documento, pertenecen al subgénero *Calosphace* (Benth.) Epling. Sin embargo, también existen representantes de la sección *Heterosphace* Benth. (*Salvia henryi* A. Gray, *S. roemeriana* Sheele, y *S. summa* A. Nelson), y lo que antes era reconocido como el género *Salviastrum* Heist. ex Fabr. (*S. texana* (Sheele) Torr. y *S. whitehousei* Alziar), y de la sección *Audibertia* Benth. in Lindl. (*S. apiana* Jeps., *S. brandegeei* Munz, *S. californica* Jeps., *S. carduacea* Benth., *S. clevelandii* (A. Gray) Greene, *S. columbariae* Benth., *S. mohavensis* Greene, S. *munzii* Epling, *S. pachyphylla* Epling ex Munz. y *S. vaseyi* (Porter) Parish) (Epling, 1938; Strachan, 1982; Neisess, 1983; Walker y Elisens, 2001; Martínez-Gordillo et al., 2013). Ramamoorthy y Elliott (1998) reconocieron con base a referencias bibliográficas y datos inéditos del primer autor, que el estado de Oaxaca era el que contenía la mayor cantidad de especies al poseer una cifra de 63. En esa misma publicación se señalaron 35 especies para Chiapas y 48 para Michoacán. Sin embargo, revisiones puntuales y más recientes para estos estados, revelan una cantidad de especies mayor para cada uno de ellos, 84 (García-Mendoza y Meave, 2011), 75 (Domínguez et al., 2002), y 73 (Rodríguez y Espinosa, 1996) ó 64 (Cornejo-Tenorio & Ibarra-Manríquez, 2011), respectivamente. El incremento en el número de especies es evidente, lo cual señala un conocimiento todavía insuficiente del género en el país. Es aún de esperar que el desarrollo de investigaciones y exploración botánica resulten en el descubrimiento de novedades en términos del descubrimiento de especies en lugares donde no hayan sido previamente registradas, y de especies no descritas. En este sentido, aquí se presenta y describe una de estas nuevas adiciones: *Salvia tilantongensis*. Se trata de una especie nueva que es muy semejante en su morfología a *Salvia fulgens* Cav. y *S. gesneriflora* Lindl. & Paxton; éstas son a la vez muy semejantes entre sí y confundidas con frecuencia, por lo que en este documento se ofrece primero una descripción de ellas, para luego contrastarlas con *S. tilantongensis*.

La especie fue evidenciada durante el desarrollo de un estudio florístico en el municipio de Santiago Tilantongo, Oaxaca; una vez que se determinó que se pudiera tratar de un taxón no descrito, se procedió a examinar especímenes de herbario de las especies más afines en su morfología para tomar una resolución. La información de las etiquetas de los especímenes examinados fue capturada en una base de datos; se realizó la georreferenciación de un subconjunto de los registros de acuerdo de manera parcial a los criterios de Wieczorek (2001), para elaborar mapas y esclarecer la distribución de los taxa implicados. Los herbarios consultados fueron: CIIDIR, CHAPA, CIMI, CREG, ENCB, IEB, GUADA, HUAA, HUMO, IBUG, MEXU, MICH, UC, WIS, y ZEA.

Resultados

Descripciones complementarias

Salvia fulgens Cav. Icon. 1: 15, t. 23. 1791. Fig 1. Tipo: ejemplar de una planta cultivada a partir de semillas colectadas en México, *Anónimo 1802* (holotipo: MA-476223). Fig. 1A.

Arbusto de 0.8 a 2(-4) m de alto, erecto y en ocasiones subescandente; tallos pilosos y puberulentos, con frecuencia cubiertos con tricomas capitado-glandulares de estípite corto. Hojas con peciolo de 1.1 a 5.0(-7.0) cm de largo, piloso y a veces con tricomas capitado-glandulares de estípite corto; lámina ovado-lanceolada u ovada, de (3.2-)4.6 a 10.0(-14.0) × 2.0 a 3.3(-7.0) cm, aguda en el ápice, cordada, oblicua, truncada a redondeada en la base, serrada a serrulada en el margen, pilosa o con tricomas adpresos en el haz, pilosa o con menor frecuencia tomentosa en el envés. Inflorescencia de 9.5 a 30 cm de largo, con 4 a 8 verticilastros, cada uno con 2 a 8 flores, los de la base separados entre sí por 1.5 a 2.6 cm, eje floral piloso y con tricomas capitado-glandulares de estípite corto. Bráctea floral ovado-lanceolada, de (1.9-)2.0 a 3.6(-4.3) × 0.6 a 1.0 cm, decidua, verde o roja, pilosa en la cara externa y en ocasiones con tricomas capitado-glandulares de estípite corto. Flores con pedicelos de 4.0 a 8.0 mm de largo (hasta 11.3 mm en fruto), piloso y con tricomas capitado-glandulares de estípite corto. Cáliz de 1.4 a 1.8 cm de largo, de 0.6 a 0.9 cm de ancho en la garganta (alcanzan hasta 2 × 1.2 cm en fruto), verde o rojo, piloso o hispidulo en el exterior y con tricomas capitado-glandulares de estípite corto, hispidulo a glabro en el interior y hacia los labios, lóbulos agudos, el superior entero y con 5 ó 7 venas. Corola rojo brillante, pilosa en el labio superior y en el dorso de la porción media distal, o en algunas ocasiones con algunos tricomas dispersos a todo lo largo; tubo de 2.5 a 3.6(-3.9) cm de largo, ventricoso, de 0.7 a 0.9(-1.0) cm de ancho en el vientre, recto en la base y ornamentado con un par de papilas en el interior; labio superior de 1.6 a 1.9(-2.1) cm de largo, labio inferior de 1.4 a 1.8 × (0.4-)0.6 a 1.0(-1.2) cm. Estambres insertos en la corola; filamento de 0.48 a 0.74(-0.83) cm de largo; conectivo de 2.2 a 2.8 cm de largo, recto, con un diente corto y retrorso después de la inserción del filamento hacia la porción posterior, o bien sin ornamentaciones, piloso en el dorso en el área de la inserción del filamento; teca de 3.0 a 3.8(-4.2) mm de largo; un par de estaminodios filiformes presentes atrás y arriba de la inserción del filamento a la corola. Cuerno ginobásico de 0.9 a 1.6 mm de largo; estilo de 4.0 a 5.3(-5.6) cm de largo, piloso hacia el ápice en el dorso y vientre, rama inferior aguda y recta. Núcula ovoide, de 3.0 a 4.1 × 1.9 a 2.5 mm, café oscura uniforme o café claro y jaspeada con un tono más oscuro, lisa y glabra.

FIGURA 1.

Material selecto examinado. MÉXICO. Distrito Federal. Álvaro Obregón: San Bartolo, 2700 m, 17 jul 1977, *A. Ventura-A. 2937* (MEXU); Cañada de Contreras: Llanos de Copilco, al SE del Tercer Dínamo, 10 dic 1983, *J. L. Villaseñor-R. & E. Martínez-S. 633* (MEXU); Cuajimalpa: Área Natural Protegida Desierto de los Leones, 19º17'7"N 99º18'45"W, 3250 m, 10 jun 2005, *A. Espinosa-H. et al. 79* (MEXU); Milpa Alta: Volcán Tláloc, ladera E, 3200 m, 23 jul 1986, *G. Zamudio-V. 15* (MEXU); Tlalpan: Topilejo, 2650 m, 27 nov 1976, *A. Ventura-A. 2425* (MEXU). Estado de México. Amecameca: 12 km al E de Amecameca, 14 nov 1976, *A. Marín-M. 183* (IBUG, MEXU); Chalco: cerca de la Colonia Agrícola Manuel Ávila Camacho, 2750 m, 11 sep 1966, *A. Vargas-N. s.n.* (MEXU); Iturbide: alrededores de la Presa de Iturbide, 28 nov 1982, *C. García-G. 130* (IBUG, MEXU); Ixtapaluca: campo experimental de investigación y enseñanza Zoquipan, 3300 m, 8 jul 1978, *J. García-P. 12923* (GUADA); Naucalpan: Villa Alpina, 3200 m, 7 nov 1979, *B. J. Guillermo-R. 69* (CIIDIR, MEXU); San Felipe: Palo Amarillo, 3100 m, 28 jul 1984, *A. Hérnández-F. et al. 91* (MEXU); San José de Allende: 71 km W de Toluca near hwy 15, 26 km E of Zitácuaro, near the Michoacán border, 19º24'N 100º10'W, 2700 m, 11 nov 1985, *S. A. Reisfield 1260* (MEXU); Texcoco: Santa Catarina del Monte, 15 nov 1983, *E. Ventura-V. 1604* (IBUG); Tlalmanalco: aproximadamente 3 km al E de San Rafael, 2700 m, 19 sep 1976, *P. G. García-G. 457* (MEXU); Zinacantepec: 2 km S de raíces, Nevado de Toluca, 19º11'27"N 99º48'28"W, 3262 m, 15 jul 2002, *J. Martínez-R. et al. 22* (MEXU). Hidalgo. Huasca de Ocampo: San Miguel Regla, 27 sep 1987, *E. Argüelles 1981* (MEXU). Michoacán. Angangueo: Estación Chincua, Reserva de la Biósfera Mariposa Monarca, 19º39'75"N 100º16'34"W, 3190 m, 4 ago 2000, *M. G. Cornejo-T. 19* (MEXU); Contepec: Cerro Altamirano, 2 km de Contepec, 20º0'21"N 100º7'34"W, 2400 m, 15 sep 2005, *M. G. Cornejo-T. & M. A. Salinas-M. 1579* (IBUG); Cuanajo: Cerro del Burro, 20 oct 1985, *J. M. Escobedo 513* (IBUG); Huiramba: parte alta del Cerro de la Taza, 22 ago 1986, *H. Díaz-B. & S. Zamudio 2620* (CIIDIR, IBUG, MEXU); Los Reyes: aproximadamente 3 km al N de Pamatácuaro, 3080 m, 22 oct 1990, *L. Torres-R. 491* (ENCB, IEB); Morelia: parte alta del Cerro del Águila, 3100 m, 19 ago 1988, *S. Zamudio 6679* (MEXU); Ocampo: El Rosario, 19º35'51"N 100º15'59"W, 3230 m, 5 mar 2009, *G. Cornejo-T. & G. Ibarra-Manríquez 3383* (MEXU); Pátzcuaro: Cerro El Frijol, 2900 m, 26 oct 1989, *E. Pérez-C. 686* (MEXU); Quiroga: ladera sur del Cerro Tzirate, 18 sep 1986, *H. Díaz-B. & S. Zamudio 2833* (IBUG, MEXU); Santa Clara del Cobre: en el Cerro Burro, 14 km al SE de Opopeo, 2820 m, 12 oct 1985, *J. C. Soto-N. 10782* (MEXU); Tancítaro: lado W del de Tancítaro aprox. a 3 km al NE de el Jazmín, 29 sep 1989, *I. García-R. & J. Nava V. 2919* (CIMI, GUADA, IBUG, IEB); Tangancícuaro: aproximadamente 2 km al SW de Patambán, Cerro Patambán, 2400 m, 1 abr 1989, *L. Torres-R 221* (IEB); Tlalpujahua: ejido San Pedro Tarimbaro, 16 ene 1987, *S. Zamudio & N. López 5114* (IBUG); Villa de Allende: en el ejido Cuesta del Carmen, cerca del límite entre Michoacán y México, 2830 m, 2 abr 1985, *J. C. Soto-N. et al. 7920* (MEXU); Zinapécuaro: Camino Viejo, hacia la presa La Gachupina, 2640 m, 11 oct 1984, *M. J. Jasso 287* (MEXU); Zitácuaro: 20 km al NE de Zitácuaro, 2560 m, 28 ene 1986, *J. C. Soto-N. 11877* (MEXU). Morelos. Huitzilac: W of Lagunas de Zempoala guard station, near Morelos-Mexico state line, 2800 m, 10 ago 1981, *D. Engle & D. Remington 91* (MEXU). Tlaxcala. Nanacamilpa: 2.5 km al W de San Felipe Hidalgo, 2700 m, 17 mar 1998, *M. Agonizante 66* (MEXU).

Salvia fulgens se distribuye de manera casi exclusiva en la Franja Volcánica Transmexicana, en el Distrito Federal y en los estados de Hidalgo, México, Michoacán, Morelos, Puebla y Tlaxcala (Fig. 2). Crece en bosques de oyamel, de pino y encino, y de forma ocasional en bosque mesófilo de montaña; ocupa un rango de elevación de 2400 a 3400 m, aunque en el Popocatépetl se le ha registrado hasta a 3990 m. Esta especie suele formar poblaciones densas. La floración y fructificación son sincrónicas, pueden desarrollarse en cualquier momento del año, pero con mayor frecuencia de agosto a noviembre. De manera regular se le conoce como mirto.

Este taxón es muy semejante en su morfología vegetativa y floral a *Salvia gesneriflora*. Los gradientes de variación en hábito y porte de las plantas, forma, tamaño, indumento y color de las hojas, longitud de las inflorescencias, y tamaño, color y pubescencia de las flores, se traslapan de forma indisoluble y nulifican el valor diagnóstico de tales rasgos. Debido a lo anterior, la distinción entre los taxones ha sido problemática, es frecuente encontrar errores de determinación en ambos sentidos en especímenes de herbario y en listados florísticos. No obstante estas especies pueden reconocerse de manera sencilla con base en las siguientes características: a) longitud de las brácteas florales, en *S. fulgens* miden de (1.9-)2.0 a 3.6(-4.3) cm, mientras en *S. gesneriflora* en general son de menor longitud con una variación que va de (0.6-)0.7 a 2.0(-2.4) cm, b) presencia de un par de papilas en la base de la parte interna del tubo de la corola en *S. fulgens* y su ausencia en *S. gesneriflora*. Cabe señalar que las características del tamaño de bráctea y la presencia/ausencia de papilas en la base del tubo de la corola ya habían sido utilizadas por Ramamoorthy (2005) para hacer la distinción.

La distribución de *S. fulgens* es simpátrida a la de *S. gesneriflora* (Fig. 2). Aunque, la anterior además extiende su distribución más hacia el norte por los estados de Colima, Jalisco, Nayarit, Durango, Sinaloa y Zacatecas; y ocupa espacios en la porción sur de la Sierra Madre Occidental, además de aquellos de la Faja Volcáncia Transmexicana (Fig. 2).

FIGURA 2.

Salvia gesneriflora Lindl. & Paxton, Paxton's Fl. Gard. 2: 49, t. 47. 1851. Tipo: lámina 47, Lindley & Paxton, 1851; elaborada con base a un ejemplar vivo cultivado a partir de semillas colectadas en México. Fig. 1B.

Arbusto 0.8 a 2.5(-4) m de alto, a veces un poco decumbente; tallos tomentosos a pilosos y puberulentos, por lo general cubierto con abundantes tricomas capitado-glandulares. Hojas con peciolo 1.3 a 4.6(-8.0) cm de largo, piloso y cubierto por tricomas capitado-glandulares de estípite corto y glándulas sésiles; lámina ampliamente ovada a ovado-lanceolada, (3.0-)5.3 a 10.3(-16.0) × 2.0 a 6.6(-10.9) cm, aguda a acuminada o atenuada hacia el ápice, cordada a truncada o en ocasiones redondeada en la base, serrulada en el margen, pilosa o con tricomas adpresos en el haz, por lo común blanco-tomentosa y a menudo con puntos glandulares en el envés, las hojas jóvenes con tricomas capitado-glandulares en ambas caras. Inflorescencia 10 a 30(-44) cm de largo, 4 a 11(-17) verticilastros, cada uno con 2 a 6(-10) flores, los de la base de la inflorescencia separados entre sí por 1.4 a 3.0(-4.0) cm, eje floral piloso y cubierto con tricomas capitado-glandulares. Bráctea floral ovada a ovado-lanceolada, (0.6-)0.7 a 2.0(-2.4) × 0.2 a 0.7(-1.0) cm, decidua, verde o roja, atenuada en el ápice, truncada en la base, margen entero, pilosa en la cara externa y con tricomas capitado-glandulares. Flores con pedicelos 5 a 10 mm de largo (hasta 12 mm en fruto), piloso y con tricomas capitado-glandulares. Cáliz (1.3-)1.7 a 2.5(-3.0) cm de largo, 0.5 a 0.8(-1.0) cm de ancho en la garganta, verde o rojo, piloso a hispidulo en el exterior y con tricomas capitado-glandulares, hispidulo a glabro en el interior y hacia los labios, lóbulos agudos, el superior entero y con 5 o 7 venas. Corola rojo brillante, pilosa en el labio superior y en el dorso de la porción media distal, o en algunas ocasiones con algunos tricomas dispersos a todo lo largo; tubo 3.2 a 4.0(-4.4) cm de largo, por lo general ventricoso, 0.6 a 1.0(-1.2) cm de ancho en el vientre, recto en la base y epapilado; labio superior 1.6 a 2.1(-2.5) cm de largo, labio inferior 1.2 a 2.0(-2.4) × 0.5 a 1.0 cm. Estambres insertos en la corola; filamento 0.6 a 0.8(-0.9) cm de largo; conectivo (1.9-)2.0 a 2.6 cm de largo, con un diente corto y retrorso después de la inserción del filamento hacia la porción posterior, o bien sin ornamentaciones, puberulento en el dorso y vientre en el área de la inserción del filamento; teca 3.6 a 4.5(-5.0) mm de largo; un par de estaminodios filiformes presentes atrás y arriba de la inserción del filamento a la corola. Cuerno ginobásico 1.0 a 1.6(-1.9) mm de largo; estilo 4.7 a 5.9(-6.6) cm de largo, piloso hacia el ápice en el dorso y vientre, rama inferior aguda y recta. Núcula ovoide, 2.8 a 3.5 × 1.6 a 2.0 mm, café oscura uniforme o café claro y jaspeada con un tono más oscuro, lisa y glabra.

Material selecto examinado. MÉXICO. Aguascalientes. Calvillo: Salto del Pilar, 2450 m, 15 abr 1985, *M. de La Cerda-L. s.n.* (HUAA). Colima. Comala: Parque Nacional Nevado de Colima, camino Comala-San Antonio-Nuevo Pueblo San Antonio, 19º29'20"N 103º39'57"W, 1770 m, 14 abr 2001, *G. Ibarra-M. et al. 4861* (MEXU); Minatitlán: Sierra of Manantlán, road from el Sauz to El Terrero, 19º26'51.6"N 103º56'6.47"W, 922 m, 5 dic 1999, *J. Cahill & M. J. Cházaro-B. 3024* (CIMI, HUMO, MEXU, MICH). Estado de México: Amecameca: Cerro Sacramento, 2100 m, 2 nov 1981, *J. A. Vázquez-G. 637* (IBUG); Chalco: cerca de la Colonia Agrícola Manuel Ávila Camacho, 2750 m, 11 sep 1966, *A. Vargas-N. 2750* (IBUG); Coatepec de Harinas: El Salto, 18º56'14.9"N 99º47'55.2"W, 2239 m, 28 feb 2010, *N. Muñoz-C. 379* (MEXU); Contreras: Capulticla San Bernabé, 2750 m, 13 mar 1977, *A. Ventura-A. 2639* (MEXU); Donato Guerra: Cerro Pelón, 19º21'23"N 101º16'18"W, 2300 m, 2 may 2005, *J. Martínez-C. et al. 1646* (MEXU); Jilotzingo: 3 km al NO de San Luis Ayucan, 2850 m, 29 ene 1978, *R. López-G. 11756* (GUADA); Ocuilán: San Juan Atzingo, 19º1'N 99º22'W, 2600 m, 6 feb 1987, *J. Castañeda-R. & P. Trejo-G. 48* (MEXU); Temascaltepec: Mesón Viejo, NE of Temascaltepec, on highway 130, 99º54'N 19º9'W, 2800 m, 10 nov 1988, *S. A. Reisfield 1257* (MEXU); Texcoco: Sta. Cartarina, 2300 m, 26 oct 1985, *C. García s.n.* (IBUG); Tlalmanalco: 3 km al E de San Rafael, 2800 m, 1 ene 1965, *J. Rzedowski 19339* (MEXU). Durango. Otaez: 5 km de Otaez, sobre el camino a Los Altares, 2300 m, 4 oct 1990, *A. Benítez-P. 2621* (CIIDIR, MEXU); Pueblo Nuevo: 8 km al E de El Palmito, carretera Mazatlán-Durango10 mar 1985, *P. Tenorio-L. & C. Romero de T. 8238* (MEXU). Hidalgo. Pachuca: Cerro de Las Ventanas, 6 km al N de Pachuca, 2900 m, 25 jun 1967, *C. Jiménez-R. 94-A* (MEXU). Jalisco. Ahualulco del Mercado: Ahualulco, camino al Cerro Bola, aprox. 10 km al SE, 1600 m, 30 ene 1983, *A. de Santiago-C. 2* (IBUG); Autlán de Navarro: Sierrra de Cacoma, 400 m al S del Punto de Santa Mónica, 2100 m, 7 ene 1995, *O. Vargas-P. & R. González-T. s.n.* (IBUG); Ciudad Guzmán: km 14 brecha El Fresnito-Antenas del Canal 13, Nevado de Colima, 2660 m, 12 sep 1983, *R. Ramírez-D. & L. M. González-V. 518* (IBUG); Cuautitlán: brecha a Las Capillas, Sierra de Manantlán, 2750 m, 20 nov 1981, *L. M. Villarreal de Puga et al. 11974* (IBUG); Jocotepec: Cerro Grande, al N de Jocotepec, Sierra del Madroño, 2400 m, 26 ene 1983, *O. Reyna-B. 89* (IBUG); Mazamitla: 3 km al SW de Mazamitla, 1800 m, 16 dic 1981, *J. J. Velasco-R. s.n.* (IBUG). Puerto Vallarta: rocky crest of low mountains of the Pacific slope, 7 km by rd. E of the crossing (El Crucero) Unidad Cuale-Cuale-Talpa (a little pass with rd. jct. On top of Sierra el Cuale), 6 km due SE of Cuale and due E of the Minas de Zimapan, 2250-2340 m, 18 ago 1993, *T. S. Cochrane et al. 13141* (IBUG); San Martín Hidalgo: Cerro El Huehuentón, al SW de Lagunillas, 2400 m, 2 ene 1987, *L. M. González-V. 2870* (IBUG); San Sebastián del Oeste: La Bufa, 7 abr 1993, *J. J. Reynoso-D. et al. 1262* (IBUG); Talpa de Allende: La Torre, 8 km al W de Cuale, 2200 m, 22 ene 2000, *L. M. González-V. 4648* (IBUG) Tecolotlán: sierra de Quila, ladera SE del Cerro Huehuentón, 2100 m, 4 feb 1990, *J. J. Guerrero-N. 661* (IBUG); Tequila: Cerro de Tequila, 1200-2500 m, 26 feb 1967, *L. M. Villarreal de Puga 12543* (IBUG); Tolimán: en las faldas del Nevado de Colima, 2000 m, 25 Nov 1985, *C. O. Nathal-E. 45* (IBUG); Tonila: brecha a las Joyas, Nevado de Colima, 2340 m, 9 feb 1986, *R. Ramírez-D. 215* (IBUG); Tuxpan: nevado de Colima, 2600 m, 10 feb 1974, *L. M. Villarreal de Puga 6048* (IBUG); Zapopan: 40 km de la Carretera a Saltillo, 20 abr 1978, *J. Rivera & Quevedo s.n.* (IBUG). Zapotitlán de Vadillo: 10 km sobre la desviación al Nevado de Colima, a partir de El Fresnito, 2510 m, 6 abr 1988, *A. G. Mendoza 3826* (IBUG). Michoacán. Angangueo: Chincua, terrenos federales, 19º40'28"N 100º16'36"W, 3217 m, 27 oct 2004, *J. Martínez-C. et al. 1314* (MEXU); Charo: Cerro de la Espadilla cerca de Las Mesas, 2400 m, 8 may 1987, *J. Santos-M. 2065* (CIIDIR, IBUG); Cherán: Cerro de La Virgen, 3100 m, 15 oct 1990, *E. García & E. Pérez 3328* (IBUG); Contepec: 2 km de Santa María la Ahogada, 20º0'37"N 100º8'52"W, 2420 m, 23 ago 2004, *M. G. Cornejo-T. et al. 852* (MEXU); Cuanajo: Cerro El Burro, 2400 m, 2 dic 1985, *J. M. Escobedo 748* (CIIDIR, IBUG); Erongarícuaro: Cerro Las Varas, 2300 m, 7 nov 1985, *H. Díaz-B. 1694* (GUADA); Hidalgo: A 3 km al S de Mil Cumbres, 2200 m, 15 may 1985, *J. C. Soto-N. et al. 8520* (CIIDIR); Indaparapeo: Cerro El Acre, cerca del rancho Rosa Jorio, 2400 m, 18 mar 1986, *J. Santos-M. 1257* (CIIDIR); Morelia: Cerro Pico Azul, cerca de Jesús del Monte, 2500 m, 2 may 1985, *J. Santos-M. 3928* (MEXU); Nahuatzen: Cerro La Bandera, cerca de Comachuen, municipios de Nahuatzen y Tingambato, 2850 m, 6 feb 1986, *A. Martínez-L. 758* (CIIDIR, IBUG); Ocampo: ejido El Rosario, límite del Santuario de la Mariposa Monarca, 2000 m, 25 feb 1989, *A. Flores-H. et al. 1506* (IBUG); Queréndaro: Cañada Real, cerca de San José de la Cumbre, 2600 m, 12 abr 1986, *J. Santos-M. 1233* (CIIDIR, IBUG); Salvador Escalante: Cerro La Tapada, ejido Felipe Tzinzun, 3075 m, 21 ene 1988, *S. Zamudio 6029* (CIIDIR, GUADA, IBUG); Santa Clara del Cobre: Zirahuén, 2100 m, 1 mar 1989, *E. Pérez-C. 472* (MEXU); Tancítaro: Cerro Tancítaro, 27 km al W en línea recta, 3 km al E de Apo, camino a Parastaco, 19º26'15"N 102º23'35"W, 2280 m, 11 mar 1998, *I. García-R. 5061* (CIMI, IEB, MICH); Tingambato: barranca al NW y NE de Tingambato, 2000 m, 22 abr 1995, *M. Cruz-E. 44* (MEXU); Zacapu: 1.5 km al N de el Pueblito, m, 4 nov 1985, *A. Martínez-L. 97* (IBUG); Zinapécuaro: cañada El Salto, cerca de Bocaneo, 2000 m, 1 mar 1988, *J. Santos-M. 1230* (CIIDIR, IBUG); Zitácuaro: zona 7, ladera NW del Cerro Cacique, 19º23'50"N 100º19'7"W, 2340 m, 4 mar 1979, *G. Ibarra-C. 384* (MEXU). Morelos. Huitzilac: Rancho San Lorenzo, km 53.5 de la carretera federal México-Acapulco 95, al SW del poblado Tres Marías, 19º39'N 99º14'W, 2650 m, 7 sep 1989, *I. Díaz-V. & R. Noriega-T. 1154* (MEXU). Puebla. San Nicolás de Los Ranchos: laderas del Popocatépetl, por la cañada de Xalitxintla, 3000 m, 18 oct 1968, *H. Ern 372* (MEXU). Sinaloa. Concordia: 2-4 km SW of El Palmito, 1980 m, 7 abr 1988, *D. E. Breedlove & B. Bartholobew 66486* (MEXU). Tlaxcala. Nanacamilpa: Nanacamilpa, 2810 m, 21 oct 1985, *F. A. Pérez-M. s.n.* (IBUG). Zacatecas. El Plateado de Joaquín Amaro: barranca de Las Mujeres, El Plateado, 2400 m, mar 1964, *L. Vela-G. 1475* (MEXU).

Salvia gesneriflora crece en la Sierra Madre Occidental y en la Faja Volcánica Transmexicana (Fig. 2). Esta presente en el Distrito Federal y en los estados de Aguascalientes, Colima, Durango, Estado de México, Jalisco, Michoacán, Morelos, Puebla, Sinaloa y Zacatecas (Fig. 2); también se le registra de Guerrero (Epling, 1939) y de Nayarit (Téllez, 1995) aunque no observamos especímenes de herbario que así lo atestigüen. Habita en bosques de pino y encino, pino, encino, oyamel, y mesófilo de montaña. Es frecuente encontrar poblaciones densas a la orilla de brechas y claros dentro del bosque. El rango altitudinal que ocupa va de (1500-)1900 a 2800(-3600) m. La floración y fructificación son sincrónicas y se desarrollan durante todo el año, con una mayor presencia de octubre a marzo. En Zinapécuaro, Michoacán, suelen conocer a la especie como retame de monte.

Salvia tilantongensis J. G. González & R. Aguilar-Santelises sp. nov. Tipo: México. Oaxaca. Dto. Nochixtlán, Santiago Tilantongo: 6 km al O de Santiago Tilantongo, en el Cerro Monte Negro, Mixteca, 17°15'N 97°21'O, 2700 m, 6 nov 2008 (fl, fr), *R.*

Martínez-García 84 (holotipo OAX, isotipos IBUG, ENCB, IEB, MEXU, SERO). Fig. 1C y D, 3.

Salvia tilantongensis ad sectionem *Nobiles* Epling pertinet sed ab aliis speciebus huius sectionis differt propter caules desquamatos, petiolos articulatos, folias potius angustas, bracteas florales parvas (minus quam 8 mm longas), fructus cum pedicellis longis (usque ad 17.8 mm), et lobulos calicis longe aristatos (aristis 3-4.5 mm longis).

Arbusto 1 a 2(-2.5) m de alto, erecto; tallo piloso y con tricomas capitado-glandulares, estos últimos concentrados hacia la inflorescencia, peciolos y ramas jóvenes, corteza exfoliante en láminas longitudinales en las ramas principales. Hojas con peciolo (1.2-)1.8 a 2.9(-3.5) cm de largo, articulado en la base sobre una prolongación ensanchada del entrenudo, densamente piloso y con tricomas capitado-glandulares; lámina lanceolada a ovado-lanceolada, 5.2 a 8.0(-10.0) × 1.5 a 4.5(-5.1) cm, aguda hacia el ápice, cordada y cortamente cuneada en la base, crenada a ligeramente serrada en el margen, cubierta con tricomas adpresos dispersos en el haz, moderada a densamente pilosa en el envés. Inflorescencia 5.3 a 11.2(-14.0) cm de largo, (4-)6 a 12 verticilastros, cada uno con 2 a 4(-6) flores, los de la base de la inflorescencia separados entre sí 0.6 a 1.5(-2.2) cm, eje floral glabro o con tricomas capitado-glandulares. Bráctea floral ovada, 0.2 a 0.50(-0.8) × 0.2 a 0.4(-0.5) cm, decidua, verde o roja, acuminada en el ápice, truncada en la base, margen entero, pilosa y cubierta por tricomas capitado-glandulares en la cara externa, la interna glabra. Flores con pedicelos 0.5 a 1.0(-1.1) cm de largo en flor, hasta 17.8 mm de largo en fruto, densamente cubierto por tricomas capitado-glandulares de 0.1 a 0.2 mm de largo. Cálices (1.3-)1.5 a 2.0(-2.3) cm de largo, 0.7 a 0.9 cm de ancho en la garganta (hasta 2.5 × 1.1 cm en fruto), rojo (pajizo al secarse), esparcidamente cubierto por tricomas capitado-glandulares concentrados sobre todo en las venas, en el interior cubierto por tricomas adpresos o verrucoso, lóbulos agudos y rematados por una arista de 3.0 a 4.5 mm de largo, el superior entero y con 7 venas. Corola rojo brillante, esparcidamente pilosa hacia los labios; tubo de 3.8-4.3 cm de largo, ligeramente ventricoso, (0.5-)0.6 a 1.0 cm de ancho en el vientre, recto en la base y epapilado en el interior; labio superior 1.6 a 2.4 cm de largo, labio inferior (1.2-)1.7 a 2.7 × 1.0 a 1.5 cm. Estambres insertos en la corola; filamentos 0.4 a 0.6 cm de largo; conectivos 1.9 a 2.4 cm de largo, puberulentos en el dorso y pilosos junto a la inserción del filamento; tecas 2.4 a 3.3 mm de largo; estaminodios representados por un par de papilas arqueadas de 0.4 a 0.5 mm de largo en la porción media del tubo, atrás y arriba de la inserción del filamento. Cuerno de la ginobase 0.2 a 1 mm de largo; estilos 4.3 a 4.5 cm de largo, densamente pilosos en el tercio apical; rama superior 7 a 8 mm de largo, la inferior 5.3 a 6.1(-7) cm de largo. Núcula ovoides, 2.8 a 3.2 × 1.6 a 2.2 mm, café amarillentas a veces jaspeada de manera irregular con un tono más oscuro, lisa y glabra.

FIGURA 3.

Material adicional examinado. MÉXICO. Oaxaca. Santiago Tilantongo: brecha hacia las ruinas arqueológicas de santiago Tilantongo, 1 km en línea recta al SO de las mimas, Cerro Monte Negro, 17º15’6.9”N 97º21’31.1”W, 2663 m, 14 nov 2012, *J. G. González-Gallegos & G. Santos 1400* (IBUG).

Salvia tilantongensis es una especie endémica restringida a la Mixteca Alta en el estado de Oaxaca, México. Ocupa un rango de elevación aproximado de 2600 a 2800 m. Habita en bosques de encino bien conservados o en ocasiones en zonas con cierto grado de disturbio. Comparte hábitat con *Quercus laurina* Bonpl. Florece y fructifica de octubre a diciembre.

Las características del nuevo taxon lo relacionan directamente con la sección *Nobiles* Epling. Esta sección incluye arbustos o hierbas perennes, de hojas ampliamente ovadas o elíptico-lanceoladas, glabras o moderadamente vellosas, con brácteas florales deciduas o persistentes, inflorescencias en racimos o en ocasiones con flores dispuestas en las axilas de las hojas hacia el ápice de las ramas, labio superior de los cálices con 5 a 7 venas, corola roja con el tubo ventricoso o ampliado hacia el ápice, desnudo en el interior, labio inferior tan largo como el superior o más corto, estambres inclusos, conectivo entero o, sobre todo en las especies mexicanas, con un diente pequeño posterior a la inserción con el filamento, estilo velloso en el dorso y vientre. Proponemos al nuevo taxón como parte de esta sección de manera provisional ya que la evidencia filogenética disponible no respalda la monofilia del grupo (Jenks et al., 2013), y es evidente que en el futuro cercano será necesaria la reestructuración de la clasificación infragenérica en su totalidad. Esta situación ya había sido anticipada por dos Santos (1991), quien recircumscribe a *Nobiles* al excluir a las especies mexicanas; sin embargo, en el presente trabajo es preferido el sistema propuesto por Epling (1939). Entre las especies de dicha sección, *S. tilantongensis* es muy similar en su morfología a *S. gesneriflora*. Difiere de ella debido a sus tallos exfloliantes (*vs.* no exfoliantes), peciolos articulados en un ensanchamiento del nudo a manera de base (*vs.* peciolos articulados de forma directa al tallo), láminas foliares por lo regular más estrechas (1.5 a 4.5(-5.1) *vs*. 2.0 a 6.6(-10.9) cm), inflorescencias que nunca superan los 15 cm de largo (*vs.* inflorescencias que pueden alcanzar hasta 40 cm), brácteas florales más cortas (0.2 a 0.50(-0.8) *vs*. (0.6-)0.7 a 2.0(-2.4) mm), pedicelos más largos durante la fructificación (17.8 *vs*. 12 mm), lóbulos del cáliz largamente aristados (aristas de 3 a 4.5 mm de largo *vs*. ausencia de aristas), el lóbulo medio del labio inferior de la corola incurvado-cóncavo formando una capucha (*vs.* reflejo), filamento más corto (0.4 a 0.6 *vs.* 0.6 a 0.8(-0.9) cm), y estilo más corto (4.3-4.5 *vs.* 4.7 a 5.9(-6.6) cm) (cuadro 1). *Salvia fulgens* de la sección *Fulgentes* Epling también es semejante en su morfología al nuevo taxon. Sin embargo, ésta se reconoce claramente de *S. gesneriflora* y *S. tilantongensis* por la presencia de un par de papilas en la parte basal e interna del tubo de su corola, por sus pedicelos con tricomas capitado-glandulares de menos de 0.05 mm de largo y sus brácteas florales usualmente más largas ((1.9-)2.0 a 3.6(-4.3) *vs*. (0.6-)0.7 a 2.0(-2.4) en *S. gesneriflora*, y 0.2 a 0.50(-0.8) mm en *S. tilantongensis*) (cuadro 1).

Es de notar que la característica del engrosamiento del punto de inserción del peciolo con el nudo en el tallo, ya había sido utilizada como diagnóstico por Bedolla-García et al. (2011), y que es recomendable un análisis de su distribución y valor taxonómico dentro del género.

El nombre de la especie hace referencia al único municipio en que esta planta ha sido colectada hasta el momento: Santiago Tilantongo, Oaxaca, México.

Clave para la determinación de *Salvia tilantongensis* y especies morfológicamente afines

1a Brácteas florales de (1.9-)2.0 a 3.6(-4.3) cm de largo; pedicelos con tricomas capitado-glandulares de menos de 0.05 mm de largo; un par de papilas presentes en la parte interna y basal del tubo de la corola …..…….……………………..*S. fulgens*

1b Brácteas florales por lo general menores de 20 mm de largo; pedicelos con tricomas capitado-glandulares de 0.1-0.2 mm de largo; el tubo de la corola epapilado en el interior hacia su base ………………………………………………….…...……2

2a Tallo con corteza no exfoliante; peciolo articulado de forma directa al tallo; láminas foliares hasta de 10.9 cm de ancho; inflorescencias hasta de 40 cm de largo; brácteas florales de (0.6-)0.7 a 2.0(-2.4) mm de largo; pedicelos en fruto no más de 12 mm de largo; lóbulos del cáliz no aristados; lóbulos medio del labio inferior reflejo; filamento de 0.6 a 0.8(-0.9) cm de largo; estilo de 4.7 a 5.9(-6.6) cm de largo. Plantas distribuidas por las serranías del Pacífico desde Durango hasta Guerrero y luego penetrando por el centro del país hasta Tlaxcala e Hidalgo ..………..…*S. gesneriflora*

2b Tallo con corteza exfoliante; peciolo articulado a una base engrosada a partir del nudo; láminas foliares sin sobrepasar 5.1 cm de ancho; inflorescencias hasta de 15 cm de largo; brácteas florales de 0.2 a 0.50(-0.8) mm de largo; pedicelos en fruto hasta de 17.8 mm de largo; lóbulos del cáliz con una arista de 3.0 a 4.5 mm de largo; lóbulo medio del labio inferior incurvado-cóncavo de tal manera que forma una capucha; filamento 0.4 a 0.6 mm de largo; estilo de 4.3 a 4.5 mm de largo. Plantas exclusivas de Oaxaca ....*S. tilantongensis*

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Cuadro 1. Comparación de características morfológicas, distribución, rango altitudinal y hábitat entre *Salvia tilantongensis* y especies semejantes en morfología.

Características	*S. gesneriflora*	*S. fulgens*	*S. tilantongensis*
HOJA			
Longitud del peciolo (cm)	1.3 a 4.6(-8.0)	1.1 a 5.0(-7.0)	(1.2-)1.8 a 2.9(-3.5)
Inserción del peciolo	directa al tallo	directa al talla	sobre una prolongación engrosada del entrenudo
Forma de la lámina	ovada a ovado-lanceolada	ovado-lanceolada u ovada	lanceolada a ovado-lanceolada
Tamaño de la lámina (cm)	(3.0-)5.3 a 10.3(-16.0) × 2.0 a 6.6(-10.9)	(3.2-)4.6 a 10.0(-14.0) × 2.0 a 3.3(-7.0)	5.2 a 8.0(-10.0) × 1.5 a 4.5(-5.1)
INFLORESCENCIA			
Longitud del racimo (cm)	10 a 30(-44)	9.5 a 30	5.3 a 11.2(-14.0)
Número de flores por verticilastro	2 a 6(-10)	2 a 8	2 a 4(-6)
BRÁCTEA FLORAL			
Forma	ovada a ovado-lanceolada	ovado-lanceolada	ovada
Tamaño (cm)	(0.6-)0.7 a 2.0(-2.4) × 0.2 a 0.7(-1.0)	(1.9-)2.0 a 3.6(-4.3) × 0.6 a 1.0	0.2 a 0.50(-0.8) × 0.2 a 0.4(-0.5)
Duración	decidua	decidua	decidua
PEDICELO			
Longitud (cm)	0.5 a 1.0	0.4 a 0.8	0.5 a 1.0(-1.1)
CÁLIZ			
Tamaño (cm)	(1.3-)1.7 a 2.5(-3.0) × 0.5 a 0.8(-1.0)	1.4 a 1.8 × 0.6 a 0.9	(1.3-)1.5 a 2.0(-2.3) × 0.7 a 0.9
Forma de los lóbulos	agudos y no largamente aristados	agudos y no largamente aristados	agudos y largamente aristados (aristas 3 a 4.5 mm de largo)
COROLA			
Color	rojo brillante	rojo brillante	rojo brillante
Tamaño del tubo (cm)	3.2 a 4.0(-4.4) × 0.6 a 1.0(-1.2)	2.5 a 3.6(-3.9) × 0.7 a 0.9(-1.0)	3.8 a 4.3 × (0.5-)0.6 a 1.0
Longitud del labio superior (cm)	1.6 a 2.1(-2.5)	1.6 a 1.9(-2.1)	1.6 a 2.4
Tamaño labio inferior (cm)	1.2 a 2.0(-2.4) × 0.5 a 1.0	1.4 a 1.8 × (0.4-)0.6 a 1.0(-1.2)	(1.2-)1.7 a 2.7 × 1.0 a 1.5
Número de papilas en la porción interna basal del tubo	0	2	0
ANDROCEO			
Longitud del	0.6 a 0.8(-0.9)	0.48 a 0.74(-0.83)	0.4 a 0.6

filamento (cm)			
Longitud del conectivo (cm)	(1.9-)2.0 a 2.6	2.2 a 2.8	1.9 a 2.4
Longitud de la teca (mm)	3.6 a 4.5(-5.0)	3.0 a 3.8(-4.2)	2.4 a 3.3
Presencia/ausencia de un par de estaminodios	presente	presente	presente
GINECEO			
Longitud del estilo (cm)	4.7 a 5.9(-6.6)	4.0 a 5.3(-5.6)	4.3 a 4.5
Pubescencia	piloso	piloso	piloso
FRUTO			
Tamaño de la núcula (mm)	2.0 a 3.5 × 1.6 a 2.0	3.0 a 4.1 × 1.9 a 2.5	2.8 a 3.2 × 1.6 a 2.2
DISTRIBUCIÓN GEOGRÁFICA	Aguascalientes, Colima, Durango, Estado de México, Hidalgo, Jalisco, Michoacán, Morelos, Puebla, Sinaloa, Tlaxcala y Zacatecas	Distrito Federal, Estado de México, Hidalgo, Michoacán, Morelos y Talxcala	Oaxaca
RANGO ALTITUDINAL (m en elevación)	(1500-)1900 a 2800(-3600).	2400 a 3400(-3900)	2700
HÁBITAT	bosque de pino-encino, encino, pino, oyamel y mesófilo de montaña	bosque de pino, encino y mesófilo de montaña	bosque de encino

Figura 1. Fotografías de las flores de A. *Salvia fulgens*, B. *S. gesneriflora*, y C. *S. tilantongensis* sp. nov. El inciso D. muestra el tallo exfoliante de esta última (fotografías tomadas por J. G. González-Gallegos. A. Acuitzio del Canje, Michoacán; B. Sierra de Manantlán, Jalisco; C. y D. Santiago Tilantongo, Oaxaca).

Figura 2. Mapa de distribución mediante trazos individuales de *Salvia fulgens* (recuadro medio superior) y *S. gesneriflora* (en el mapa base, fuera del recuadro). *Salvia tilangongensis* sp. nov. se conoce de una sola localidad y está señalada con un punto. Las áreas de la Sierra Madre del Sur (sombreado de líneas horizontales), la Faja Volcánica Transmexicana (sombreado de líneas verticales) y la Sierra Madre Occidental (sombreado de cuadrícula), están resaltadas.

Figura 3. *Salvia tilantongensis* sp. nov. A. Aspecto general de la planta mostrado en una rama; B. Brácteas florales en la porción apical de una inflorescencia; C. Cáliz; D. Corola; E. Conectivos y tecas; F. Porción apical del estilo; G. Núcula madura (izquierda) y semilla (derecha), con un acercamiento de su superficie (ilustración basada en *R. Martínez-García 84*, y elaborada por Daniel Acosta-Aguilar).

Figura 1.

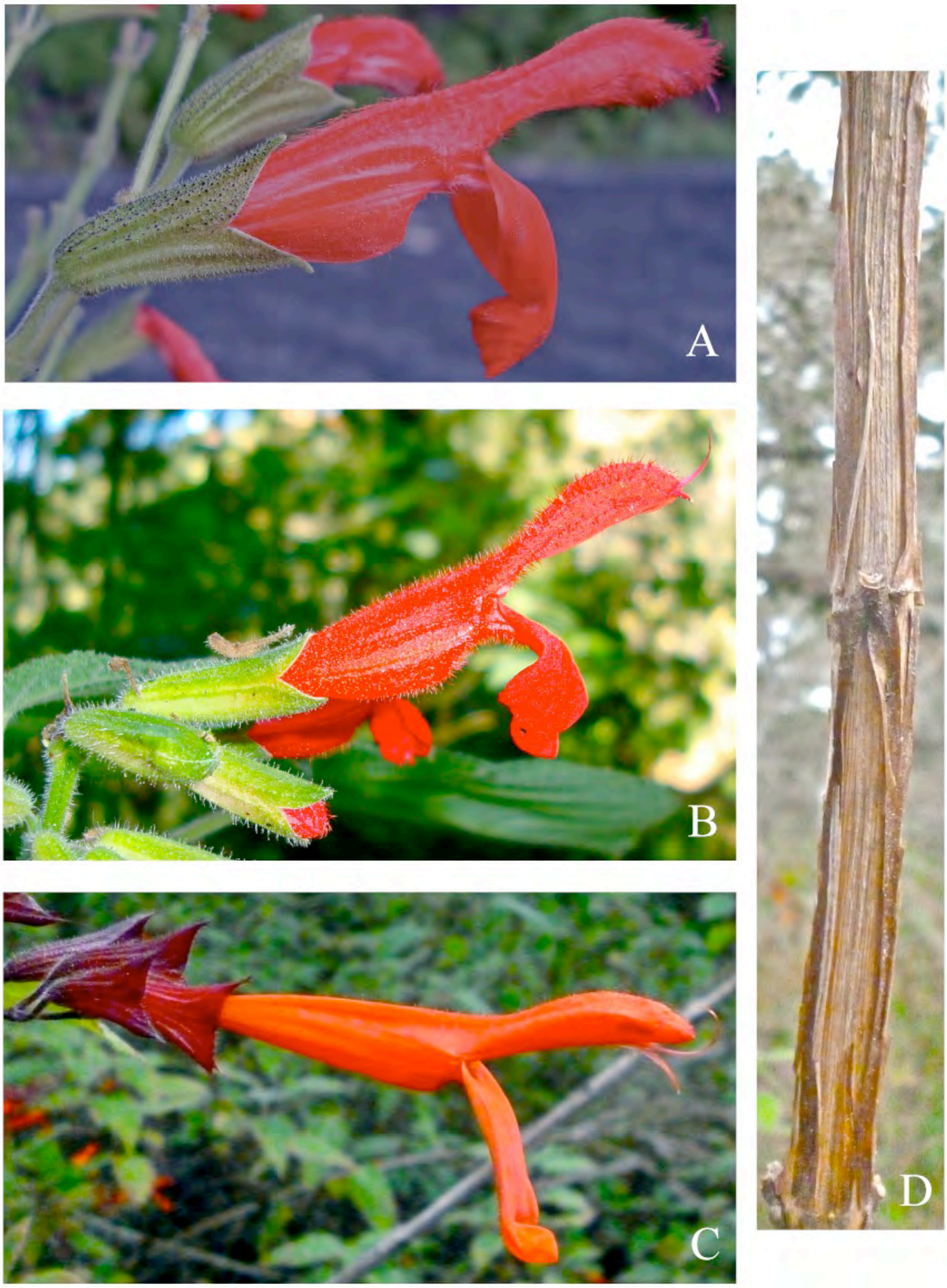


Figura 2.

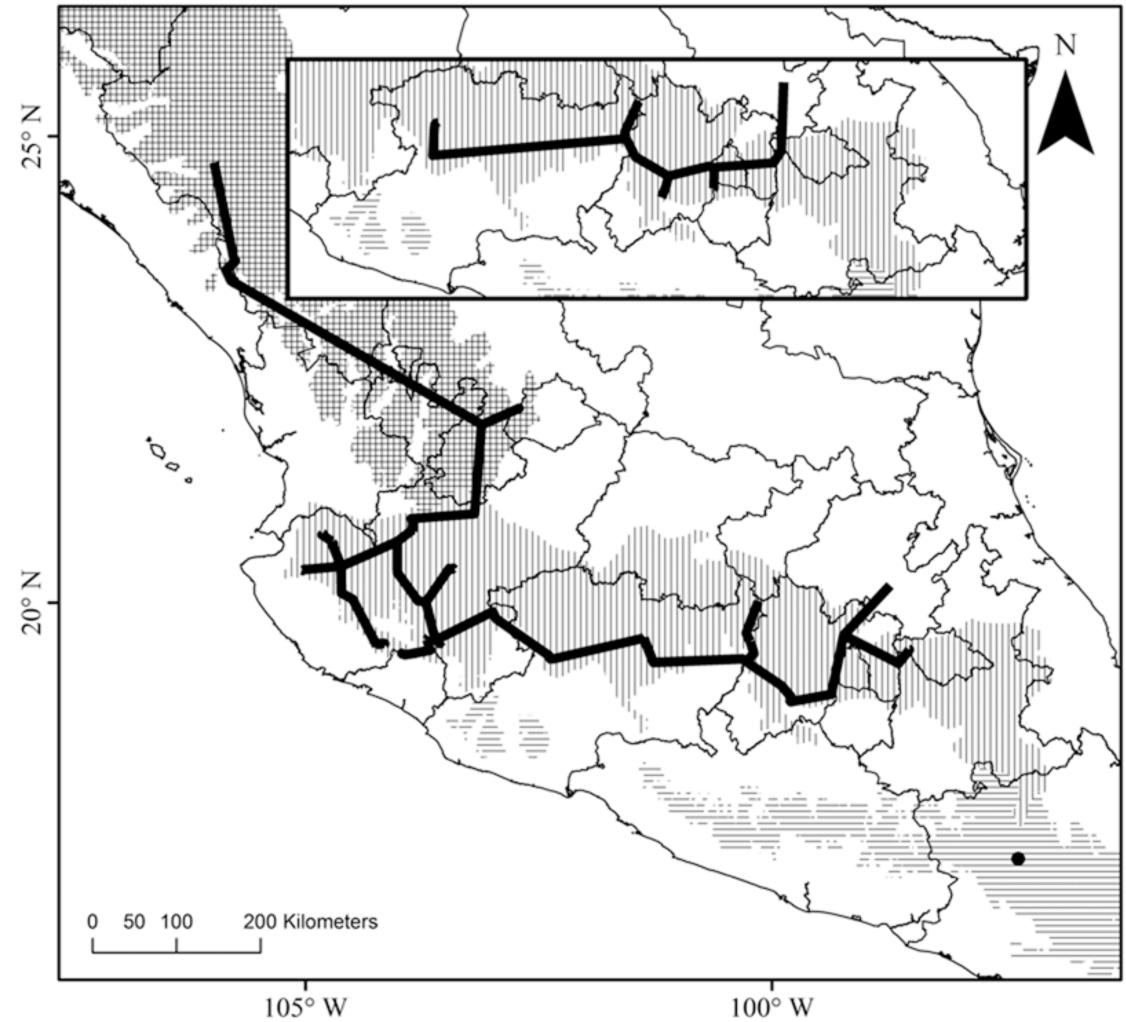
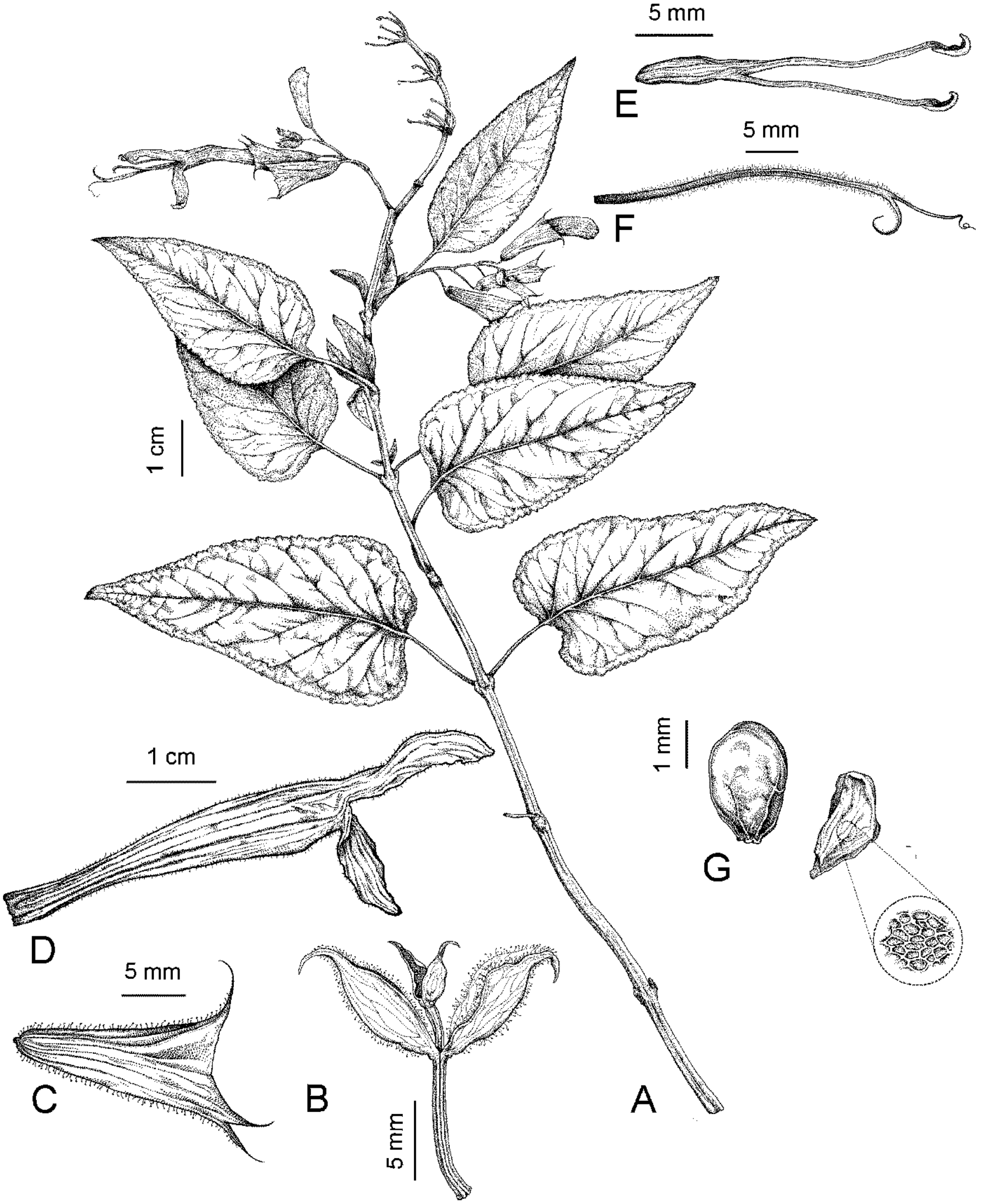


Figura 3.



4.11 González-Gallegos, J. G. y O. J. Gama-Villanueva. 2013. Resurrection of *Salvia* species (Lamiaceae) recently synonymized in *Flora Mesoamericana*. *Phytotaxa* 151: 1-24

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Resurrection of *Salvia* species (Lamiaceae) recently synonymized in Flora Mesoamericana

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Abstract

Some species of *Salvia* were regarded as conspecific with other species of the genus in *Flora Mesoamericana*. Several of these changes are not justified and could eventually create misconceptions and confusion regarding the identification and distribution of these species, as well as the diversity exhibited by the genus. Therefore, in order to avoid the negative consequences of this synonymizing, updated and improved descriptions, a discussion of the diagnostic features, distribution maps and photographs of the taxa involved are provided here.

Resumen

Algunas especies de *Salvia* fueron sumergidas como conespecíficas de otras especies del género en *Flora Mesoamericana.* Varios de estos cambios no están justificados y podrían eventualmente generar malinterpretaciones y confusión respecto a la identificación y distribución de estas especies, y sobre la diversidad del género. Por tanto, para evitar los efectos negativos del proceso de sinonimización, se proveen descripciones actualizadas y complementadas, una discusion de las características diagnósticas, mapas de distribución y fotografías de los taxa implicados.

Introduction

The large number of species (about 900 species worldwide) and extensive distribution of the genus *Salvia* L. (Harley et al. 2004) make this genus taxonomically difficult. At present, no comprehensive modern revision of the genus is available, since Bentham (1876) and Briquet (1897). However, since that time several new species and geographical novelties have been published (for example: Epling 1939, Fernald 1900, dos Santos 1991, Espejo & Ramamoorthy 1993, Torke 2000, Fernández-Alonso 2006, Wood 2007, Celep et al. 2010, Cornejo-Tenorio & Ibarra-Manríquez 2011, Klitgaard 2012). On the other hand, phylogenetic analysis based in DNA sequences have revealed that the genus is not monophyletic as traditionally defined, other genera from subtribe Salviinae are intermixed within *Salvia* lineages; altogether at least three well-defined clades (Walker & Sytsma 2004, Walker 2006, Walker et al. 2007, Jenks et al. 2011, Jenks et al. 2013). One of these clades embraces subgenus *Calosphace* (Bentham 1832–1836: 198) Epling (1939: 4) plus section *Audibertia* Benth. in Lindley (1829: sub t. 1282), and incorporates the majority of *Salvia* growing in America. There are also some representatives of subgenus *Leonia* Bentham (1876: 1196) section *Heterosphace* Bentham (1876: 1196) and three species that originally constituted the genus *Salviastrum* Heister & Fabricius (1759: 231) in the continent; these correspond to a different clade to that of *Calosphace*.

The development of regional floras has been an outstanding contribution to the inventory, classification and solution of taxonomic uncertainties. One of these projects that are currently in progress is *Flora Mesoamericana*. It deals with vascular plant diversity found along Central America and southeastern Mexico, including the Mexican states of Campeche, Chiapas, Tabasco, Quintana Roo and Yucatán. The last volume

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published includes the family Lamiaceae (Davidse *et al.* 2012), with most of the *Salvia* species treated by Klitgaard (2012). In her work, she regarded several *Salvia* species as synonyms of other ones, a view not followed in other regional floras and taxonomic revisions (Fernald 1900, Epling 1939, 1940, 1941, 1944, 1947, 1951, 1960, Epling & Mathias 1957, Epling & Játiva 1963, 1966, 1968, Standley & Williams 1973, Wood & Harley 1989, Espejo & Ramamoorthy 1993, Pool 2001, Rzedowski & Rzedowski 2005, Turner 2008, 2009, 2011). Despite the novelty of her decision she does not provide a strong justification for it. She did not expand morphological circumscriptions of the species to include the variation exhibited by those that she synonymized. The species concerned are: *S. brachyodonta* (1898: 149) [considered by Klitgaard (2012) under *S. albiflora* M.Martens & Galeotii (1844: 76)], *S. dichlamys* Epling (1939: 276) [under *S. amarissima* Gómez (1797: 4)], *S. heterotricha* Fernald (1900: 500) [under *S. reptans* Jacquin (1797: 33)], *S. iodantha* Fernald (1900: 547) [under *S. purpurea* Cavanilles (1793: 52)], *S. lophanthoides* Fernald (1900: 499) [under *S. mocinoi* Bentham (1833: 271)], *S. nepetoides* Kunth [under *S. amarissima*], *S. punicans* Epling (1940: 525) [under *S. carnea* Kunth (1817: 300)], *S. subpatens* Epling (1939: 97) [under *S. patens* Cavanilles (1799. 33)], and *S. unicostata* Fernald (1900: 501) [under *S. reptans*]. It is conceived here that these changes are not admissible, and that if those are not clarified, they could provoke confusion in the identity of *Salvia* samples and in the curation of specimens at the herbaria. Accordingly, the present document provides expanded descriptions of the species involved and a brief explanation justifying why they should be recognized as distinct species. *Salvia lophanthoides* Fernald (1900: 499) was excluded because this species is being treated in another paper (in preparation). Distribution maps, and photographs (when available) are also provided here. The descriptions and the distribution maps where based on field observations and on herbarium specimens examined at several herbaria (CHAPA, CIDIIR, CIMI, CREG, ENCB, Herbario de la Univerisdad Autónoma de Zacatecas, GUADA, HUAA, HUMO, IBUG, IEB, MEXU, MICH, UAGC, UC, WIS, XAL, and ZEA) and online collections of type specimens.

Salvia brachyodonta Briquet (1898: 149). Type: MEXICO. Jalisco: hillsides near Guadalajara, 27 September 1889, *C.G. Pringle 2463* (holotype BR!, isotypes CAS!, F!, GH!, GOET!, K!, MEXU!, MO!, MPU!, NY!, US!). Fig. 1.

Shrub, erect, 50–80 cm tall; stems puberulent and covered with appressed hairs. Leaves with petioles (0.7–)1.4–2.9(–4.7) cm long, puberulent and covered with appressed hairs; leaf blade deltoid, ovate to ovate-lanceolate, 3–6(–7.3) × 2.2–3.1(–5.2) cm, acuminate to caudate at the apex, truncate, cordate to subequal, or less often short cuneate, margin broadly serrate, puberulent and sparsely covered with appressed hairs and sessile glandular dots, mainly on the veins and beneath. Inflorescence in racemes 7.5–21 cm long, 8–20 verticillasters each, these 6–12(–16)-flowered, lowermost nodes 1.2–2.4 cm apart, floral axis puberulent and with some appressed hairs. Floral bract ovate to ovate-lanceolate, 3.9–4.5 × 1.4–2.8 mm, deciduous, acuminate to caudate at the apex, truncate at the base, margin entire and ciliated. Flowers with pedicels (1–)2–2.4(–3.5) mm long, puberulent. Calyx 3.1–3.5 mm long, 1.7–2.2(–2.5) mm wide at the throat, green, hispidulous on the veins and wit sessile glandular dots, the rest glabrous, internally puberulent, upper lip 3-veined and entire, lobes of the lips truncate. Corolla sky-blue with white nectar guides on the lower lip, glabrous except for the upper lip, which is sparsely pilose; tube (3.6–)4–5.2 mm long, 1.7–2.2 wide at the throat, slightly ventricose, not constrained at the base, internally ornate with two papillae; upper lip 4–4.7 mm long, lower lip (3–)4–5.1 × 3–4.8 mm, deflexed. Stamens 2, included; filament 1.6–1.8 mm long; connective (3.4–)4.8–6.1 mm long, ornate at midportion with an acute retrorse tooth; theca 1–1.2(–1.6) mm long; a pair of staminodes present above and behind filament attachment to the corolla. Gynobasic horn 0.5–0.8 mm long; style 7.7–9.8 mm long, pilose at the apex, lower stigmatic branch acute. Mericarp ovoid 1–1.3 × 0.8-1 mm, golden brown, smooth and glabrous.

Distribution, habitat and phenology: *Salvia brachyodonta* grows in a segment of the canyons and surroundings of the rivers Verde, Santiago and Juchipila in the states of Jalisco and Zacatecas, Mexico (fig. 2). It dwells in tropical deciduous forests and secondary vegetation, at elevations from (800–)1000–1600(–1920)

m. It shares habitat with the trees *Acacia pennatula* (Schltdl. & Cham.) Benth., *Alvaradoa amorphoides* Liebm., *Bursera bipinnata* (DC) Engl., *B. fagaroides* (Kunth) Engl., *Cascabela ovata* (Cav.) Lippold, *Ceiba aesculifolia* Baker f., *Dalembertia populifolia* Baill., *Guazuma ulmifolia* Lam., *Pithecellobium dulce* (Roxb.) Benth., *Stemmadenia palmeri* Standl., *Tabebuia chrysantha* (Jacq.) G.Nicholson, and the herbs *Adenophyllum porophyllum* (Cav.) Hemsl., *Bidens odorata* Cav., *Delilia biflora* (L.) Kuntze, *Elytraria imbricata* (Vahl) Pers., *Euphorbia francoana* Boiss., *E. tanquahuete* Sessé & Moc., *Iresine diffusa* Willd., *Justicia caudata* A.Gray, and *Tagetes erecta* Kunze. It flowers and fructifies from July to September.

FIGURE 1. *Salvia brachyodonta*, A) inflorescence, B) leaves (pictures taken by J.G. González-Gallegos).

Discussion: *Salvia brachyodonta* was reduced to the synonymy of *S. albiflora* by Klitgaard (2012) even though the first belongs to section *Polystachyae* Epling (1939: 213) and the other to section *Angulatae* (Epling 1935: 67) Epling (1939: 234). These sections differ in several characters: cordate, truncate to rounded leaves at the base in section *Polystachyae* (*vs.* attenuated to acute in section *Angulatae*), truncate to short cuspidate calyx lobes (*vs.* acute to caudate) and corolla tube internally ornate with 2 or 4 papillae (*vs.* epapillate). Additionally, *S. brachyodonta* presents shorter floral bracts (3.9–4.5 *vs.* 5–7 mm long), shorter calyces [3.1–3.5 *vs.* (4–)5–5.8 mm], always sky blue instead of white corollas, which is the more typical corolla color in *S. albiflora*, and the style is apically pilose instead of glabrous. *Salvia brachyodona* is a Mexican endemic with a narrow distribution, it is restricted to western Mexico and no population grows in the area of *Flora Mesoamericana* (fig 2).

Representative specimens examined (*Salvia brachyodonta*): MEXICO. Jalisco. Guadalajara: Barranca de Huentitán, bajando hacia el pueblo e Arcediano, 1000–1700 m, 28 July 1985, *R. Cuevas-G. 730* (IBUG!, IEB!, MICH!, WIS!). San Cristóbal de la Barranca: cerca del Puente del Río Cuixtla, aproximadamente 0.4 km al NE de San Cristóbal de la Barranca, 21°2'5"N 103°25'40"W, 810 m, 28 August 1998, *P. Carrillo-R. & L. Ortiz-C. 411* (IBUG!). Zapotlanejo: al extremo W de la población El Aguacate y al borde de la barranca del Río Verde, 20.755174ºN 103.241581ºW, 1550 m, 22 September 2012, *J.G. González-G. et al.* 1288 (IBUG!). Zacatecas. Jalpa: por la carretera a Aguascalientes, a la altura del camino que va a La Capilla, 21°38'40"N 102°55'43"W, 1800 m, 26 September 1991, *J.J. Balleza-C. 4010* (CIIDIR, Herbario de la Universidad Autónoma de Zacatecas).

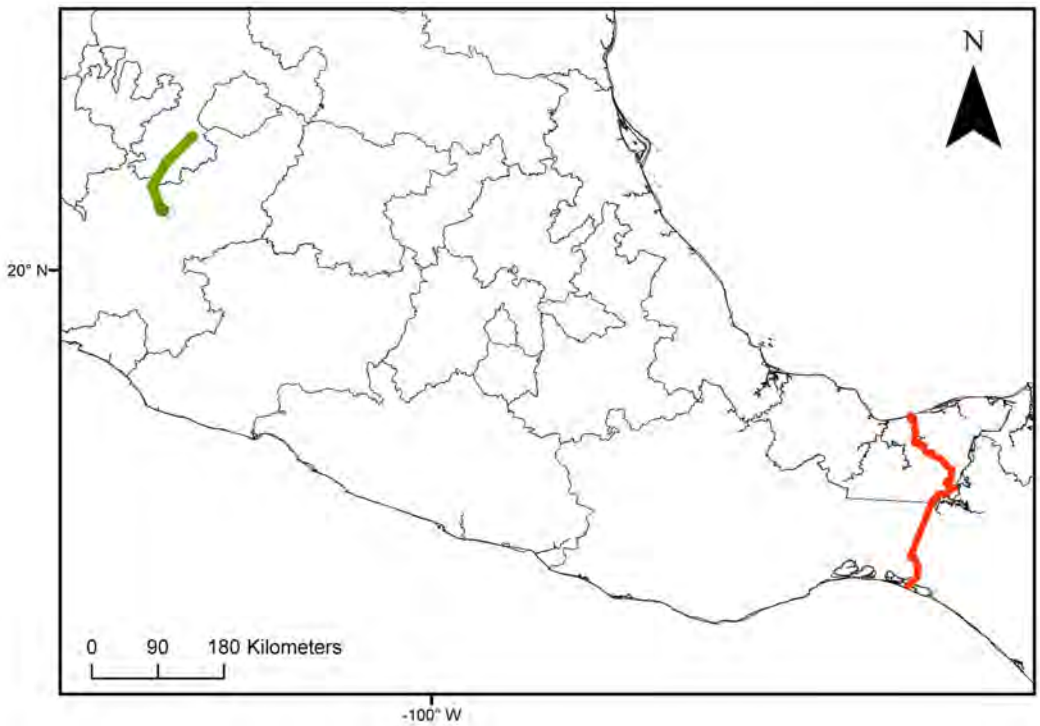

FIGURE 2. Distribution of *Salvia brachyodonta* represented by an individual track (green line) and collection points (circles). The northern boundary of *Flora Mesoamericana* is highlighted with a red line.

Representative specimens examined (*Salvia albiflora*): MEXICO. Veracruz. Acajete: along Mex. Hwy. 140 through extensive lava flow called El Colcancillo, 26.5 km by road NO of Jalapa, 1.7 km O of La Joya, 19º38'N 97º6'W, 2200 m, 19 July 1978, *T.S. Cochrane et al. 8577* (IBUG!); Cruz Verde, 19º35'N 97º0'W, 2050 m, August 1979, *M.J. Cházaro-B. 997* (GUADA!). Ixhuacan: en el camino de El Arenal a Ixhuacan de los Reyes, 19º22'N 97º6'W, 1500 m, 15 July 1983, *H. Narave-F. & F. Vázquez-B. 843* (GUADA!). Miahuatlán: Miahuatlán, calle Galeana, esquina con La Defensa, 19º11'13"N 96º87'8.7"W, 25 August 2012, *R. Méndez-B. 10* (IBUG!). Soledad Atzompa: col. Rancho Nuevo, congregación Atzompan, 18º10'0"N 97º16'0"W, 2300 m, 7 November 1985, *J.L. Martínez & R. Acosta P. 1056* (IBUG!). Tatatila: camino de terracería las Visas-Tatatila a la altura de la desviación a San Antonio, 19º40'N 97º7'W, 2200 m, 29 April 1989, *P. Zamora-C. 970* (IBUG!). Tlacolulan: Potrero García, 17 August 1973, *F. Ventura-A. 8863* (IBUG!). Xico: Terracería, 1 km al NE de Oxtlapa, rumbo a Tonalco, faldas del Cofre de Perote, 19º25'50"N 97º6'5"W, 2250 m, 27 September 2001, *A. Rincón-G. & C. Durán 2619* (IBUG!).

Salvia dichlamys Epling (1939: 276). Type: MEXICO. Estado de México. Temascaltepec: near Rincón, 1960 m, 2 July 1932, *G.B. Hinton 914* (holotype RSA, isotypes GH, MO!, PH, NY!, UC!). Fig. 3.

Salvia nigriflora Epling (1940: 529). Type: MEXICO. Michoacán. Coalcomán: Sierra Naranjillo, 1300 m, *G.B. Hinton 13956* (holotype UC!, isotypes CAS!, GH!, LL!, MO-155463!, MO-155464!, NY!, PH!, RSA!, US!).

Perennial herb, erect, 20–80(–100) cm tall; stems pilose and occasionally covered with glandular-capitate hairs. Leaves with petioles 2–6.4 mm long, sparsely to densely pilose; leaf blade lanceolate, oblong-lanceolate to ovate-lanceolate, (1.5–)2.8–6.3 × 0.8–1.8(–2.6) cm, acute to rounded at the apex, rounded at the base, margin crenate to serrate, bullate, glabrous and sparsely pilose above, white tomentose beneath. Inflorescences in racemes 12–21 cm long, 4–10 verticillasters each, these 2–4(–6)-flowered, lowermost nodes

2.5–4.4 cm apart. Floral bract lanceolate to ovate-lanceolate, 2.8–8 × 1.5–3 mm, deciduous, acute to caudate at the apex, truncate at the base, margin entire, sparsely pilose and ciliated at the margin. Flowers with pedicels 3.6–5.8(–7.2) mm long, pilose and puberulent. Calyx (6.2–)8.3–11 mm long, 3.8–6 mm wide at the throat, green and purple tinged, pilose, internally covered with tiny appressed hairs, the upper lip 7-veined and entire, lobes of the lips acute. Corolla magenta or purple and with white nectar guides on the lower lip, glabrous except for the upper lip which is sparsely pilose; corolla tube 7–15 mm long, 4.8–7.2 mm wide at the throat, ventricose, constrained toward the base and internally ornate with two papillae; upper lip 5.2–9.2 mm long, lower lip 10–16 × (5.8–)9.2–12 mm, deflexed. Stamens 2, included; filament 2.4–4 mm long; connective 9.8–12 mm long, ornate at midportion with a short acute tooth; theca 1.7–3.2 mm long. Gynobasic horn 1–1.2 mm long; style 1.6–2.2 cm long, pilose at the apex, lower stigmatic branch acute. Mericarp ovoid, 2.5–2.9 × 1.8–2 mm, light brown and dark brown marbled, smooth and glabrous.

FIGURE 3. *Salvia* dichlamys, A) variant with magenta corollas, B) variant with purple corollas, C) lower leaf surface (pictures A and C taken by J.G. González-Gallegos, B by R. Ramírez-Delagadillo).

Distribution, habitat and phenology: *Salvia dichlamys* inhabits the Mexican states of Estado de México, Guerrero, Jalisco and Michoacán (fig. 4). It grows in oak and pine-oak forests, from (1167–)1800–2400 m. It shares habitat with *Arctostaphylos pungens* Kunth, *Pinus oocarpa* Schiede ex Schltdl., *Quercus castanea* Née, *Q. gentryi* C.H.Mull*, Q. magnoliifolia* Née. It flowers and fructifies from the end of May to November.

Discussion: Klitgaard (2012) considers *Salvia dichlamys* to be conspecific with her concept of *S. amarissima*. The first belongs to section *Fulgentes* Epling (1939: 273) and the other to section *Uricae* Epling (1939: 174). Section *Fulgentes* differs because the lack of long glandular-capitate hairs throughout the stems, 7-veined upper calyx lip (*vs.* 5-veined), and red corollas (*vs.* blue corollas) though there are some populations of *S. dichlamys* and *S. microphylla* with purple ones. Furthermore, *S. dichlamys* has shorter petioles [(2–6.4 *vs.* (7–)30–44 mm)], oblong-lanceolate to ovate-lanceolate leaves (*vs.* ovate-deltoid to ovate), less flowers per verticillaster [2–4(–6) *vs.* 6–10], usually bigger calyces [(6.2–)8.3–11 × 3.8–6 *vs.* 4.7–7 × 3–4 mm], longer corolla tube [7–15 *vs.* 5–6.5(–7.3) mm], longer lower corolla lip [(10–16 *vs.* 7–10(–11.3) mm)], longer filament (2.4–4 *vs.* 1.5–1.7 mm), longer connective [9.8–12 *vs.* (2.5–)5–5.5 mm] and longer style [1.6–2.2 *vs.* (0.8–)1.2–1.4 cm], and bigger mericarps [2.5–2.9 × 1.8–2 *vs.* (1.6–)2.1–2.2 × (0.5–)1–1.1 mm]. *Salvia dichlamys* does not grow in Mesoamerican region (fig. 4).

Representative specimens examined (*Salvia dichlamys*): MEXICO. Guerrero. Coyuca de Catalán: 2.5 km al NE de la comunidad del Aguacate, brecha rumbo a Primer Campo, 18°10’59.52”N 101°273.57”W, 1167 m, 8 November 2009, *J.G. González-G. et al. 434* (IBUG!). Jalisco. Concepción de Buenos Aires: 24 km al E de Cd. Guzmán, carr. A Tamazula, 33 A. 40 km por brecha de Vista Hermosa a Concepción de Buenos Aires, 1900 m, 5 July 1988, *M. Fuentes-O. 364* (CIIDIR!, ENCB!, GUADA!, IEB!, MEXU!, MICH!). Mazamitla: along road from Jiquilpan to Ciudad Guzmán, in mountains S of Michoacán border, ca. 3 km NE and above puerta El Zapatero (above rancho El Terrero and 2.5 km S of Espinal), 2400 m, 30 July 1960, *H.H. Iltis et al. 559* (MICH!, UC!, WIS!). Tamazula de Gordiano: brecha de Tamazula a San Juan de la Montaña, 10.8 km directos al E de Tamazula, 1620 m, 15 July 1988, *M. Fuentes-O. 407* (GUADA!, IEB!, MEXU!, MICH!). Tecalitlán: Llano Verde, cerca de Los Corales, Sierra de Los Corales, 1600 m, 24 October 1963, *J. Rzedowski 17413* (MICH!, UC!). Michoacán. Aguililla: 500 m al NE de Dos Aguas, antena de microondas Chiqueritos, 2383 m, 1 November 2009, *J.J. González-G et al. 420* (IBUG!). Chinicuila: Sierra Naranjillo, 13 July 1939, *G.B. Hitnon et al. 13916* (UC!).

Representative specimens examined (*Salvia amarissima*): MEXICO. Estado de México. Chalco: San Pablo Atlazalpan, 25 May 1985, *A. Ventura-A. 4384* (IBUG!). Huehuetoca: presa de Cuevecillas, a 5 km al SW de Huehuetoca, 12 October 1974, *A. Patiño-S. 109* (IBUG!). Guanajuato. Atarjea: Aldama, 8 October 1977, *S. Zamudio 2513* (IBUG!). Guanajuato: 3 km al NE de Santa Rosa, 20 November 1986, *R. Galván & J.D. Galván 2475* (IBUG!). Salvatierra: cerro de los Lobos, 3 km al E del Rancho de Las Cruces, 7 September 1974, *D. Flores 40* (IBUG!). Hidalgo. Jacala: Jacala, km 276 carr. Méxcio-Jacala, 1700 m, 30 October 1966, *L.M. Villarreal de Puga 15097* (IBUG!). Metzquititlán: Sobre la autopista 105 al N de Tampico, 5.7 mi al N de Metzquititlán, sobre el lado N de la carretera, 21 November 1975, *K.M. Peterson & C. R. Broome 491* (IBUG!). Michoacán. Jiquilpan: Los Remedios, 1650 m, 19 October 1984, *B. Ceja-R. 125* (CIMI!). Pátzcuaro: cerro del Bao, cerca de Tzurumutaro, 27 October 1988, *H. Díaz-B. 5232* (IBUG!). Querétaro. Cadereyta: parador Tepozán, 14 km de la carr. Vizarrón a San Joaquín, 26 August 2001, *E. Carranza & S. Zamudio 6225* (IBUG!). Zacatecas. Guadalupe: 3 km al N de la calzada Solidaridad, por la carretera en construcción que entronca con la carretera a Veta Grande, 2412 m, 16 August 2002, *J.J. Balleza-C. & M. Adame-G. 12795* (Herbario de la Universidad Autónoma de Zacatecas!).

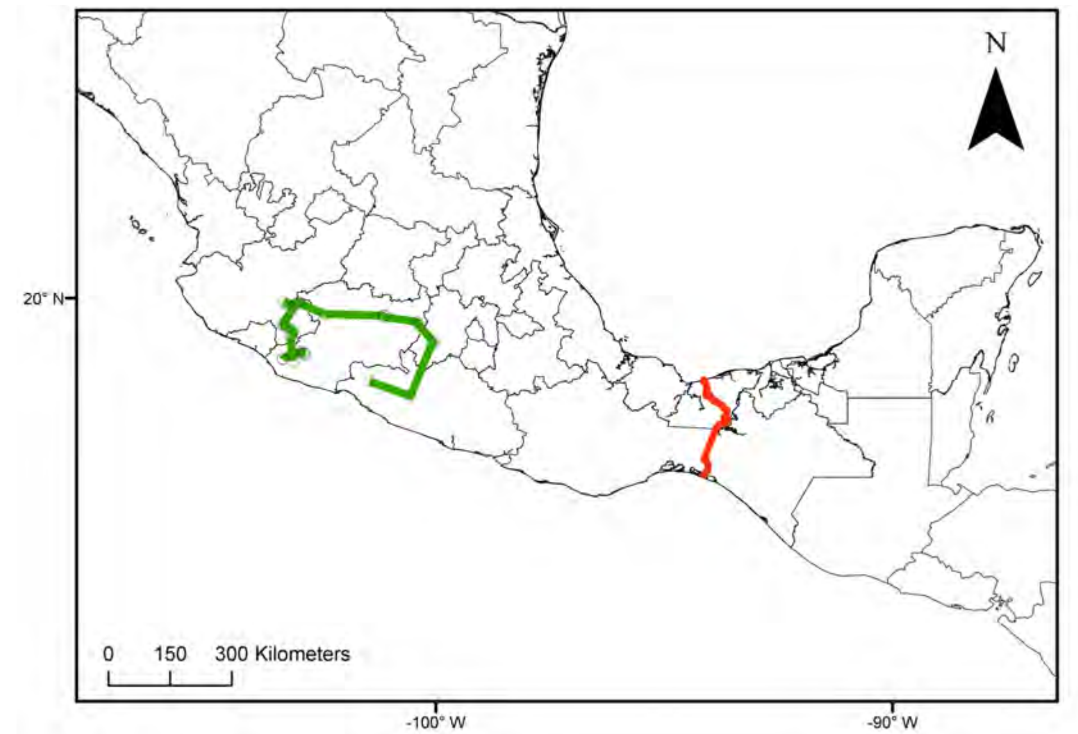

FIGURE 4. Distribution of *Salvia dichlamys* represented by an individual track (green line) and collection points (circles). The northern boundary of *Flora Mesoamericana* is highlighted with a red line.

Salvia heterotricha Fernald (1900: 500). Type: MEXICO. Jalisco. Zapopan: Río Blanco, June–October 1886, *E. Palmer 53* [lectotype GH!, isolectotype BM, F, MEXU!, MO, NY!, PH, US!; lectotype designated by Epling (1939)]. Fig. 5 A–C.

Salvia heterotricha var. *multinervia* Fernald (1900: 501). Type: MEXICO. Nayarit: between Acaponeta and Pedro Paulo, 2 August 1897, *J.N. Rose 1934* (holotype US!).

FIGURE 5. *Salvia heterotricha*, A) apical portion showing the typical corolla color and the insertion of the leaves, B) variant with violet to purple corolas, C) variant with white corollas. *Salvia reptans,* D) flowers, E.) pseudo-whorled insertion of the leaves (pictures A and C taken by J.G. González-Gallegos; B, C and D by A. Castro-Castro).

Perennial herb, erect, (10–)20–60 cm tall, often tuberous roots; stems hispid with a mix of glandular-capitate and eglandular hairs. Leaves sessile; leaf blade linear to linear-lanceolate, (1.8–)3–7.8(–10) × 0.2–0.9) cm, acute at the apex, attenuated and then truncate at the base, margin entire, glabrous or sparsely covered with appressed hairs on both surfaces. Inflorescences in racemes (8–)14.5–21 cm long, with (5–)7–11 verticillasters each, these (2–)4–6-flowered, lowermost 2–3.2 cm apart, floral axis hirsute with a mix of glandular-capitate and eglandular hairs. Floral bract ovate to ovate-lanceolate, 3–4.6(–16.7) × 1.8–3.3(–4) mm, persistent, acute at the apex, truncate at the base, margin entire, diffusely covered with appressed hairs and sessile glandular dots, ciliated and bordered with glandular-capitate hairs at the margin. Flowers with pedicels 2.5–3 mm long, hirsute with both glandular-capitate and eglandular hairs. Calyx 5.5–7.1(–10) mm long, 3.7–4.1(–5.5) mm wide at the throat, green, hirsute with glandular-capitate and eglandular hairs, covered with sessile amber glandular dots, internally puberulent to verrucose, upper lip 5-veined, entire, lobes of the lips acute. Corolla sky blue to purple with white nectar guides on the lower lip (rarely completely white); corolla tube (6–)6.7–8.3 mm long, 3.2–4.1(–4.8) mm wide at the throat, slightly ventricose and constrained at the base, internally epapillate; upper lip 4–7 mm long, lower lip 8.5–13.9 × (5.2–)8.2–12.5 mm, deflexed. Stamens 2, included; filament 2.2–2.8 mm long; connective 5.1–7 mm long, ornate with a retrorse acute tooth, or sometimes this absent; theca 1.7–2.2 mm long; a pair of staminodes above and behind filament attachment to the corolla. Gynobasic horn 1.1–1.2 mm long; style 11.9–15.8 mm long, pilose at the apex, lower stigmatic branch acute. Mericarp ovoid, 2.6–2.8 × 1.4–1.6 mm, pale brown, smooth and glabrous.

Distribution, habitat and phenology: *Salvia heterotricha* is endemic to western Mexico, growing only in the states of Jalisco, Nayarit and Zacatecas. (fig. 6). It dwells mainly in oak, pine-oak and oak-pine forests, but it can be occasionally found in tropical deciduous forests, grasslands or secondary vegetation, from (600–)1500–2000(–2550) m elevation. It shares habitat with the trees *Acacia farnesiana* (L.) Willd., *A. pennatula*, *Agarista mexicana* (Hemsl.) Judd., *Arbutus xalapensis* Kunth, *Bejaria aestuans* Mutis ex L., *Byrsonima crassifolia* (L.) Kunth, *Clethra rosei* Britton, *Pinus devoniana* Lindl., *P. lumholtzii* B.L.Rob. & Fernald, *P. oocarpa* Shiede & Schltdl., *Quercus coccolobifolia* Trel., *Q. grisea* Liebm., *Q. magnoliifolia*, *Q. potosina* Trel., *Q. resinosa* Liebm., *Q. viminea* Trel., and the herbs *Bletia adenocarpa* Rchb. f., *Chloris virgata* Sw., *Dahlia pugana* Aarón Rodr. & Art.Castro, *Desmodium angustifolium* (Kunth) DC., *Euphorbia macropus* (Klotzsch & Garcke) Boiss., *E. sphaerorhiza* Benth., *Iostephane heterophylla* (Cav.) Hemsl., *Lolium perenne* L., *Salvia angustiarum* Epling, *S. firma* Fernald, *S. lavanduloides* Kunth, and *Tigridia dugesii* S.Watson. It can flower and fructify through whole the year, but more frequently from July to September.

Discussion: *Salvia heterotricha* was regarded as a synonym of *S. reptans* (fig 5 D and E) in *Flora Mesoamericana* (Klitgaard 2012). However, this species differs from *S,. reptans* by 3 distinctive characters, the roots are tuberous instead of slender and delicate, leaves are clearly opposite instead of pseudo-whorled (fascicles of several leaves developed in the leaf axils at each node throughout the plant; fig. 5 E), and the inflorescences are covered with mixed glandular-capitate and eglandular hairs (2–3 mm long), hence the specific epithet *heterotricha*, different hairs, contrasting with the hispidulous (hairs less than 1 mm long) and without glandular hairs of *S. reptans*. Peterson (1978) conducted a revision of section *Farinaceae*, which embraces both species, she distinguished them in base to the same characters of the roots, leaf distribution and inflorescence pubescence; moreover, she highlighted the difference in ecological preferences between them, the first growing in well drained calcareous soils, and the other in wet volcanic soils, usually at the edge of little ponds and creeks. Turner (2008) in a more recent analysis of the section also recognizes both species. *Salvia heterotricha* is restricted to western Mexico (fig. 6), while *S. reptans* extends from southern United States of America to Guatemala.

Representative specimens examined (*Salvia heterotricha*): MEXICO. Jalisco. Mezquitic: Los Lirios, 1.6 km al S de San Andrés Cohamiata, 130–140 km al SW de Huejuquilla, 22°10’18.54”N 104°14’15.65”W, 1943 m, 4 September 2012, *J.G. González-G. et al. 1273* (IBUG!). San Martín Bolaños: Las Vidrieras, 10 km al NW de El Platanar, 2450 m, 1 September 1968, *J. Rzedowski 26174* (MICH!). Tequila: cerro de Tequila, 2400 m, 14 July 1971, *R. González-T. 271* (ENCB!, MICH!). Zapopan: La Primavera, 30 km al O de Guadalajara, 1700 m, 27 July 1965, *J. Rzedowski 20259* (ENCB!); cerro El Tepopote, aproximadamente 3.2 km al NO de Venta del Astillero, aproximadamente 13 km an línea recta al O del extremo occidental de Guadalajara, 20.751148°'N 103.563266°'W, 1813 m, 26 July 2012, *J.G. González-G. et al. 1226* (IBUG!). Nayarit. Acaponeta: 1–2 km al SE de Mesa de Pedro-Pablo, por la vereda a pie a San Blasito, 6 August 1987, *O. Téllez-V. et al. 10690* (MEXU!). Del Nayar: 4 miles of La Ciénega on ridge aobut 5 miles NW of Mesa del Nayar, 29 July 1970, *D.H. Norris & D.J. Taranto 14233* (MEXU!). Zacatecas. General Enrique Estrada: cerro La Antorcha, Sierra El Laurel, W slopes of Cerro La Antorcha, ca. 9 km ESE of La Higuera (La Higuera is along hwy 70, ca 16 km SW of Calvillo, 21°41.8'N -102°46'W, 2300–2800 m, 14 July 1999, *M. Provance et al. 1512* (MEXU!). Tlaltenango de Sánchez Román: aproximadamente 38 km al W de Jalpa, sobre la carretera a Tlaltenango, 30 km del entronque con la carretera Jalpa-Juchipila, 2550 m, 21 October 1973, *J. Rzedowski & R. McVaugh 969* (ENCB!, MEXU!, MICH!).

Representative specimens examined (*Salvia reptans*): MEXICO. Aguascalientes. Calvillo: Los Alisos, 2050 m, 7 January 1981, *C. Cuéllar-R. 35* (HUAA!). Colima. Cuauhtémoc: Cerro Colorado, 2 km al E del poblado Cerro Colorado, 990 m, 23 August 1984, *F.J. Santana-M. & N. Cervantes-A. 588* (IBUG!, WIS!). Distrito Federal. Magadalena Contreras: Contreras, 14 June 1925, *H. Yoshida 112* (IBUG!). Estado de México. Acambay: 4.6 km al S de Acambay, alrededores de la caseta de cobro Acambay, autopista Arco Norte, 19°54'47"N 99°51'7"W, 2515 m, 24 August 2011, *P. Carrillo-R. 6436* (IBUG!). Morelos. Tepozotlán: presa de La Concepción, 2400 m, 23 September 1979, *T. Estrada 11827* (GUADA!). Guanajuato. Ciudad Manuel Doblado: 6 km al NE de Ayo, 1850 m, 30 July 1975, *H. Puig 6292* (ENCB!). Jalisco. Arandas: 4.5 km N of the road summint above Atotonilco, 3 km S of junction of Arandas-Tepatitlán road, 1930 m, 30 August 1990, *R. McVaugh 26624* (CHAPA!, MICH!). Lagos de Moreno: 11 miles SE of Lagos de Moreno, 16 August 1967, *U.T. Waterfall & C.S. Wallis 13874* (UC!). Michoacán. Jiquilpan: lower N-facing slopes of Cerro Santa María, 8–10 km SW of Jiquilpan and 5 km NE of Quitupan (Jalisco), 2000 m, 5 August 1959, *C. Feddema 2* (MICH!). Marcos Castellanos: La Arena, 2100 m, 21 July 1988, *I. García-R. 1926* (IEB!). Tangamandapio: 10 km al SW de Jacona, carretera Jacona-Los Reyes, 1770 m, 23 August 1980, *J. Soto-N. et al 2430* (MEXU!). Nayarit. Tepic: wet meadows near the highway, 12 miles SE of Tepic. Zacatecas. Atolinga: Carrito Polón, 21°48'50"N 103°25'19.8"W, 2079 m, 17 October 2002, *J.J. Balleza-C. & M. Adame-G. 14517* (Herbario de la Universidad Autónoma de Zacatecas!). Tlaltenango de Sánchez Román: cerca de Teúl, 1900 m, 27 July 2010, *J. Padilla-L. 185* (IBUG!). Valparaiso: 24 km of Valparaiso along road to Huejuquilla El Alto, 2256 m, 6 September 1984, *D.E. Breedlove 61369* (MEXU!).

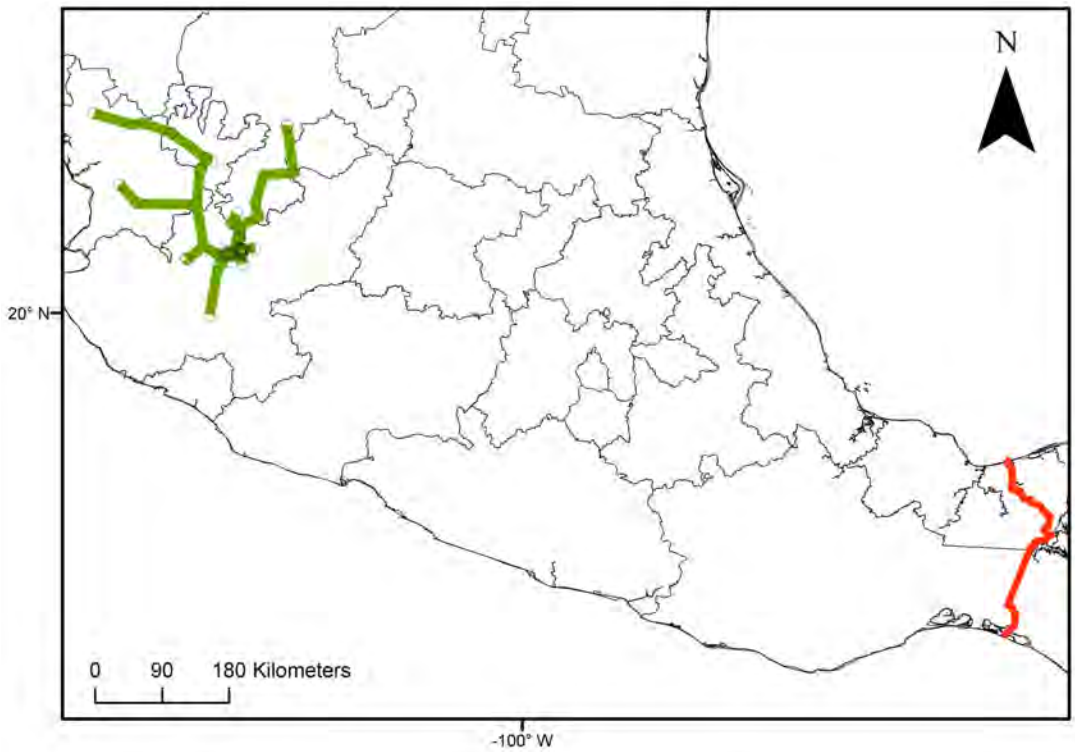

FIGURE 6. Distribution of *Salvia heterotricha* represented by an individual track (green line) and collection points (circles). The northern boundary of *Flora Mesoamericana* is highlighted with a red line.

Salvia iodantha Fernald (1900: 547). Type: MEXICO. Morelos. Cuernavaca: mountain side above Cuernavaca, 7800 ft [2377 m], 5 February 1899, *C.G. Pringle 8039* (holotype GH!, isotypes BM!, BR!, E!, F!, JE!, K!, MEXU!, MICH!, MO!, MU!, NY!, PH!, RSA!, UC!, US!, WU!). Fig. 7A.

Salvia arbuscula Fernald (1910: 421). Type: Michoacán and Guerrero: Sierra Madre, 1500 m, 20 January 1899, *E. Langlassé 767* (holotype GH!, isotypes K!, P-00714834, P-00714835!, US!).

Salvia michoacana Fernald (1900: 548). Type: MEXICO. Michoacán. Pátzcuaro: near Pátzcuaro, 24 November 1891, *C.G. Pringle 3946* (lectotype US, isolectotypes AC!, BM!, BR!, MEXU-00028352!, MEXU-00028353!, MEXU-00028354!, MSC!, NY!, PH!).

Perennial herb to subshrub 0.8–2(–3) cm tall; stems puberulent to shortly pilose. Leaves with petioles 1.7–3.7 cm long, puberulent to shortly pilose; leaf blade ovate to ovate-lanceolate, 4–11.1 × (1.6–)2.4–4.8 cm, acute to caudate at the apex, rounded to truncate at the base, margin serrate, glabrous to sparsely strigose above, pilose to tomentose beneath. Inflorescences in racemes 10.5–25 cm long, with (10–)17–26 verticillasters each, these 8–18-flowered, lowermost nodes 0.5–2.2 cm long, pilose and covered with sessile glandular dots. Floral bract lanceolate to ovate-lanceolate, (0.6–)1–2.3 × (0.1–)0.5–1 mm, deciduous, acute to attenuated at the apex, truncate at the base, margin entire, puberulent to shortly pilose at the outer surface. Flowers with pedicels (1.3–)2–4.8 mm long, puberulent to shortly pilose and covered with sessile glandular dots. Calyx 2.7–3.5(–4.4) mm long, 2–2.8 mm wide at the throat, green, shortly pilose and profusely covered with sessile glandular dots, upper lip 3-veined and entire, lobes of the lips truncate and topped with a mucro by means of a vein extension. Corolla magenta to dark violet, velutinous throughout; tube (11–)13–18 mm long, 2.3–4 mm wide at the throat, slightly expanded toward the apex but not ventricose, not constrained at the base and internally ornate with a pair of papillae; upper lip 3.4–6 mm long, lower lip (1.3–)2.1–4.5 × 2.8–4 mm, incurved-concave. Stamens 2, exserted 6–8 mm from the upper corolla lip; filament 2.2–3.2(–5) mm long; connective (8.3–)13.4–18.8 mm long, ornate with a tiny acute teeth near midportion; theca 1.7–2 mm long. Gynobasic horn 1–1.3 mm long; style 17.3–27 mm long, 6–8 mm exserted from corolla upper lip, glabrous at the apex, lower stigmatic branch acute. Mericarp ovoid, 0.8–1 × 0.4–0.8 mm, brown, smooth and glabrous.

FIGURE 7. *Salvia iodantha*, A) flowers. *Salvia purpurea,* B) flowers (Picture A taken by A. Castro-Castro, and B by J.G. González-Gallegos).

Distribution, habitat and phenology: *Salvia iodantha* grows in the Mexican states of Colima, Durango, Estado de México, Guerrero, Jalisco, Michoacán, Morelos, Nayarit and Sinaloa (fig. 8). It dwells in oak, oak-pine, pine-oak, pine, fir, montane cloud forests, and less often in tropical deciduous forests, from (400–)1100–3200 m elevation. It shares habitat with *Abies flinckii* Rushforth, *Alnus acuminata* subsp. *arguta* (Schltdl.) Furlow, *Arbutus xalapensis*, *Carpinus caroliniana* Walter, *Clusia salvinii* Donn.Sm., *Cornus disciflora* DC., *Clidemia dentata* Pav. ex D.Don., *Fraxinus uhdei* (Wenz.) Lingelsh., *Hesperocyparis lusitanica* (Mill.) Bartel, *Magnolia pacifica* A.Vázquez, *Meliosma dentata* (Liebm.) Urb., *Ostrya virginiana* (Mill) K.Koch., *Parathesis villosa* Lundell, *Podocarpus reichei* J.Buchholz & N.E.Gray, *Prunus rhamnoides* Koehne, *Quercus castanea*, *Senna multifoliolata* (Paul G. Wilson) H.S.Irwin & Barneby, *Smallanthus maculatus* (Cav.) H.Rob., *Symplococarpon purpusii* (Brandegee) Kobuski, *Symplocos citrea* Lex. ex La Llave & Lex., and *Tilia mexicana* Schltdl. It is sympatric with other species of *Salvia* as *Salvia elegans* Vahl, *S. gesneriflora* Lindl. & Paxton, *S. mexicana* L., *S. quercetorum* Epling, *S. thyrsiflora* Benth. It can be found in flower and fruit throughout the year, but more frequently from November to March.

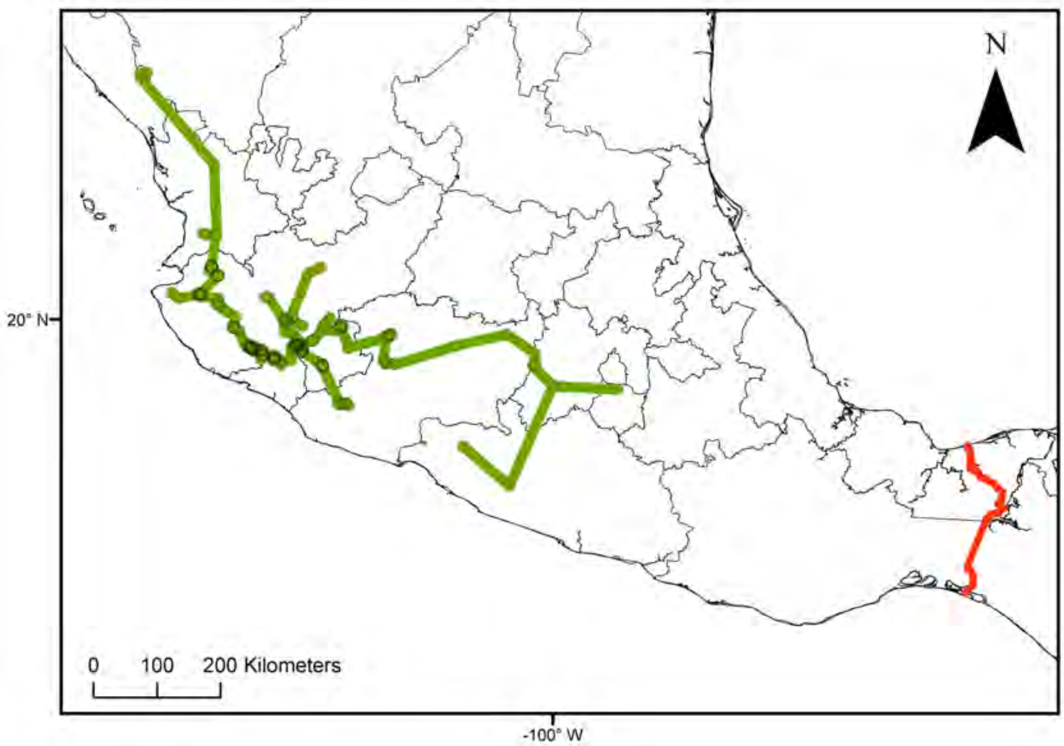

FIGURE 8. Distribution of *Salvia iodantha* represented by an individual track (green line) and collection points (circles). The northern boundary of *Flora Mesoamericana* is highlighted with a red line.

Discussion: *Salvia iodantha* was reduced to the synonymy of *S. purpurea* (fig. 7 B) by Klitgaard (2012); however, even when they are close similar, the first can be distinguished because of its shorter [2.7–3.5(–4.4) mm] and truncate calyces, shorter lower corolla lip [(1.3–)2.1–4.5 mm], and long exserted stamens from upper corolla lip (6–8 mm); in *S. purpurea* the calyces are (4.5–)5–6.2 mm long and with evidently acute lobes a the apex, lower corolla lip (4.2–)6.4–8.3(–11.2) mm long, and the stamens are inserted in the upper corolla lip. Moreover, *S. iodantha* grows mainly in temperate forests above 2000 m elevation, while *S. purpurea* usually grows in tropical forests below 1900 m elevation.

Salvia arbuscula Fernald (1910: 421) is clearly a synonym of *S. iodantha.* The first was described as possessing branched hairs; however, those hairs were not found in any specimen examined. Epling (1939) neither reported branched hairs in the species, he distinguish them in terms of pubescence density beneath the leaves; but leaf pubescence is extremely variable between populations and even within an individual of *S. iodantha*, there is a tendency that young leaves manifest a dense tomentum, which is progressively lost as the leaf grows. Hence, the recognition of *S. arbuscula* as a distinct species is not warranted, accordingly here is reduced to the synonymy of *S. iodantha.*

It is highly probable that *Salvia townsendii* Fernald (1904: 55) is also a synonym of *S. iodantha*. Epling stated they differ because corolla tubes are longer in the first, varying from 21 to 26 mm long; they are almost identical in every other character. However we did not have enough available specimens for examining as to take a conclusive decision.

Salvia iodantha has a narrower distribution than *S. purpurea* and does not grow in the area of *Flora Mesoamericana* (fig. 8).

Representative specimens examined (*Salvia iodantha*): MEXICO. Colima. Minatitlán: 7–9 km al O de Los Sauces, camino a terreros, El Terrero, 1850–1900 m, 30 January 1987, *J. A. Vázquez-G. & L. Guzmán 4146* (WIS!, ZEA!); 14-15 km al NEE de Minatitlán, 2–2.5 km al E de El Terrero, 2100 m, 19 February 1988, *R. Cuevas-G. & N. M. Núñez 3482* (ZEA!). Estado de México. Donato Guerra: rumbo al llano de Los Tres Gobernadores, por San Juan Xoconusco, 19°22'30"N 100°14'46"W, 2740 m, 20 March 2005, *G.M. Cornejo-T. et al. 1008* (IBUG!). Guerrero. Petatlán: 3 km al NE de La Guayabera, a 29 km al NE de Coyuquilla, 5 February 1986, *J.C. Soto-N. et al 12259* (IBUG!). Jalisco. Atenguillo: en el predio Buenavista, 20°11'23.5"N 104°42'28.1"W, 2162 m, 12 March 2004, *R. Cuevas-G. et al. 8059* (ZEA!). 2–4 km al ONO de Estación Biológica Las Joyas (Zarzamora) en el camino y abajo del camino a Corralitos; 10 km de distancia aérea al SSE de Ahuacapán, 19°35'36"N 104°17'30"W, 1900–1950 m, 21 December 1984, *E.J. Judziewicz & T. S. Cochrane 4784* (IBUG!, MEXU!, WIS!, ZEA!). Cabo Corrientes: Piedra Habladora, ca. 2 km al SE de El Tuito, 600 m, 10 March 1973, *M. Sousa-S. et al. 3938* (CIDIIR!, MEXU!); la bajada de La Pitarilla, entre la Guázima y Agua Caliente, 20°22'50"N 105°24'10"W, 400 m, 1 March 1993, *G. Castillo-C. et al. 10605* (XAL!). Manzanilla de la Paz: 5 km después del crucero en la brecha a Concepción de Buenos Aires, 16 January 1977, *L.M. Villarreal de Puga & S. Carvajal-H. 9826* (IBUG!). Mascota: Laguna de Juanacatlán, 1940 m, 17 March 1971, *R. González-T. 159* (MICH!, WIS!). San Gabriel: NW slopes of Nevado de Colima, in pine-fir zone above Jazmin; deep heavily wooded barranca at the end of abandoned lumber road 1 km above of El Izote, 2500–2600 m, 25 March 1949, *R. McVaugh 10014* (MEXU!, MICH!); Talpa de Allende: Talpa de Allende: 8–9 km al SE de Cuale sobre la brecha hacia Talpa de Allende (vista de la Presa Cajón de Peñas), 20°21'20.8"N 105°0'15.8"W, 2448 m, 29 November 2009, *J.J. González-G. 476* (IBUG!); Michoacán. Aguililla: 8–12 km SW of Aserradero Dos Aguas and nearly W of Aguililla, 2250–2400 m, 5 March 1965, *R. McVaugh 22820* (MICH!). Tancítaro: cerro Tancítaro, 27 km al W de Uruapan en línea recta, Barranca de El Puerto al N de Tancítaro, 19°24'17"N 102°23'39"W, 2200 m, 29 January 1996, *I. García-R. et al. 4500* (CIMI!, MICH!); Nayarit. Compostela: 31 km al E de Las Varas, camino lateral de tierra en la carretera a Compostela, 5 March 1985, *P. Magaña & O. Téllez-V. 164* (MEXU!). Sinaloa. Concordia: en las colinas al E de Santa Lucía, 300 m al E de la población, 23°26'1.7"N 105°50'34.8"W, 1225 m, 5 January 2010, *J.G. González-G. 529* (IBUG!).

Representative specimens examined (*Salvia purpurea*): MEXICO. Aguascalientes. Calvillo: Los Alisos, 2080 m, 10 October 1982, *M.E. Siqueiros 1908* (CIIDIR, HUAA!); Chiapas. Pueblo Nuevo Solistahuacán: 600–700 m al SO de Pueblo Nuevo, 17º9'12.69"N 92º53'20.8"W, 1690 m, 15 November 2009, *J.G. González-G et al.* 457 (IBUG!). Colima. Colima: rancho El Jabalí, 20 km N of Colima in the SW foothills of Volcan de Colima, 19º27'N 103º42'W, 1250 m, 27 October 1990, *E.J. Lott et al. 2932* (MEXU!, MICH!); Estado de México. Amecameca: 3 km del Portezuelo, al N de Ameca, 1650 m, 13 October 1978, *J.L. Alvizo-L. s.n.* (IBUG!). Guanajuato. Tarimoro: cerro de los Agustinos, 25 km al ESE de Tarimoro, en Puerto Honod, 14 October 1974, *D. Flores 157* (IBUG!). Guerrero. Malinaltepec: Ojo de Agua de Cuauhtémoc, 26 December 2012, *E. Cándido-B. & B. Nepomuceno-C. 101* (IBUG!, UAGC!). Jalisco. Atotonilco el Alto: carretera Guadalajara-Atotonílco, a 30 m de la desviación rancho La Pareja, 7 October 1990, *M.M. Ruiz-B. 8* (CHAPA!, IBUG!, IEB!)). Guachinango: 16 miles NW of Ameca along the road to Mascota, 1310 m, 1 November 1970, *D.E. Breedlove 18664* (MICH!). Mascota: 2 km al NE del rancho El Galope, 1600 m, 18

October 1987, *R. Ramírez-D.et al. 748* (HUMO!, IBUG!). Zapotlanejo: SE de Zapotlanejo, 1550 m, 18 November 1981, *J.P. Lira-M. s.n.* (IBUG!). Michoacán. Coalcomán: Salitre-Mesa, 1780 m, 30 October 1938, *G.B. Hinton et al. 12482* (MICH!). Villamar: ladera del cerro Cotijarán, 26 September 1984, *R. Flores 560* (CIMI!). Morelos. Tepostlán: Tepoztlán, 2000 m, 1 December 1986, *M. Zagal-A. 10* (IBUG!). Tlayacapan: 3 km al SW de San José de los Laureles, rumbo al cerro de Las Mariposas, 1800 m, 3 November 1990, *G. Serrano-J. 14* (IBUG!). Nayarit. Ahuacatlán: mountains 10 miles SE of Ahuacatlán, on the road to Barranca del Oro and Amatlán, 1100 m, 17 November 1959, *W.N. Koelz & R. McVaugh 831* (MICH!). Oaxaca. Santa Catarina Juquila: al W de Santa Catarina Juquila, entre Panixtlahuaca y Santa Lucía, 16°14’5.2”N 97°16’40.9”W, 1529 m, 27 January 2010, *J.G. González-G. 565* (IBUG!). Veracruz. Huatusco: 9 km al N de Huatusco por la carretera rumbo a Totutla, 19°11’22.92”N 96°57’18”W, 1330 m, 22 December 2008, *J.G. González-G. & S. Rúa-H. 271* (IBUG!). Zacatecas. Tlaltenango: about 38 km al W de Jalpa, sobre la carretera a Tlaltenango, 30 km del entronque con la carretera Jalpa-Juchipila, 2550 m, 21 October 1973, *J. Rzedowski & R. McVaugh 1015* (MICH!). Moyahua: Cerro La Bota, al W de Las Palmas, camino de terracería Las Plamas, El Pitayito, 17 October 1997, *E.D. Enríquez-E. & J.J. Balleza-C. 1685* (Herbario de la Universidad Autónoma de Zacatecas!).

Salvia nepetoides Kunth (1818: 299). Type: MEXICO. Guanajuato: entre San José Temascatio y Guanajuato, 1000 hex. [1829 m], *F.W.H.A. Humboldt & A.J.A. Bonpland s.n.* (holotype P). Fig. 9.

FIGURE 9. *Salvia nepetoides*, A) flowers, B) flowers and calyces bearing mature fruits (pictures taken by J.G. González-Gallegos).

Perennial herb to subshrub, erect or reclined, (0.2–)0.5–1(–1.7); stems hispidulous and generally covered with short glandular-capitate hairs. Leaves with petioles 2.5–16.6 mm long, hispidulous and covered with short glandular-capitate hairs; leaf blade ovate to ovate-lanceolate, 1.3–5(–7.5) × 1–4.3(–7.2) cm, acute to acuminate at the apex, truncate to rounded at the base, margin crenate to serrate, pilose to covered with appressed hairs above, usually white tomentose beneath, both surfaces with sessile glandular dots. Inflorescence in racemes (6–)10–28.9 cm long, with (3–)10–19 verticillasters, these (2–)4–6(–10)-flowered, lowermost nodes 0.8–2.7(–3.9) cm apart, floral axis hispidulous and covered with short glandular-capitate hairs. Floral bract lanceolate, (1.3–)2.2–4.7 × 0.4–1.4 mm, deciduous, acute at the apex, truncate at the base, margin entire, pilose, covered with glandular-capitate hairs and sessile glandular dots, ciliated at the margin; bracteols present at the base of each pedicel. Flowers with pedicels 1.9–3.5(–4.7) mm long, puberulent and covered with short glandular-capitate hairs. Calyx (4–)5–7(–7.7) mm long, (1.8–)2.5–4.8 mm wide at the throat, green and sometimes wine tinged, pilose, with glandular-capitate hairs and covered with sessile glandular dots, upper lip 5–7-veined, entire, lobes of the lips acute. Corolla sky blue with white nectar guides on the lower lip, glabrous except for the upper lip and lower margin of the lower one which are sparsely pilose; corolla tube, (3.3–) 4.3–6.5(–7.8) mm long, (1.4–)2–2.8(–3.8) mm wide at the throat, ventricose, slightly constrained at the base, internally epapillate; upper lip 2.1–4.4(–7.9) mm long, lower lip (2.5)4.4–6.2(–9.8) × (3–)4.2–6.7 mm, deflexed. Stamens 2, included; filament (1.4–)2–3 mm long; connective 2–3.9 mm long, geniculate; theca 1.1–1.6 mm long; a pair of staminodes above and behind filament attachement to the corolla. Gynobasic horn 0.8–1.4 mm long; style 6.2–10.7 mm long, pilose at the apex, lower stigmatic branch sigmoid. Mericarp ovoid, 1.3–1.9 × 0.8–1.3 mm, pale brown and dark brown marbled, smooth, glabrous.

Distribution, habitat and phenology: *Salvia nepetoides* grows in the Distrito Federal, and in the Mexican states of Estado de México, Guerrero, Jalisco, Michoacán and Morelos (fig. 10). It inhabits oak, oak-pine, pine-oak, and in a less frequency, montane cloud and tropical deciduous forests, from (1100–)1800–2800(–3100) m elevation. It shares habitat with *Abies religiosa* (Kunth) Schltdl. & Cham., *Alnus jorullensis* Kunth, *Arbutus xalapensis*, *Clinopodium macrostemum* (Moc. & Sessé ex Benth.) Kuntze, *Comarostaphylis glaucescens* (Kunth) Zucc. ex Klotzsch, *Cunila polyantha* Benth., *Dahlia barkeriae* Knowles & Westc., *D. coccinea* Cav., *Pinus lumholtzii* B.L.Rob. & Fernald, *P. oocarpa* Schiede ex Schltdl., *Quercus candicans* Née, *Q. castanea*, *Q. laeta* Liebm., *Q. resinosa* Liebm., *Q. rugosa* Née, *Q. salicifolia* Née; and it is sympatric with other species of *Salvia* as *S. concolor* Lamb. ex Benth., *S. elegans* Vahl., *S. fulgens* Cav., *S. gesneriflora* Lindl. & Paxton, *S. longistyla* Benth., *S. melissodora* Lag., *S. mexicana* L. It can flower and fructify throughout the year, but more likely from August to January.

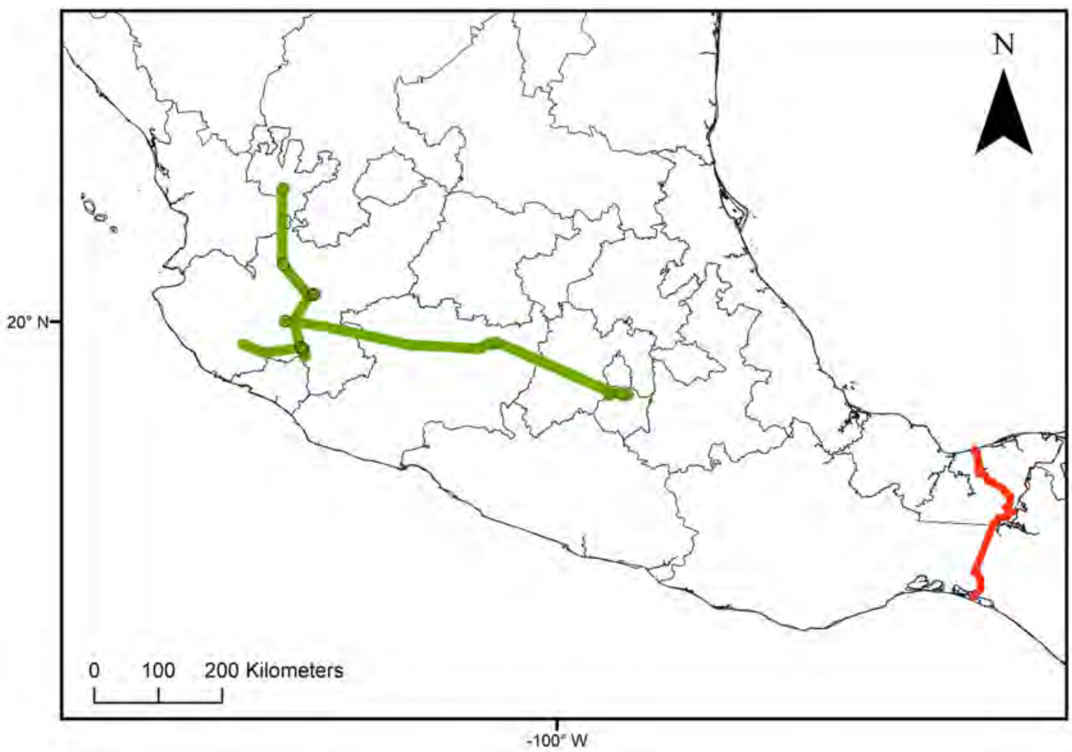

FIGURE 10. Distribution of *Salvia nepetoides* represented by an individual track (green line) and collection points (circles). The northern boundary of *Flora Mesoamericana* is highlighted with a red line.

Discussion: *Salvia nepetoides* was also synonymized under the concept of *S. amarissima* (Klitgaard, 2012). Nonetheless, it belongs to section *Sigmoideae* Epling (1939: 42) which is unique within the genus because of its sigmoid lower stigmatic branch, a characteristic that is present in *S. nepetoides* but not in *S. amarissima* which has an acute lower stigmatic branch. The species of section *Sigmoideae* also present bracteoles at the base of each pedicel, a character that is unusual within *Salvia* subgenus *Calosphace* (González-Gallegos & Castro-Castro, 2013) and that is not shared by *S. amarissima*. Furthermore, *S. nepetoides* has shorter petioles [2.5–16.6 mm *vs.* (7–)30–40 mm], usually smaller floral bracts [(1.3–)2.2–4.7 × 0.4–1.4 mm *vs.* 5.5–11(–14) × 2–3 mm], and usually smaller connective [2–3.9 mm *vs.* (2.5–)5–5.5 mm]. *Salvia nepetoides* does not grow in the area covered by the *Flora Mesoamericana* project (fig. 10).

Representative specimens examined (*Salvia nepetoides*): MEXICO. Distrito Federal: Esclava, 19 November 1902, *C.G. Pringle 11125* (MICH!). Jalisco. Jocotepec: Cerro Viejo, paraje El Rincón-Cresta, Bola del Viejo, Barranca del Agua, 20°24'N 103°25'W, 1600–2950 m, 5 February 1987, *J.A. Machuca-N. 5479* (WIS!). San Gabriel: along road from El Fresnito to Venustiano Carranza, at km 22.590 marker, in large stand on mountaintop in semishade area in weathered limestone soil, 2347 m, 6 November 1975, *K.M. Peterson & C. R. Broome 391* (IBUG!, MEXU!). Michoacán. Charo: Las Trojes, ca 32 km E de Morelia, 2200 m, 12 November 1985, *S.A. Reisfield 1277* (MEXU!). Paracho: cerro al N de Ahuitan, 2300 m, 13 December 1990, *E. García & E. Pérez 3568* (MEXU!). Morelos. Cuautla: 20 km NE de Cuautla, 1981 m, 3 August 1950, *C.E. Boyd 84* (MEXU!); 20 km NO de Cuautla, 30 July 1960, *W. Forbey 68* (MEXU!). Tepoztlán: Sierra de Tepoztlán, 2286 m, 27 September 1904, *C.G. Pringle 13166* (MEXU!, MICH!).

Salvia punicans Epling (1940: 525). Type: MEXICO. Guerrero. San Miguel Totolapan: district Galeana, pie de La Cuesta-Toro Muerto, 22 January 1938, *G.B. Hinton et al. 11224* (holotype UC!, isotypes ARIZ!, F!, GH, K, LL, MEXU!, MO!, NY!, PH, TEX, US!). Fig. 11 A.

FIGURE 11. *Salvia punicans*, A) flower. *Salvia carnea*, A) variant with blue corollas, B) variant with pink corollas (pictures taken by J.G. González-Gallegos).

Perennial herb, erect, 0.8–1.8 m tall; stems glabrous to scarcely puberulent above all on the nodes and between the ribs. Leaves with slender petioles (2–)3–12(–14) cm long, puberulent at the middle of upper surface, the rest glabrous; leaf blade broad ovate to ovate-lanceolate, 5.7–12 × 3.4–8(–10) cm, caudate at the apex, truncate, cordate to sometimes oblique at the base, crenate-serrate margin, puberulent on the main and secondary veins on both sides, the rest glabrous. Inflorescences in racemes 13–31 cm long, with 9–20 verticillasters, these 6–10(–12)-flowered, lowermost nodes 1.7–2.7 cm apart, floral axis short hispidulous and covered with short glandular-capitate hairs. Floral bract ovate to ovate-lanceolate, (1.6–)2.5–3.5 × (0.5–)1.1–2.2 mm, caudate at the apex, truncate at the base, margin entire and ciliated, sparsely puberulent and covered with sessile glandular dots outside. Flowers with pedicels 2.2–4.2 mm long, glabrous. Calyx 6.2–6.7(–11) mm long, 3.2–3.8 mm wide at the throat (up to 7.7–8.5 × 3.9–4.2 mm in fruit), green and irregularly magenta tinged toward the lips, hispidulous on the veins and covered with sessile glandular dots, internally verrucose to shortly scabrous, upper lip 3-veined and entire, lobes acute and short caudate. Corolla magenta with white nectar guides on the lower lip, pilose at the dorsal side, upper lip and ventral portion of the lower one, the rest glabrescent; tube 18–19.2(–20) mm long, 4.8–5.9 mm wide at the throat, not constrained at the base, slightly ventricose, internally ornate with 4 papillae near the base; upper lip 5.2–6.6(–8.5) mm long, lower lip 7–7.5(–9.8) × (6.2–)7–8.4 mm, incurved-concave. Stamens 2, included; filament 1.9–2.5 mm long; connective 6.8–7.7 mm long, straight and ornate with a short acute tooth near midportion; theca 1.5–1.9 mm long; two staminodes present above and behind filament attachment to corolla tube. Gynobasic horn 0.7–0.9 mm long; style 21.4–22.7 mm long, pilose toward the apex, lower stigmatic branch acute. Mericarp ovoid, 1.4–1.7 × 0.8–1 mm long, light brown and irregularly dark brown marbled, smooth and glabrous.

Distribution, habitat and phenology: *Salvia punicans* grows in the Mexican states of Guerrero and Oaxaca (fig. 12). It inhabits pine-oak and montane cloud forests, from 2600–2900 m elevation. It shares habitat with *Abies religiosa* subsp. *mexicana* (Martínez) Strandby, K.I.Chr. & M.Sørensen, *Arbutus xalapensis*, *Bejaria aestuans*, *Chiranthodendron pentadatylon* Larreat., *Cleyera integrifolia* (Benth.) Choisy, *Clinopodium macrostemum*, *Hedyosmum mexicanum* C.Cordem, *Oreopanax xalapensis* (Kunth) Decne. & Planch., *Pinus ayacahuite* C.Ehrenb. ex Schltdl., *P. herrerae* Martínez, *P. maximinoi* H.E.Moore, *P. pseudostrobus* var. *apulcensis* (Lindl.) Shaw, *Quercus liebmannii* Oerst. Ex Trel., *Q. obtusata* Bonpl., *Q. uxoris* McVaugh, *Q. salicifolia* Née, *Scutellaria dumetorum*, it is sympatric with other *Salvia* species as *S. cinnabarina* M.Martens & Galeotti, *S. confertispicata* I.Fragoso & Martínez-Gordillo, *S. karwinskii* Benth., *S. mexicana* and *S. tricuspidata* M.Martens & Galeotti. It flowers and fructifies from October to January.

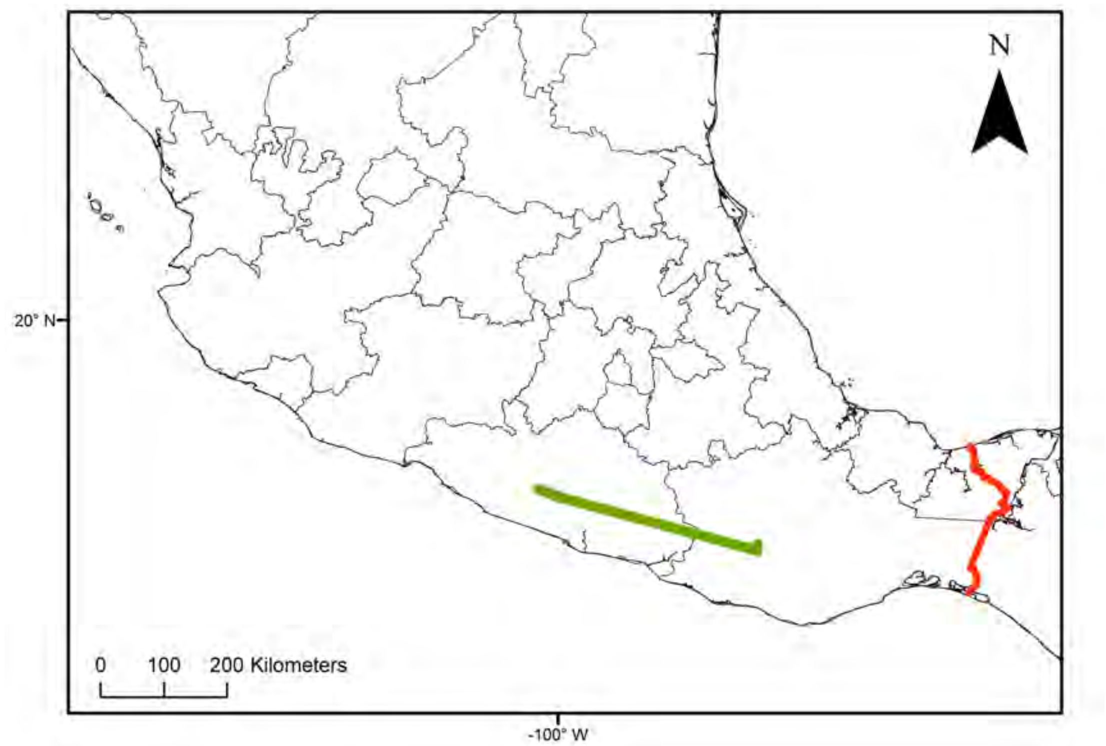

FIGURE 12. Distribution of *Salvia punicans* represented by an individual track (green line) and collection points (circles). The northern boundary of *Flora Mesoamericana* is highlighted with a red line.

Discussion: *Salvia punicans* was treated as synonym of *S. carnea* (Klitgaard, 2012; fig. 11 A and B). Both species belong to section *Carnea* (Epling) Epling (1939: 228). *Salvia punicans* can be differentiated by its stems without glandular-capitate hairs, usually bigger floral bracts [(1.6–)2.5–3.5 × (0.5–)1.1–2.2 mm *vs.* 2.1–

2.4 × 0.5–0.7 mm], magenta corollas (*vs.* pink to violet), bigger corolla tube [18–19.2(–20) × 4.8–5.9 mm *vs.* 7–10 × 2–2.5 mm], incurved-concave lower corolla lip (*vs.* deflexed), longer connective (6.8–7.7 mm *vs.* 5.2–6.3 mm), longer thecae (1.5–1.9 mm *vs.* 1.2–1.3 mm) and longer style (21.4–22.7 mm *vs.* 8.5–12 mm). The former has been also considered as *S. carnea* var. *punicans* (Epling) Wood & Harley (1989: 252). These latter authors regarded the morphological variation within *S. carnea* as outstanding and reduced several species to the synonomy of this species. In the present contribution, it is judged that the particular features of *S. punicans* supports its recognition as a distinct species.

On the other hand, *Salvia gracilis* Bentham (1833: 258) was considered as a distinct species from *S. carnea*, and *Salvia myriantha* Epling (1939: 238) was included as synonym of *S. tiliifolia* Vahl (1794: 7) (Klitgaard, 2012). Consulting original descriptions of *S. carnea* and *S. gracilis* leds to the conclusion that they do not differ more than by the supposed glabrous styles of the first. However, all the specimens here examined exhibit pilose styles toward the apex. Klitgaard (2012) distinguish them in the identification key she provides by means of the 10 veins in the calyces of *S. carnea* and 9 in those of *S. gracilis*; though, this is not enough to support both species, it is preferable accepting only *S. carnea*. The morphological variation of what was described as *S. myriantha* is embedded in that of *S.* carnea, and hence it is appriopriatly treated as one of its synonyms. In this sense, *S. carnea* differs considerably from *S. tiliifolia* and there is not reason to synonymize *S. myriantha* under the later. *Salvia tiliifolia* stands out because of its tiny (corolla tube 2.7–3.5 mm long) sky-blue corollas, internally epapillate, the tube is entirely inserted in the calyx and only the lips surpass it.

Additional specimen examined (*Salvia punicans*): MEXICO. Oaxaca. Santiago Textitlán: cerca del paraje El Campanario, 7.44 km en línea recta al E de Santiago Textitlán y 12.7 km al N de San Lorenzo Texmelucan, 3.5 km por brecha al W del campamento El Tlacuache, 16°42’1.81”N 97°11’17.14”W, 2630 m, 17 November 2012, *J.G. González-G. & J.H. Zárate-J. 1439* (IBUG!).

Representative specimens examined (*Salvia carnea*): MEXICO. Estado de México. Amecameca: km 13 de la carretera Amecameca-Paso de Cortés, 9 km al SE de Amecameca, 14 December 1976, *J. García-P. 268* (IBUG!). Guerrero. Atoyac de Álvarez: 0.8–1 km al NE de Nueva Delhi, entre el Paraíso y Puerto de Gallo, 17°26.131’N 100°11.469’W, 1680 m, 28 October 2012, *J.G. González-G. et al. 1326* (IBUG!). Hidalgo. Tenango de Doria: 11 km al O de Tenango de Doria, 2200 m, 6 July 1979, *R. Hernández-M. 3432* (IBUG!). Jalisco. Cuautitlán: Sierra de Manantlán (15–20 miles SW of Autlán), about 2 miles from Aserradero San Miguel 1, W and S of the divide toward Manzanillo, 2250 m, 4 November 1952, *R. McVaugh 13920* (MICH!, UC!). Puebla. Villa Juárez: Ranchito Villa Juárez, 1600 m, 12 October 1966, *L.M. V. de Puga 12681* (IBUG!).

Salvia subpatens Epling (1939: 97) (Figs. 1 and 2A–B). Type: MEXICO. Estado de México. Temascaltepec: near Tejupilco, 1340 m, 27 July 1933, *G.B. Hinton 4376* (holotype UC!, isotypes ASU, BM, GH, K!, US!). Fig. 13 A and B.

Salvia viscidifolia Epling (1940: 517). Type: MEXICO. Guerrero. Coyuca de Catalán: Río Frío Diamantes, 2100 m, 26 September 1937, *H.B. Hinton et al. 10725* (holotype UC!, isotype K!).

Perennial herb, erect, 40–80 cm tall, arising from tuberous fusiform roots; stems pilose. Leaves mostly sessile, or with petioles up to 2 mm long, pilose; leaf blade lanceolate, oblong-lanceolate to ovate, 4.3–15 × 1.4–6.3 cm, acute at the apex, rounded to truncate at the base, serrate margin, pilose or with appressed hairs, and covered profusely with sessile glandular dots on both surfaces. Inflorescences in racemes (5–)11–22 cm long, with 3–13 verticillasters each, these 2–6-flowered, lowermost nodes 1.3–2 cm apart, floral axis pilose to hirsute and covered wih glandular-capitate hairs. Floral bract lanceolate to linear-lanceolate, 3.2–11.4 × (0.4–)1–1.7 mm, persistent, attenuated at the apex, truncate at the base, margin entire, covered with some glandular-capitate hairs. Flowers with pedicels (2.6–)4–5(–7.1) mm long (up to 9 mm long in fruit), pilose and with some glandular-capitate hairs, glandular punctate. Calyx (4.4–)7.2–11.1 mm long, 3.1–6.5 mm wide at the throat (up to 13.3 × 8.8 mm in fruit), green and irregularly purple tinged, pilose and covered with glandular-capitate hairs, internally with antrorse hairs toward the apex, upper lip 5-veined and shortly trimucronate, lobes of the lips acute, border of the lips ciliated. Corolla deep blue with white nectar guides on the lower lip, glabrous except for the upper lip and beneath the lower one which are sparsely pilose; tube 8.5–11.8 mm long, (3.6–)4.5–6.4 mm wide at the throat, slightly constrained toward the base, ventricose, internally epapillate; upper lip 5.6–8.5 mm long, lower one (7.3–)11.4–15.3 × 5.5–12 mm, deflexed. Stamens 2, exserted 9–12 mm from upper corolla lip; filament 2–3(–6) mm long; connective 16.3–19 mm long, thin and not ornate; theca 2.7–3(–4) mm long; a pair of staminodes above and behind filament attachment to the corolla. Gynobasic horn absent; style 2.1–3.3 cm long, glabrous, lower stigmatic branch acute. Mericarp ovoid, 2.2–3 × 1.5–2.5 mm, light brown and irregularly dark brown marbled, smooth and glabrous.

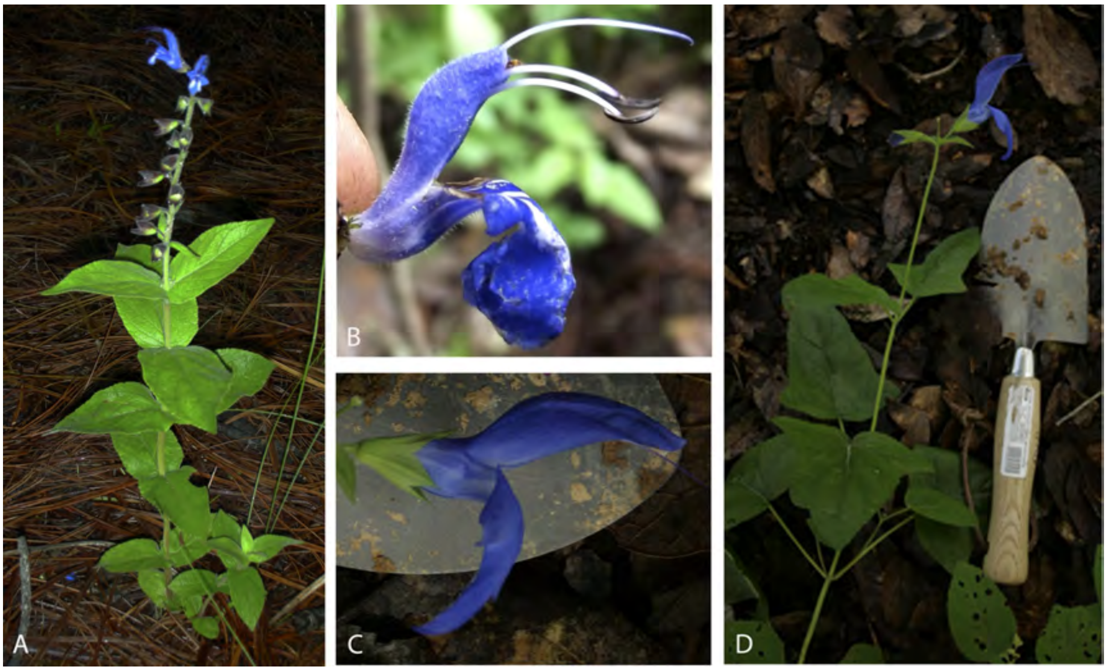

FIGURE 13. *Salvia subpatens*, A) habit, B) corolla. *Salvia patens*, C) corolla, D) habit (picture A taken by L.M. González-Villarreal, B by J. Padilla-Lepe, C and D by A. Castro-Castro).

Distribution, habitat and phenology: *Salvia subpatens* grows in the Mexican states of Estado de México, Guerrero, Jalisco and Michoacán (fig. 14). It inhabits pine-oak, oak, pine and montane cloud forests, from (1600–)2100–2900 m elevation. It shares habitat with *Abies religiosa*, *Arbutus occidentalis* McVaugh & Rosatti, *A. xalapensis*, *Castilleja mcvaughii* N.H.Holmgren, *Comarostaphylis glausescens*, *Pinus durangensis* Martínez, *P. hartwegii* Lindl., *Quercus crassifolia* Bonpl., *Q. laurina* Bonpl. and *Symplocos citrea*. It flowers and fructifies from late July to the beginning of January.

Discussion: *Salvia patens* (fig. 13 C and D) and *S. subpatens* belongs to section *Blakea* (1939: 94); the species contain therein are morphologically very similar, they are grouped mainly because they share tuberous fusiform roots, persistent floral bracts, trimucronate upper calyx lips, showy deep blue corollas with the upper lip generally arquate, glabrous styles and lower stigmatic branch very short to almost absent. Klitgaard (2012) regards the type specimens of *S. subpatens* as possibly representing distal fragments of individuals of *S. patens*, since the leaves are reduced and sessile as the distal leaves in the latter species. Hence, she reduced *S. patens* to the synonymy of *S. subpatens*. However, the examination of more than just type specimens and field exploration reveals that such proposal is not justified. *Salvia subpatens* differs in several other characters that can not be embraced by the morphological variation of *S. patens*. The stems lack of glandular-capitate hairs, though they can rarely present them in the last internodes before the inflorescence (*vs.* covered with glandular-capitate hairs throughout the stem), sessile leaves or with petioles up to 2 mm long along the stem (*vs.* leaves with petioles 2–10 cm long that are progressively reduced toward the inflorescences till being absent), lanceolate, oblong-lanceolate to ovate leaf blades (*vs.* ovate-deltoid to deltate), generally narrower leaves (1.4–6.3 cm *vs.* 5–14 cm), shorter calyces [(1.4–)7.2–11.1 mm *vs.* 11.8–16(–20) mm], smaller corolla tubes [8.5–11.8 × (3.6–)4.5–6.4 mm *vs.* 16–24 × 7–10 mm], shorter upper (5.6–8.5 mm *vs.* 23–37 mm) and lower [(7.3–)11.4–15.3 mm *vs.* 16–24 mm] corolla lips, exserted stamens from upper corolla lip (*vs* inserted), shorter connective [16.3–19 mm *vs.* (3.4–)4–4.3 mm], and shorter style (2.1–3.3 cm *vs.* 5–6 cm).

Salvia subpatens does not grow in the area covered by the *Flora Mesoamericana* project (fig. 14).

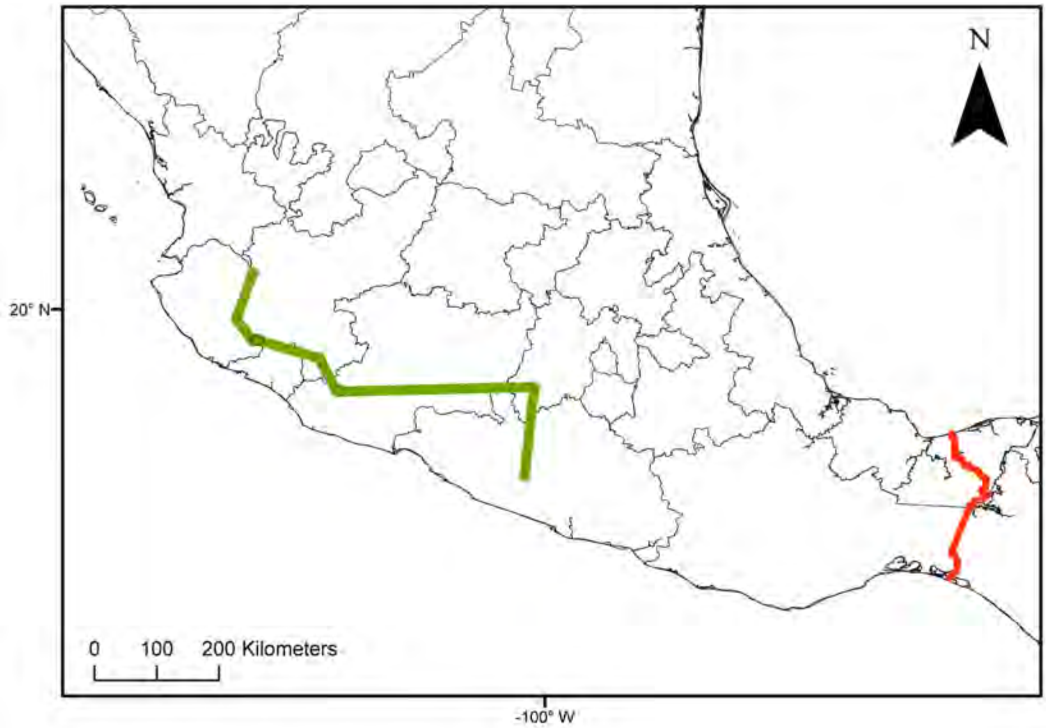

FIGURE 14. Distribution of *Salvia subpatens* represented by an individual track (green line) and collection points (circles). The northern boundary of *Flora Mesoamericana* is highlighted with a red line.

Representative specimens examined (*Salvia subpatens*): MEXICO. Jalisco Cuautitlán: mountains E of Manantlán, about 15 miles SSE of Autlán by way of Chante, 8300 ft, 27 July 1949, R.L. Wilbur & C.R. Wilbur 1873 (MICH!); top of sharp crest of the Sierra de Manantlán Oreintal just E of Cerro Las Capillas, along road from Cerro La Cumbre to Los Jardines, 19 km due SSE of El Chante, 19º33’15”N 104º9’0”W, 2800 m, 7 January 1980, *P.D. Sorensen & P. Metekaitis 7911* (ENCB!, MEXU!, UC!, WIS!); top of sharp crest of the Sierra de Manantlán Oreintal just E of Cerro Las Capillas, along road from Cerro La Cumbre to Los Jardines, 19 km due SSE of El Chante, 19º33’15”N 104º9’0”W, 2800 m, 10 October 1980, *H.H. Iltis & R. Guzmán-M. 3214* (ENCB!, IBUG!, UC!, WIS!); Cerro de Las Capillas, junto a la cabaña de los guarda incendios, Sierra de Manantlán, 19º33’15.6”N 104º8’53.6”W, 2880 m, 21 January 2011, *J.G. González-G. & F.J. Santana Michel 850* (IBUG!, ZEA!). Tecalitlán: km 41 de la brecha que conduce a Jilotlán de Dolores, a partir de la carr. 110, campamento maderero Plan de Lego, Altitlán, 1940 m, 18 July 1986, *A. Rodríguez-C. 413* (IBUG!). Michoacán. Coalcomán: Sierra de Torricillas. 2200 m, 13 October 1938, *G.B. Hinton et al. 12369* (MICH!, UC!); Sierra de Torricillas (sic), 2150 m, 24 July 1939, *G.B. Hinton et al. 13989* (MICH!).

Representative specimens examined (*Salvia patens*): MEXICO. Aguascalientes. Calvillo: Barranca Las Cazuelas, Sierra Fria, 2350 m, 2 September 1981, *C. Cuéllar-R. 23* (HUAA!). Guanajuato. León: frente al Área Natural Protegida Sierra Los Lobos, km 18 de la carretera León-San Felipe, 21°20’N 101°40’W, 2500 m, 6 October 2008, *M. Harker et al. 3858* (IBUG!). Hidalgo. Omitlán de Juárez: poblado de Guerrero, km 17 carretera Méx. 105 entre Pachuca y Huejutla, 20º9'27.3"N 98º39'27.6"W, 2548 m, 16 September 2011, *A. Rodríguez-C. et al. 6455* (IBUG!). Jalisco. Lagos de Moreno: cerro de El Espía, 3 km al S de la presa Juan Vaquero y 6.3 km al SE de Ciénega de Mata, en una cañada que desemboca a la presa, 21º42'38.4"N 101º45'19.1"W, 2450 m, 20 October 2011, *J.G. González-G. & F. Pérez 1128* (IBUG!). Michoacán. Senguío: aproximadamente 1 km al SW de la Cortina de la Presa Chincua, en camino Chincua-Seguío, m, 29 August 1989, *I. García-R. 2885* (GUADA!, IBUG!). Ucareo: Las Peñas del Bellotal, 9 October 1987, *H. Díaz-B. 4214* (IBUG!). Querétaro. Amealco: 2 km a l s de Laguna de Servín, 2650 m, 25 August 2001, *E. Carranza & S. Zamudio 6214* (IBUG!). Colón: Vertiente S del Cerro Zamorano, cerca de Trigos, 2800 m, 2 September 1987, *J. Rzedowski 44500* (IBUG!). San Luis Potosí. Villa de Zaragoza: alrededores de Sierra de Álvarez, entrando por San Francisco, 22º1'48.4"N 100º36'46.8"W, 2352 m, 12 September 2011, *A. Rodríguez-C. et al. 6364* (IBUG!).

Salvia unicostata Fernald (1900: 501) Type: MEXICO. San Luis Potosí. Without specific locality, 6000–8000 ft, 1878, *C.C. Parry & E. Palmer 760* (holotype GH!, isotypes BM, E, F!, K!, MO!, NY!, P!, PH, US!).

FIGURE 15. *Salvia unicostata*, inflorescence. (picture taken by J.G. González-Gallegos)

Perennial herb, erect, 15–50 cm tall; stems glabrous, interpetiolar space pilose. Leaves sessile; leaf blade linear, 2.4–8.2 × 0.1–0.5 cm, acute to attenuated at the apex, slightly attenuated at the base, margin entire and revolute, verrucose above and sparsely hispidulous beneath on the midvein, the rest glabrous, midvein thicken and white, the other are not visible; wih axillary fascicles of several immature leaves. Inflorescences in racemes 7–15(–33) cm long, with 3–9 verticillasters, these 2–6-flowered, lowermost nodes 2.4–4.5 cm apart, floral axis covered with glandular capitate hairs. Floral bract ovate, ovate-lanceolate to rhomboid, (4–)5.7–6.6(–10.2) × 2.8–3.2 mm, caudate at the apex, attenuated and then truncate at the base, margin entire and ciliated, covered with glandular capitate hairs outside. Calyx 5.2–6.1 mm long, 3.1–4 mm wide at the throat (up to 6.2–7 × 5–8.7 mm in fruit), green to bluish green, covered with glandular capitate hairs and black sessile glandular dots, internally verrucose, upper lip 5–7-veined and trimucronate, lobes acute and spinulose. Corolla deep blue with white nectar guides on the lower lip, upper lip and ventral portion of lower one pilose, the rest glabrous to glabrescent; tube 5–6.2 mm long, 3.1–3.8 mm wide at the throat, slightly ventricose, not constrained at the base, internally epapillate; upper lip 3.6–4.1 mm long, lower lip (8–)9.6–10.5 × (7.4–)8–9.8 mm, deflexed. Stamens 2, included; filament 1.4–1.6 mm long; connective 4.5–5 mm long, geniculate near midportion; theca 1.4–1.6 mm long; two staminodes present above and behind filament attachment to corolla tube. Gynobasic horn 0.7–0.9 mm long; style 8.5–8.9 mm long, evidently thicker toward the apex and densely pilose on dorsal side, lower stigmatic branch acute. Mericarp ovoid, 1.5–1.7 × 1–1.2 mm, amber-brown, smooth and glabrous.

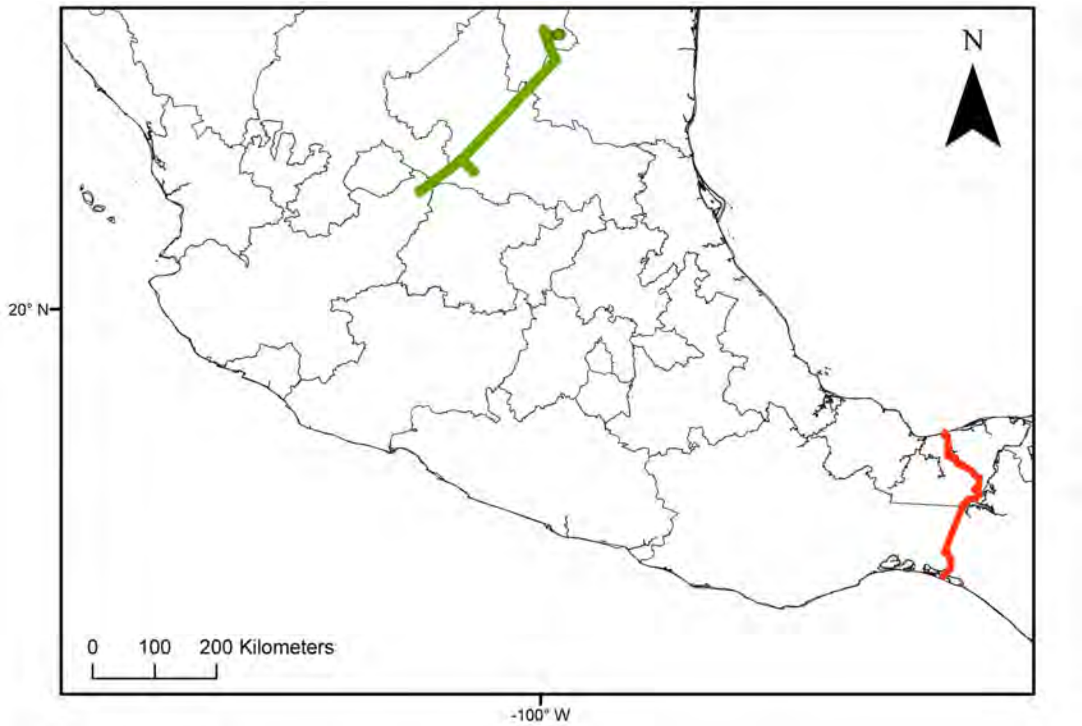

FIGURE 16. Distribution of *Salvia unicostata* represented by an individual track (green line) and collection points (circles). The northern boundary of *Flora Mesoamericana* is highlighted with a red line.

Distribution, habitat and phenology: *Salvia unicostata* is restricted to the Mexican Plateau region, reported from the states of Jalisco, Nuevo León, San Luis Potosí and Tamaulipas; but probably also present in Aguascalientes. It dwells in dwarf oak, pine, oak-pine, and cedar forests, from (1795–)2300–2500(–3400) m elevation. It shares habitat with *Juniperus deppeana* Steud., *Nasella mucronata* (Kunth) R.W.Pohl, *Pinus cembroides* Gordon, *P. montezumae* Lamb., *P. teocote* Schltdl. & Cham., *Quercus chihuahuensis* Trel., *Q.*

eduardi Trel., *Q. greggii* (A.DC.) Tre., *Q. grisea* Liebm., *Q. laeta* Liebm., *Q. mexicana* Bonpl., *Q. opaca* Tel., *Q. potosina* Trel., *Q. sideroxyla* Bonpl, *Sisyrinchum tenuifolium* Humb. & Bonpl. ex Willd., *Stevia lucida* Lag., *Yucca filifera* Chabaud; it is sympatric with other *Salvia* species as *S. axillaris* Moc. & Sessé, *S. macellaria* Epling, *S. microphylla* Kunth, and *S. prunelloides* Kunth. It flowers and fructifies from the end of May to October.

Discussion: *Salvia unicostata* belongs to section *Uliginosae* (Epling 1935: 52) Epling (1939: 54), this is noteworthy because the calyx is covered with dark amber sessile glandular dots and the upper calyx lip is trimucronate. Klitgaard (2012) reduced *S. unicostata* to the synonymy of *S. reptans*, a species that belongs to section *Farinaceae*. Nonetheless, additionally to the distinctive characters of *Uliginosae* exhibited by *S. unicostata*, this can be distinguished by means of its clearly opposite leaves (*vs.* pseudo-whorled in *S. reptans*), thicken and whitish midvein (*vs.* slender and green), revolute leaf margin (*vs.* not revolute), floral bracts (outer surface), floral axis, pedicels and calyces covered with glandular-capitate hairs (*vs.* hispidulous), calyx lobes stiff at the apex like a tiny spine (*vs.* acute and slender), shorter corolla tube [5–6.2 mm *vs.* 7.9–8.5(–10) mm], shorter upper corolla lip (3.6–4.1 mm *vs.* 5.2–6.2 mm), geniculate connective (*vs.* ornate at midportion with a retrorse acute tooth), shorter connective (4.5–5 mm *vs.* 6.6–7.7 mm), shorter filament (1.4–1.6 mm *vs.* 2.5–2.8 mm), and shorter style (8.5–9 mm *vs.* 12.2–13 mm).

Salvia unicostata grows in semiarid habitats in the Mexican Plateau and surrounding portions of Sierra Madre Oriental; hence it is not present in the area covered by the *Flora Mesoamericana* project. Furthermore, the kind of habitat occupied by *S. unicostata* differs from that of *S. reptans*, which grows in wet soils.

Representative specimens examined: MEXICO. Jalisco. Lagos de Moreno: cerro de El Espía, 3 km al S de la presa Juan Vaquero, 21°42'45"N 101°45'17.9"W, 2300 m, 20 October 2011, *J.G. González-G. & F. Pérez 1121* (IBUG!). Nuevo León. Arramberi: La Escondida-San Francisco, 1795 m, 23 June 1993, *G.B. Hinton 23079* (Herbario Hinton!); San Josecito, below, 2395 m, 31 June 1999, *G.B. Hinton et al. 27393* (Herbario Hinton!). Nuevo León. Zaragoza-Puerto Pino, above, 2790 m, 26 June 1978, *G.B. Hinton et al. 17408* (Herbario Hinton!). Zacatecas. Pinos: Ejido La Purísima, aproximadamente 4 km al SW del pobaldo Cerrido de Dolores, 2540 m, 4 sep 2013, *L.F. Colin-Nolasco & J.F. Guerrero-Rodríguez 868* (IBUG!).

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4.12 González-Gallegos, J. G., B. Drew y R. Cuevas-Guzmán. 201X. Novelties on the distribution of *Lepechinia flammea* (Lamiaceae), and rediscovery of *L. glomerata* in Jalisco, Mexico. *Botanical Sciences*

Novelties on the distribution of *Lepechinia flammea* (Lamiaceae) and rediscovery of *L. glomerata* in Jalisco, Mexico

Novedades en la distribución de *Lepechinia flammea* (Lamiaceae) y redescubrimiento de *L. glomerata* en Jalisco, México

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Abstract: The recently described *Lepechinia flammea* was originally known only from the Sierra Madre del Sur in Guerrero, Mexico. However, a new population of this species was uncovered in Jalisco through recent botanical explorations. Additionally, it was described in Oaxaca as *L. oaxacana*, a name that is reduced to synonymy with *L. flammea* here. Moreover, *L. glomerata* the most morphologically similar species to *L. flammea*, is rediscovered in Jalisco. Morphological notes of *L. flammea*, an extended description of *L. glomerata*, and photographs and distribution maps for the two species are provided.
Keywords: disjunction, *Lepechinia* section *Glomeratae*, Sierra de El Cuale, western Mexico.

Resumen: La recién descrita *Lepechinia flammea* fue registrada originalmente sólo de la Sierra Madre del Sur en Guerrero, México. Sin embargo, una nueva población de esta especie fue descubierta en Jalisco durante exploraciones botánicas recientes. Por otra parte, fue descrita para Oaxaca como *L. oaxacana*, nombre que aquí se relega a sinonimia de *L. flammea*. Además, se redescubre en Jalisco a *L. glomerata*, la especie más similar en su morfología a *L. flammea*. Se proveen notas morfológicas de *L. flammea*, una descripción ampliada de *L. glomerata*, fotografías y mapas de distribución de las dos especies.
Palabras clave: disyunción, *Lepechinia* sección *Glomeratae*, Sierra de El Cuale, occidente de Mexico.

The genus *Lepechinia* Willd. contains about 45 species and is composed of perennial herbs to large shrubs that generally possess aromatic leaves, paniculate or spiciform inflorescences, sessile to short pedicellate flowers, +/- actinomorphic to weakly 2-lipped calyces that are exannulate at the throat and usually accrescent in fruit, weakly 2-lipped corollas, four didynamous stamens (included to long-exserted), short and subequal stigmatic branches, an annulate corolla, and (as opposed to the closely related genera *Melissa* L. *and Salvia* L.) non-mucilaginous mericarps (Harley *et al*., 2004). The taxonomic placement and the definition of the genus in terms of the species it embraces have been controversial (e.g., Epling, 1926; Hart, 1983; Drew, 2011). Drew and Sytsma (e.g., 2011, 2013) conducted phylogenetic analyses using DNA sequences from the nucleus and chloroplast to clarify this situation, and their results support the placement of *Lepechinia* within tribe Mentheae, subtribe Salviinae, which is in concordance with the treatment of Harley *et al*. (2004). Additionally, Drew (2011) and Drew and Sytsma (2011) demonstrated that the Eurasian genus *Melissa* is sister to *Lepechinia* and that *Lepechinia* is polyphyletic as traditionally circumscribed. The solutions Drew and Sytsma (2011) proposed to make *Lepechinia* monophyletic were the segregation of *L. mexicana* (S. Shauer) Epling [and probably *L. yecorana* Henrichson, Fishbein & T.Van Devender], which is nested within a clade that includes the monospecific genera *Chaunostoma* Donn.Sm. and *Neoeplingia* Ramamoorthy, Hiriart & Medrano, or the transfer of the two preceding to *Lepechinia*. Nonetheless, they considered for several reasons that the final decision should await for more robust evidence. Recently, Moon (2012) made the transfer of *Chaunostoma mecistandrum* Donn.Sm., to *Lepechinia* [*L. mecistandrum* (Donn.Sm.) H.K.Moon], and Drew *et al*. (2014) transferred *Neoeplingia* to *Lepechinia* [*L. Leucophylloides* (Ramamoorthy, Hiriart & Medrano) B.T.Drew, Cacho & Sytsma]. These results suggest that Salviinae should consist of *Lepechinia*, *Salvia* (*sensu* Walker and Sytsma, 2007), and the genus *Melissa* (Walker *et al*., 2004; Walker and Sytsma, 2007; Drew and Sytsma, 2011, 2013), which was previously unplaced within Mentheae (Harley *et al*., 2004). Although there are no clear morphological synapomorphies that characterize *Lepechinia*, it can be distinguished from other members of Salviinae based on non-galeate upper corolla lips, an unenlarged connective separating the two thecae of the stamens (as opposed to most *Salvia*), non-mucilaginous mericarps, and a distinctive leaf odor.

Lepechinia is restricted to the New World with populations of some of its species [*L. hastata* (A.Gray) Epling in Hawai'i, and *L. stellata* (Cordem.) Epling on Réunion Island] probably being human introductions overseas (Hart, 1983; Drew and Sytsma, 2011). In Mexico there are 12 species, seven of which are endemic: *L. leucophylloides*, *L. flammea* Mart.Gord. & Lozada-Pérez, *L. glomerata* Epling, *L. hastata*, *L. mexicana* (S.Shauer) Epling, *L. nelsonii* (Fernald) Epling and *L. yecorana* Henrickson, Fishbein & T. Van Devender (Martínez-Gordillo *et al*., 2013). Most of these occupy temperate forests at high elevations, dwelling in pine-oak, oak, and montane cloud forests; though there are some exceptions such as *L. mexicana,* which grows in arid conditions.

Epling (1948) divided the genus into eight sections, from them sect. *Glomeratae* Epling with only one species, *Lepechinia glomerata*. This section is distinctive within *Lepechinia* due to its sessile flowers arranged in hemispherical glomeruli which are axillary and long pedunculed, and are subtended at the base by two showy floral bracts. *Lepechinia glomerata* was described based on specimens from a single collection [*Mexia 1804* (UC, MICH, US); Epling, 1948], which was made at San Sebastián del Oeste, Jalisco in 1927. Since the initial collection, no other specimens have been cited from the same area, even though a floristic survey was conducted and published for the region (Reynoso-Dueñas *et al*., 2006). In 2009, Martínez-Gordillo and Lozada-Pérez described *L. flammea* from Guerrero and placed it within *Glomeratae* since its characteristics matched well with the section definition and the morphological similarity to *L. glomerata* was apparent. In fact, several specimens of *L. flammea* were initially determined to be *L. glomerata*. In the same publication, a specimen of *L. glomerata* was cited from the state of Guerrero, being the second citation of the species, but collected about 600 km SE of the type locality. As part of a broad examination of *Lepechinia*, Drew (2011) demonstrated a close relationship between *L. flammea* (labeled as *L. glomerata* in publication) and *L. nelsonii* and included both of these taxa as part of a redefined section *Eulepechinia* Epling, a clade that included all *Lepechinia* taxa (but not *Chaunostoma* or *Neoeplingia*) native to Mexico (except *L. mexicana*) and three South American taxa. Turner (2013) added a new species, *L. oaxacana* B.L.Turner, that he considered closely allied to *L. flammea* and *L. glomerata*. This new species description was based on a single collection and single specimen (*Trujillo-Olazo*, TEX).

Ongoing studies on Lamiaceae have necessitated numerous botanical expeditions and examination of herbarium specimens at several herbaria. These efforts have provided new insights on the distribution and morphological variation of several species. Here we report on new findings of *Lepechinia flammea* as well as new populations of the poorly collected *L. glomerata*. We also assess the validity of the recently described *L. oaxacana*.

Lepechinia flammea Mart.-Gord. & Lozada-Pérez, *Brittonia* **61**:112-115. 2009. Type: Mexico. Guerrero. Malinaltepec: al N de Tres Marías, 17º 7' 42" N, 98º 41' 16.8" O, 2500 m, 21 Nov 2005, *L. Lozada P. 2964* (holotype FCME). *L. oaxacana* B.L.Turner, *Phytologia* **95**:138-140. 2013. Type: Mexico. Oaxaca. Distrito Sola de Vega. Santiago Textitlán: paraje abajo de El Portillo, 16º 43' 58.2" N, 97º 25' 10.3" O, 1190 m, 8 Jan 2007, *I. Trujillo-Olazo 1336* (holotype TEX).

A new population of *Lepechinia flammea* was discovered in the middle of the mountain range known as El Cuale in the state of Jalisco, at the westernmost extreme of the Trans-Mexican Volcanic Belt, on the west side of San Pedro Mountain. The population dwells in ecotones of pine-oak with pine-fir forests between 2430 and 2480 m elevation. It shares habitat with *Abies flinckii* Rushford, *Alnus jorullensis* Kunth, *Arbutus xalapensis* Kunth, *Carpinus caroliniana* Walter, *Clethra fragrans* L.M.González & R.Delgad., *C. hartwegii* Britton, *Cornus disciflora* Moc. & Sessé ex DC., *Desmodium sumichrastii* (Schindl.) Standl., *Garrya laurifolia* Hartweg ex Benth., *Litsea glaucescens* Kunth, *Pinus herrerae* Martínez, *P. pseudostrobus* Lindl., *P. strobiformis* Engelm., *Quercus castanea* Née, *Q. laurina* Humb. & Bonpl., *Q. scytophylla* Liebm., *Rumfordia floribunda* DC., *Styrax ramirezii* Greenm., *Symplocos citrea* Lex., and *Ternstroemia lineata* DC. Other labiates occurring at the site include *Clinopodium macrostemum* (Moc. & Sessé ex Benth.) Kuntze, *Salvia elegans* Vahl, *S. gesneriflora* Lindl. & J.Paxton, *S. iodantha* Fernald, *S. lavanduloides* Kunth and *S. quercetorum* Epling. *Lepechinia flammea* has been collected in flower and fruit from February to May.

The qualitative morphological characters of the *Lepechinia flammea* population in Jalisco corresponds well with those described by Martínez-Gordillo and Lozada-Pérez (2009). There are some quantitative morphological features that differ from the parameters outlined by Martínez-Gordillo and Lozada-Pérez (2009), however; these are highlighted in the following lines. The size of the leaves from the middle of the stem vary from 12.7-23 cm long, and 2.7-4.4 cm wide at mid-leaf and are progressively reduced towards the apex of the plant; just below the inflorescence the leaves diminish to 2.1-5.6 × 0.9-1.5 cm. The inflorescences are 13-30 cm long, with peduncles 1.9-4.5 cm long (in the original description peduncle length was registered as 1.4-5.1 mm instead of cm, probably because a typographical mistake). The external floral bracts can reach up to 1.4 cm wide, the width of the bracteoles (internal bracts) ranges from 1.9-5.5 mm. Each glomerulus consists of 7-10 flowers with pedicels 0.8-2.3 mm long and corolla tubes 13-16 mm long. The thecae are up to 1.7 mm long and the mericarps are between 2.4-2.8 × 1.6-1.8 (-2) mm. The population from Jalisco is also within the altitudinal and phenological ranges of the populations from Guerrero, growing from 2000 to 2700 m, and flowering and fruiting from October to May, respectively (Martínez-Gordillo and Lozada-Pérez, 2009).

When considering the morphological variation of *L. flammea*, the recognition of *L. oaxacana* as a different species is unjustified. Turner (2013) makes the distinction mainly based on smaller foliage [6-10 × 2-3 cm *vs.* the 10-20 × 3-6 cm purportedly stated by Martínez-Gordillo and Lozada-Pérez (2009)], smaller calyces (ca. 6 mm *vs.* 9-11 mm long), and smaller corollas (10-12 × 3-4 mm *vs.* 16-20 × 6-8 mm). However, the leaves of *L. flammea* were described as 3.9-20 × 1.5-6.3 cm by Martínez-Gordillo and Lozada-Pérez (2009), it is not clear why Turner (2013) used a different variation range to contrast his species than the one written in the original description. Additionally, Turner (2013) did not clarify if the ca. 6 mm he reported for calyx length referred only to the calyx tube or to calyx tube plus the length of the lobes; in the holotype –the unique collection and specimen he examined– the calyces including the lobes reach up to 10 mm long, which ultimately is within the range provided in the description of *L. flammea*. The corollas of *L. flammea* are indeed described as 16-20 mm long, but no mention of corolla width is made by Martínez-Gordillo and Lozada-Pérez (2009); the corollas in the holotype of *L. oaxacana* are up to 15 mm long. Moreover, the holotype specimen of *L. oaxacana* is not well preserved; the leaves are crumpled, withered and broken, as are some of the corollas. In summary, the overlap of morphological variation between the taxa, uncertainty of measurements given in the description of *L. oaxacana*, and the fact that this species was described based upon a single collection of poor quality lead us to regard *L. oaxacana* as a synonym of *L. flammea*.

Specimens examined: Mexico. Guerrero. Atoyac de Álvarez: 15 km al NE de El Paraíso, 1100 m, 25 May 1986, *J.C. Soto-N. & F. Solórzano-G. 12829* (MEXU). Chihihualco: 26 km al SE de Filo de Caballo, camino a Puerto del Gallo, 2000 m, 18 Oct 1983, *E. Martínez-S. et al. 4933* (MEXU); 2 km al NE de El Jilguero, camino Atoyac-Filo de Caballo, 2250 m, 23 Nov 1983, *E. Martínez-S. & F. Barrie 5682* (MEXU); 24 km al SE de la Hierbabuena, sobre el camino a Filo de Caballo, Puerto del Gallo, 2330 m, 26 Feb 1984, *E. Martínez-S. et al. 6163* (MEXU); Puerto El Jilguero, 2560 m, 15 Dec 1985, *J.C. Soto-N. 11829* (MEXU). Malinaltepec: Ojo de Agua de Cuauhtémoc, 26 Dec 2012, *E. Cándido-B. & B. Nepomuceno-C. 117* (IBUG, UAGC). Jalisco. Talpa de Allende: parte alta de la mina de El Cuale, 20º 21' 14" N, 105º 0' 24.6" O, 2435 m, 1 May 2003, *R. Cuevas-G. et al. 7743* (IBUG, ZEA); 30 km por la brecha de Talpa de Allende rumbo a El Cuale, extremo O del cerro San Pedro, 5 km al SO de la Tetilla de El Cuale, 20.35856º N, 104.99895º W, 2470 m, 4 Feb 2013, *J.G. González-Gallegos et al. 1468* (IBUG); 30 km por la brecha de Talpa de Allende rumbo a El Cuale, extremo O del cerro San Pedro, 5 km al SO de la Tetilla de El Cuale, 20.356602º N 105.011637º O, 2481 m, 18 Mar 2013, *J.G. González-Gallegos et al. 1495* (IBUG).

Lepechinia glomerata Epling, *Brittonia* **6**:356. Type: Mexico. Jalisco. San Sebastián del Oeste: Hacienda del Ototal, 4 Mar 1927, *Y. Mexia 1804* (holotype UC, isotype MICH, US).

Lepechinia glomerata had not been collected for several decades following the first collection, which was gathered in 1927. During 2002 (*P. Carrillo-R. & E. Sahagún-G. 3032*) and 2011 (*J.G. González-G. et al. 947*), independent explorations in Sierra de El Cuale, Jalisco, let to finding populations of the species along a dirt road from about 4 km N of El Tuito to Minas de Zimapán in the municipality of Cabo Corrientes. Later, while consulting herbarium collections, another specimen was found at MICH, a collection made by Rogers McVaugh from the same area in 1975. The species was also documented in the municipality of Tecpan de Galeana, Guerrero (Martínez-Gordillo and Lozada-Pérez, 2009), with a collection made in 2007. In contrast, a botanical excursion in 2009 to the type locality yielded no individuals of the species. Thus, 48 years passed since the species was collected for the first time until the next series of collections. On the basis of these recent specimens, an extended description is provided.

Shrub (0.7-) 1.6-2 (-3) m tall, stems hirsute, puberulent and covered with short glandular-capitate hairs. Leaves sessile, leaf blades lanceolate to slightly elliptic-lanceolate, (3.7-) 6.3-20 × (1.3-) 2-3.9 (-8.1) cm, acute at the apex, auriculate and amplexicaul at the base, margins serrate chiefly on the biggest leaves. Leaves sparsely pilose and puberulent, occasionally with some glandular-capitate hairs, the indumentum concentrated along the veins and beneath them, young leaves bullate above, very aromatic, progressively diminishing in size toward the apex. Flowers 8-14, arranged in capituliform inflorescences (glomeruli), attached in the axils of reduced leaves. Peduncles 3.2-4.8 cm long, hirsute and with glandular-capitate hairs. Floral bracts of the same shape, texture, and color than the leaves, but smaller (1.5-2.9 × 0.6-1.1 cm), sparsely pilose, puberulent and bordered by glandular-capitate hairs. Bracteols lanceolate to linear-lanceolate, 0.5-0.8 (-1.1) cm long, membranaceous, sparsely pilose and ciliated at the margin, which is entire. Flowers with pedicels 0.8-1.3 mm long, pilose and with sessile glandular dots. Calyx green, tube 2.9-3.9 mm long, 3.2-3.5 mm wide at the throat, pilose and covered with glandular-capitate hairs and sessile glandular dots, teeth 1.9-2.5 mm long. Corolla light blue to lavender (lilac in the original description), glabrous, tube 6.8-7.8 × 2.3-3.4 mm, not constricted at the base, lobes subequal, 0.8-2.2 mm long. Stamens exserted, attached at 5.8-6.2 mm of corolla length from the base, filaments 8.4-8.9 mm long, glabrous, theca 0.5-1 mm long. Style 1.1-1.4 cm long, branches subulate and subequal, 0.8-0.9 mm long. Mericarps ovoid, 2.5-2.9 × 1.7-2.1 mm, black to dark brown, smooth and glabrous.

Specimens examined: Mexico. Guerrero. Tecpan de Galeana: bajitos de La Laguna, Costa Grande, 17º 34' 3.7” N, 100º 43' 29.6” O, 1180 m, 15 Jan 2007, *Y. Marcos-G. 512* (FCME). Jalisco. Cabo Corrientes: 3-10 km generally E on the road to Mina del Cuale, from the junction 5 km NW of El Tuito, 850 m, 16 Feb 1975, *R. McVaugh 26448* (MICH); km 3.4 de la brecha a la Mina de Zimapán, 20º 21' 7” N, 105º 17' 42” W, 9 Mar 2002, *P. Carrillo-R. & E. Sahagún-G. 3032* (IBUG); brecha El Tuito a la mina de Zimapán, 5.3 km a partir de la carretera El Tuito a Puerto Vallarta, 1.3 km antes de llegar a la localidad de Provincia, 20º 21' 38.2” N, 105º 16' 58.8” W, 924 m, 13 Mar 2011, *J.G. González-G. et al. 947* (IBUG); 5.6 km por la brecha de El Tuito a Las Minas de Zimapán, a partir de 4 km al N de El Tuito, carretera a Puerto Vallarta, 20º 21' 34.29” N, 105º 17' 8.07” W, 962 m, 12 Aug 2011, *J.G. González-G. et al. 1074* (IBUG).

Lepechinia glomerata inhabits in oak-pine forests and ecotones of these with montane cloud forests, from 850-1180 m elevation. It shares habitat with *Augusta rivalis* (Benth.) J.H.Kirkbr., *Byrsonima crassifolia* (L.) Kunth, *Calophyllum brasiliense* Cambess., *Cecropia obtusifolia* Bertol., *Inga andersonii* McVaugh, *Magnolia pacifica* A.Vázquez, *Oreopanax peltatus* Linden, *Podocarpus matudae* Lundell, *Quercus aristata* Hook. & Arn., *Q. glaucescens* Bonpl., and *Q. salicifolia* Née. It flowers and fructifies from January to March.

In addition to the characters that Martínez-Gordillo and Lozada-Pérez (2009) highlight as those that supports the distinction between *L. glomerata* and *L. flammea*, it can be also considered the shorter thecae of the first (0.5-1 *vs.* 1-1.5 mm long) and shorter style (1.1-1.4 *vs.* 1.6-2 cm long).

The populations of *Lepechinia glomerata* and *L. flammea* from Jalisco are disjunct in reference to those populations from Guerrero and Oaxaca since they are separated by at least 600 km. However, it is highly probable that these species will be found in the near future in intermediate locations with similar ecological conditions. Some places where this would be expected are Sierra de Cacoma and Sierra de Manantlán, Jalisco; Cerro Grande, Jalisco-Colima border; and Sierra de Coalcomán, Michoacán.

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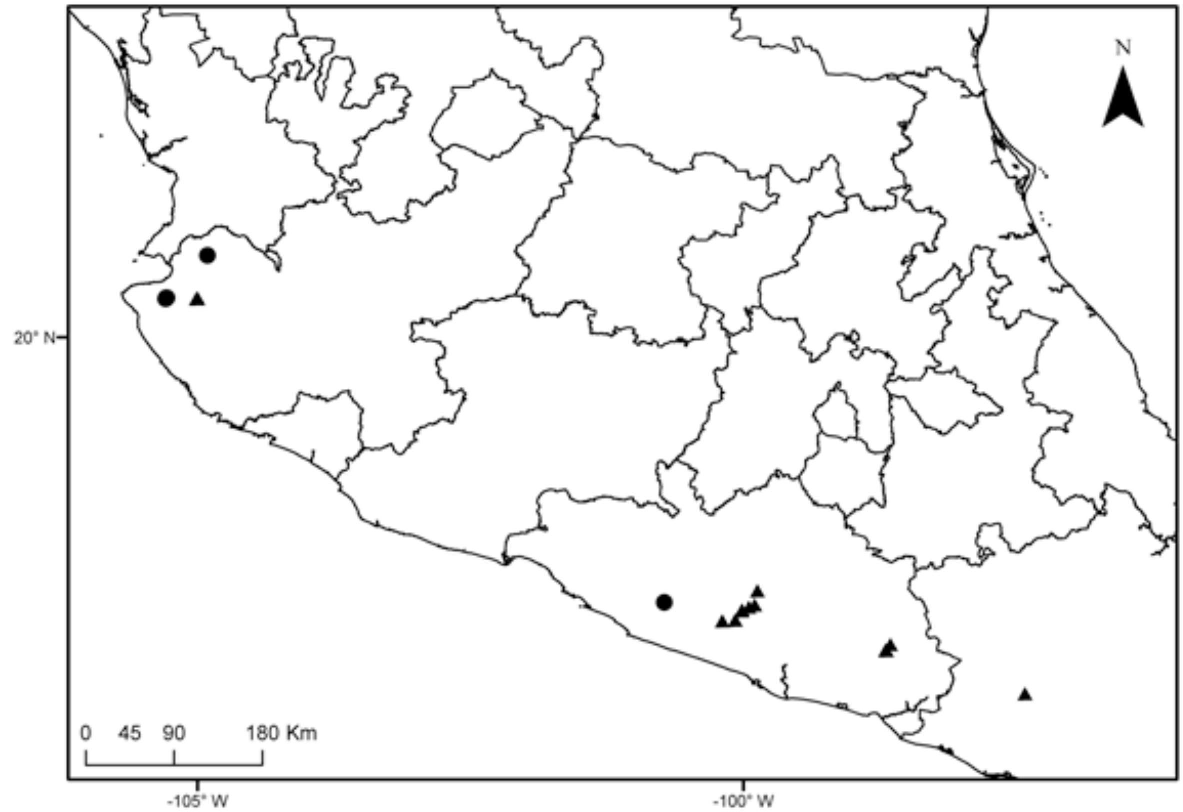
Figure legends

Figure 1. Inflorescence of *Lepechinia flammea* (up; picture taken by J. G. González-Gallegos in Talpa de Allende, Jalisco) and *L. glomerata* (down; picture taken by J. G. González-Gallegos in Cabo Corrientes, Jalisco).

Figure 2. Distribution map of *Lepechinia flammea* (triangles) and *L. glomerata* (dots).

Figure 1.

Figure 2.



4.13 González-Gallegos, J. G., A. Castro-Castro, A. Flores-Argüelles y A. R. Romero-Guzmán. 201X. Discovery of *Hyptis pseudolantana* in Jalisco and Michoacán, and description of *H. cualensis* and *H. macvaughii* (Ocimeae, Lamiaceae) from western Mexico. *Phytotaxa*

Discovery of *Hyptis pseudolantana* in Jalisco and Michoacán, and description of *H. cualensis* and *H. macvaughii* (Ocimeae, Lamiaceae), two new species from western Mexico

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Abstract
The distribution of *Hyptis pseudolantana* is documented in the states of Jalisco and Michoacán, species previously reported exclusively from the state of Guerrero, Mexico. An expanded description, distribution map and photographs are provided for it. *Hyptis cualensis* and *H. macvaughii* are also described and illustrated by photographs, as two new species from the Mexican states of Jalisco and Nayarit, respectively. Also, an identification key to species of tribe Hyptidinae in western Mexico is provided.
Key words: *Hyptis* section *Rhytidea, Hyptis* subsection *Umbellatae, Hyptis* subsection *Mutabiles*, subtribe Hyptidinea.

Resumen. La distribución de *Hyptis pseudolantana* es documentada en los estados de Jalisco y Michoacán, especie registrada con anterioridad únicamente del estado de Guerrero, México. Se proporciona una descripción ampliada, mapa de distribución y fotografías de la misma. *Hyptis cualensis* e *H. macvaughii* son también descritas e ilustradas mediante fotografías, como dos especies nuevas de los estados mexicanos de Jalisco y Nayarit, respectivamente. Además, se incluye una clave para la identificación de las especies de la tribu Hyptidinae encontradas en el occidente de México.

Introduction
The genus *Hyptis* Jacquin (1786: 101) is one of the richest Lamiaceae genera with almost 300 species. *Hyptis* grows mainly in the New World with few species extending beyond (Harley 1988, Harley *et al.* 2004, Pastore *et al.* 2011). The subtribe Hyptidinae (tribe Ocimeae), which includes *Hyptis*, can be easily recognized –excluding *Asterohyptis* Epling (1933a: 17)– because of the downwardly directed stamens, and the thickened lower corolla lobe that acts as a hood protecting the former before anthesis and releasing them explosively when mature (Harley *et al.* 2004). However, the distinction of the genera embedded in the subtribe is not entirely unambiguous (El-Gazzar & Rabei 2008). As stated in the keys provided by Harley (1988) and Harley *et al.* (2004), the delineation of the genera is achieved by means of a set of characters: structure of the inflorescences, calyx bilabiate or not, appendiculate, spiny or simple calyx lobes, these reflexed or not, stylopodium present or not and mericarp shape, amongst others. In *Hyptis*, the diagnostic character is the absence of a stylopodium, even when the species with involucrate capitula might present it eventually.

Besides, phylogenetic analysis based on DNA sequences (Pastore *et al.* 2011) have brought to light *Hyptis* as a polyphyletic genus since all other Hyptidinae genera appeared nested within *Hyptis* lineages in the cladograms. Also, the polyphyly of the genus had been previously suggested by the phenetic analysis of morphological characters (El-Gazzar & Rabei 2008). Given this complexity, two solutions may be taken, one of them is to reduce all other Hyptidinae genera under *Hyptis*, otherwise it should be recognized a much larger number of genera. In this context, Pastore *et al.* (2011) claimed for the segregation of new genera to build a monophyletic delimitation of *Hyptis* as a better solution rather than the submersion of all Hyptidinae within only one genus. Harley & Pastore (2012) did not consider a good choice leaving a single genus with a broad range of morphological variation, purportedly unmatched in any other genus of flowering plants. So they decided to integrate a new classification proposal for Hyptidinae segregating new genera grounded mainly in the cladograms presented by Pastore *et al.* (2011). Accordingly, they increased the number of genera within the subtribe from eight (Harley *et al.* 2004) to 19, with the coinage of six new generic names and status change of five infrageneric categories. Moreover, this approach generates 142 new nomenclatural combinations.

However, little less than half of Hyptidinae species are represented in Pastore *et al.* (2011) and although the clades are well supported in the topology shown, there are also several politomies in the cladograms that create mistrust in the clade relationships in spite of the clade support. In addition, distinction of the genera they proposed is ambiguous through the dichotomous key provided (Harley & Pastore 2012): characters are not precisely defined, measurements are not always used in lieu of uncertain terms, the parallelism between two leads is inconsistent and not clearly contrasting, and several unqualified negative statements are done; these features are contrary to what is recommended to construct an identification key (Judd *et al.* 2008). Moreover, morphological diversity is not synonymous with taxonomic diversity, and a broad morphological variation is not unique of *Hyptis s.l.* For example, in the large subtribe Euphorbiinae some authors decided to retain a single well-known and easily identifiable genus, *Euphorbia* Linnaeus (1753: 450), instead of a vaguely circumscribed multitude of genera; thereby *Euphorbia* becomes one of the most striking morphologically diversified genera of vascular plants, which embraces perennial and annual herbs, erect and scandent shrubs, trees, geophytes and succulents, including representatives of the three different kinds of carbon fixation C_3, C_4, and CAM, a high variability of ploidy levels, but unified by the particular and conserved configuration of its inflorescences, the cyathium (Steinmann & Porter 2002, Horn *et al.* 2012, Yang *et al.* 2012, Dorsey *et al.* 2013, Riina *et al.* 2013). Another important consideration is that a classification pursues conflicting goals, on one hand it tries to be a true picture of evolutionary history, and on the other it is committed to be practical in order to be useful to general community and not being only an academic whim; thus, an ethic position as a systematist should be to find a balance between both sides. The convenience of a classification can be evaluated in terms that it implies easily diagnosable groups (i.e., well supported, preferably with synapomorphic characters), and in second instance, few nomenclatural changes. Submerging all Hyptidinae within *Hyptis* demands 32 nomenclatural changes almost 5 times less than the choice taken by Harley & Pastore (2012). In summary, taking in consideration the uncertainty about phylogenetic results and the hardness in morphologically delimiting Hyptidinae genera, we keep on recognizing provisionally the traditional *Hyptis* definition instead of several new poorly defined genera. It is probable that the best solution in the near future will be to submerge all Hyptidinae within *Hyptis*; though, more compelling evidence is needed to take a definitive decision.

Once we have clarified our position in respect to the definition of *Hyptis,* we proceed to document the occurrence of *Hyptis pseudolantana* Epling (1941: 555) in the states of Jalisco and Michoacán, and to describe two new species of *Hyptis* from western Mexico. We provide descriptions, pictures and distribution maps for the three taxa. This is the result of recent field exploration and examination of specimens at several herbaria.

***Hyptis pseudolantana* Epling (1941: 555) (Figs. 1 and 2A-D)**

Type:—MEXICO. Guerrero. Coyuca de Catalán: Aguazarca–Filo, District Mina, Guerrero, 9 November 1937 (fl, fr), *G.B. Hinton et al. 11266* (holotype UC, isotypes K!, MO!, US-00121889!, US-01014362!).

Perennial herb to subshrub, erect, 0.6–2(–2.5) m tall, arising from a small xylopodium, aromatic. Stems glabrous to puberulent and pilose, with the hairs concentrated towards young branches. Leaves with petioles (1–)6–20 mm long, pilose; leaf blade ovate to ovate-elliptic, 1.5–7.1 × 0.9–4.1 cm, acute to acuminate at the apex, rounded to shortly cuneate at the base, serrate margin, pilose in both surfaces. Flowers sessile or with pedicels less than 0.5 mm long, arranged in axils and forming terminal spiciform inflorescences toward branch apex, 4–18 cm long, with pectinate opposite cymes at each node, 6–18 flowers per cyme, cyme peduncles 3–8.7 mm long (sometimes hidden by the flowers); peduncle bracts conformed by reduced leaves 2.1–4.9 × (0.8–)1.5–2.2 mm, bracteoles linear, 1.4–2.8 mm long; inflorescence axes, peduncles and bracteoles sparsely pilose and glandular-punctate. Calyx tube (1.7–)2.2–3.5(–5) mm long, and 1.6–1.8 mm wide at the throat in flower (up to 4.4 × 2.2 mm in fruit), sparsely pilose and covered with some short glandular-capitate hairs and or sessile glandular dots, puberulent, internally covered with a ring of hairs attached 1–2 mm below the line of the teeth or at the middle of calyx tube length; teeth triangular and attenuate towards the apex, 9–1.5 mm long and straight in flower (up to 2 in fruit). Corolla pale violet, dull lavender to white, sparsely pilose towards the lobes; tube (5.1–)6.5–7.3 mm long, (1.5–)2.3–2.8 mm wide at the throat, lobes subequal, 1.7–3 mm long. Stamens 4, attached at 5.3–5.5 mm of corolla tube length, the lateral stamens attached a little below than the inner ones; filament (1.2–)1.5–1.6(–2.4) mm long, pilose; theca 0.2–0.4 mm long. Style (3.3–)4.4–6.3 mm long, white and glabrous, without stylopodium; stigma bifurcate, the branches ovoid. Mericarps 4, ovoid to turbinate, 1–1.3 × 0.6–0.8 mm, slightly trigonous, light or dark brown, smooth to muriculate, nitid, pulverulent, glabrous, with a markedly suture line in the external face.

Distribution, habitat, and phenology:—*Hyptis pseudolantana* inhabits in western side of the Sierra del Halo, in the municipality of Tecalitlán, Jalisco, eastern side of Sierra de Coalcomán, Michoacán, and northeastern slopes of Sierra Madre del Sur in the municipality of Coyuca de Catalán, Guerrero (figure 1). It grows in pine-oak and oak forests and in ecotones with montane cloud and tropical deciduous forests, at elevations from (1400–)1650–2200 m. It shares habitat with *Pinus douglasiana* Martínez, *P. hartwegii* Lindl., *Carpinus caroliniana* Walter, *Dendropanax arboreus* (L.) Decne & Planch., *Fuchsia arborescens* Sims, *Inga micheliana* Harms, *Quercus scytophylla* Liebm., *Cunila pycnantha* B.L.Rob. & Greenm., *Cosmos carvifolius* Benth., *Galphimia glauca* Cav., and *Jungia pringlei* Greenm. It flowers and fructifies from August to May.

Taxonomic relationships:—*Hyptis pseudolantana* was assigned by Epling (1941) to sect. *Rhytidea* Epling (1933b: 80) due to the internal ring of hairs of the calyces placed at the middle of its length. However, this species is more similar to the species of sect. *Mesosphaeria* Bentham (1833: 122) subsect. *Pectinaria* Epling (1934:

97), than to *Hyptis rhytidea* Bentham (1839: 21), the other member of sect. *Rhytidea* Epling (1934: 80). It shares with subsect. *Pectinaria* the habit (herbs to subshrubs or rarely trees), petiolate leaves, ovate and rarely lanceolate, pectinate or globose cymes with peduncles longer than the calyces and, linear floral bracts. It differs from the species of sect. *Rhytidea* because of its membranaceous leaves (*vs.* coriaceous), cymes clearly pedunculated (*vs.* subsessile), and linear floral bracts (*vs.* ovate). As stated in the introduction, the classification of the genus is still unstable, so we have no elements to unequivocally support the inclusion of *H. pseudolantana* to one of the infrageneric groups.

Hyptis pseudolantana is similar to *H. pectinata* (Linnaeus 1759: 1096) Poitier (1806: 474) and *H. urticoides* Kunth (1817: 320) from subsect. *Pectinaria*, but it can be easily distinguished from these because the calyces are infundibuliform instead of tubular, with triangular teeth rather than linear, and calyx tube without an internal well-defined ring of hairs that projects between calyx teeth. It is also similar to *H. pinetorum* Epling (1933: 103b) from subsection *Mutabiles* Epling (1934: 102), but it can be differentiated by means of the glandular capitate hairs restricted to the calyces and not spread throughout stems, leaves and inflorescences, usually shorter petioles [(2.5–)6–20 *vs.* (18–)30–55 mm], flowers arranged in pectinate cymes instead of spherical cymes, shorter peduncles [3–7 *vs.* (8–)12–30 mm], shorter calyx tube (1.7–2.2 *vs.* 3–4.5 mm), and shorter style [(3.3–)4.4–6.3 *vs.* 6.2–7.7 mm] (table 1).

Hyptis pseudolantana was formerly known only from the type collection series from Guerrero, but here, several specimens from Jalisco and one from Michoacán are assigned to this species (figure 1). *Hyptis pseudolantana* is not reported for the later two states in their most recent floristic lists, although the specimen *McVaugh 22775* (ENCB) was included as an undetermined *Hyptis* for Michoacán (Rodríguez-Jiménez & Espinosa-Garduño 1996, Ramírez-Delgadillo *et al.* 2010). Our collections and other herbaria material reviewed differ in some characters from the original description of the species. Nonetheless, these differences are not so abrupt and consistent as to demand the need of naming the new discovered populations as a different taxon. The morphological discrepancies are: petioles 1–2 mm long in the original description *vs.* 6–20 mm long in the new discovered populations, axillary inflorescences *vs.* most of them terminal, calyces internally ornate with a ring of hairs attached at the middle of its length *vs.* attached 1–2 mm below calyx teeth line, and white corollas *vs.* pale violet to dull lavender. It is likely that the relatively low number of specimens that were surveyed to elaborate the original description by Epling (1941) promoted these discrepancies. Moreover, three disjunct populations around Balsas Depression integrate the distribution of the species; it can be expected that more extensive exploration in mountains between these points and with adequate elevations for the species establishment will reveal new populations. This ultimately could help to better understand the morphological variation of *H. pseudolantana*.

If the classification proposal of Harley & Pastore (2012) is followed, *H. pseudolantana* would fit better within their definition of the genus *Mesosphaerum* Browne (1756: 257).

Conservation assessment:—*Hyptis pseudolantana* has a wide geographical distribution and their populations consist of numerous individuals, so it appears not to be in danger of extinction.

Additional specimens examined:—MEXICO. Jalisco. Tecalitlán: Sierra del Halo, near a lumber road leaving the Colima highway, 7 miles SSW of Tecalitlán and extending southeasterly toward San Isidro, 1400 m, 13 August 1957 (fl, fr), *R. McVaugh 16149* (MICH!); Sierra del Halo, near a lumber road leaving the Colima highway, 7 miles SSE of Tecalitlán and extending SE toward San Isidro, 2000–2200 m, 28 November 1959 (fl), *W.N. Koelz 1171 & R. McVaugh* (MICH!); 46 km carr. Ciudad Guzmán-Pihuamo, por la brecha Llanitos-Canutillo, a 16 km, 1650 m, 14 May 1988 (fl, fr), *Pichardo 47* (MEXU!); 14 km al E de Llanitos, brecha a Canutillo, 1750 m, 18 March 1990 (fl, fr), *Villa et al. 673* (IBUG!, IEB!); brecha a Mexicanillo, Sierra del Halo, 2060 m, 13 March 1996 (fl, fr), *Ramírez et al. 3599* (IBUG!); Sierra del Halo, cañada La Jabalina, predio Las Palomas, 3.5 km en línea recta al O de Alotitlán, 19º15'35"N, 103º14'58"W, 1700–1750 m, 23 February 2012 (fl, fr), *A. Castro-Castro, E.A. Suarez-Muro & A. Frías-Castro 2619a* (IBUG!); Sierra del Halo, predio Los Fresnos, Puerto de Ortiz, 2.5 km en línea recta al O de Alotitlán, 19º15'3"N, 103º14'8"W, 1700 m, 23 February 2012 (fl, fr), *A Castro-Castro, E.A. Suárez-Muro & A. Frías-Castro 2747a* (IBUG!); Sierra del Halo, cerca del río Canutillo en el predio Las Palomas, 19º15'35"N, 103º14'58"W, 1700–1750 m, 8 March 2012 (fl, fr), *A. Castro-Castro 2680a, E.A. Suárez-Muro & A. Frías-Castro* (IBUG!); Sierra del Halo, 12 km en línea recta al E de Pihuamo, entre los predios Las Palomas y La Esperanza, 19º15'35"N, 103º14'58"W, 1980 m, 29 March 2012, *A. Castro-Castro, E.A. Suárez-Muro & A. Frías-Castro 2842a* (IBUG!). Michoacán. Aguililla: near the pass ca. 15 km S of Aserradero Dos Aguas (NW of Aguililla), 1650–1700 m, 4 March 1965 (fl), *R. McVaugh 22775* (ENCB!, MICH!).

***Hyptis cualensis* J.G.González *sp. nov.* (Figs. 1 and 2E-H)**

H. rhytidea affinis sed bracteis floralibus semper linearibus (*vs*. foliis reductis constitutus), plus floribus per verticillastum (7–10 *vs.* 3–7), bracteolis brevioribus [1.3–2.2 *vs*. 3.5–5-4(–7.4) mm], calycum tubo in florem [1.6–2.5 × 1.6–2 *vs.* 2.4–2.9 × 2.5–2.6(–3) mm] et in fructum (3.1–3.5 × 2.5–2.7 *vs.* 7–7.4 × 3.5–3.8 mm) brevioribus, trichomatum annulo interno affixo ad 1–2 mm infra dentium lineam (*vs.* ad medium calycum tubo longitudine), calycum dentibus in florem (0.8–1.3 *vs.* 2.5–4.5 mm) et in fructum (usque ad 1.5 *vs*. 7.3 mm) brevioribus et distinctis (*vs*. calycum dentibus superis ad basem connatis), et nuculis plus minusve brevioribus [1.6–1.8(–1.9) × 0.8–1 *vs*. (1.9–)2.5–2.6 × (1–)1.4–1.6 mm] differt.

Type:—MEXICO. Jalisco. Puerto Vallarta: Ojo de Agua, 20º30'43.5"N 105º12'20.5"W, 1227 m, 1 May 2013 (fl, fr), *A. Flores-Argüelles & A.R. Romero-Guzmán 662* (holotype IBUG!, isotypes IEB!, MEXU!).

Shrub up to 3 m tall, stems puberulent and covered with some sessile amber glandular dots, hairs more abundant in young branches and toward the apex, very aromatic. Leaves with petioles 5.6–9.6(–11.5) mm long, pilose, puberulent and with sessile glandular dots; leaf blade lanceolate to narrow lanceolate, 5.7–9.9 × 0.8–2 cm, decreasing in size toward the inflorescences, coriaceous, acute to acuminate at the apex, shortly rounded at the base, margin obscurely serrate, upper surface lustrous, pilose in the main vein, puberulent and with sessile glandular dots in the rest, tomentose beneath and with secondary and tertiary veins conspicuous to the naked eye. Flowers sessile, arranged in dense terminal spiciform inflorescences, (6.5–)10.5–21 × 1.4–2.1 cm, with pectinate opposite cymes at each node, 7–10 flowered each one, cyme peduncles 1.2–4.6 mm long, peduncle bracts composed of reduced leaves at the base of the inflorescence and progressively differentiated into linear structures (2.5–)4–12 mm long, bracteoles linear, 1.3–2.2 mm long; inflorescence axes, peduncles, and floral bracts pilose, puberulent and with some sessile glandular dots. Calyx tube 1.6–2.5 mm long, and 1.6–2 mm wide at the throat in flower (up to 3.1–3.5 × 2.5–2.7 mm in fruit), purple, incanous, puberulent and covered with sessile glandular dots, internally ornate with a ring of hairs attached from teeth line to 1–2 mm below; calyx teeth triangular, 0.8–1.3 mm long in flower (up to 1.5 mm in fruit). Corolla pink, externally and internally tomentose; tube 5.6–6.2 mm long, 1.3–2.4 mm wide at the throat, lobes subequal, 1.7–2.1 mm long. Stamens 4, attached at 3.6–4.1 mm of corolla tube length; filament 1.7–2.7 mm long, pilose; thecae 0.5–0.8 mm long. Style 5–7.8 mm long, brown and glabrous, without stylopodium; stigma bifurcate at the apex, the branches subulate. Mericarps 4, oblong, 1.6–1.8(–1.9) × 0.8–1 mm, triquetrous, bronze brown, nitid, muriculate, smooth to finely reticulate, and glabrous.

Distribution, habitat, and phenology:—*Hyptis cualensis* grows in the Pacific slopes of Sierra de El Cuale, and it is only known from the municipality of Puerto Vallarta, Jalisco (figure 1). It inhabits in open pine-oak forest with savannoid elements, from 1100–1227 m elevation. It shares habitat with *Bejaria mexicana* Benth., *Byrsonima crassifolia* (L.) Kunth, *Nolina* sp., *Pinus maximinoi* H.E.Moore, *Quercus* sp., and *Salvia ramirezii* J.G.González, in higher elevations, and also with *Q. aristata* Hook. & Arn. in lower elevations. It flowers and fructifies from February to May.

Etymology:—The name of *Hyptis cualensis* honors the mountain range to which it belongs: Sierra de El Cuale. The last one is a relevant spot of plant diversity in western Mexico; several novelties and species have been described from there in the last recent decades (González-Gallegos & Castro-Castro 2012).

Taxonomic relationships:—*Hyptis cualensis* is morphologically most similar to *H. rhytidea* due to its habit as robust shrub, similar pubescence throughout, coriaceous, lustrous leaves, and of similar shape and size, spiciform compact inflorescences composed of cymes with peduncles of similar length, sessile flowers, and similar corollas in shape, size and color (table 2). However, there are several differences between them that facilitate and warrant the recognition of *H. cualensis* as a distinct species. The floral bracts of *H. cualensis* are always linear except for those of the base of the inflorescence (*vs.* reduced leaves as floral bracts throughout the inflorescence in *H. rhytidea*), more flowers per verticillaster (7–10 *vs.* 3–7), shorter bracteoles [1.3–2.2 *vs.* 3.5–5-4(–7.4) mm], smaller calyx tube in flower [1.6–2.5 × 1.6–2 *vs.* 2.4–2.9 × 2.5–2.6(–3) mm] and in fruit (3.1–3.5 × 2.5–2.7 *vs.* 7–7.4 × 3.5–3.8 mm), internal ring of hairs attached from teeth line to 1–2 mm below (*vs.* at the middle of calyx tube length), shorter calyx teeth in flower (0.8–1.3 *vs.* 2.5–4.5 mm) and in fruit (up to 1.5 *vs.* 7.3 mm), and all of them distinct till the base (*vs.* the three upper connate between them at its base, and the two lower distinct), and slightly smaller mericarps [1.6–1.8(–1.9) × 0.8–1 *vs.* (1.9–)2.5–2.6 × (1–)1.4–1.6 mm]. Besides, *H. rhytidea* occupies a much wider geographical and ecological distribution, since it grows from Michoacán to almost southern Sonora (Ramamoorthy & Elliot 1998), dwelling in several different kinds of vegetation and elevation range (table 2). In contrast, *H. cualensis* is only known of one locality in the Pacific slope of Sierra de El Cuale in Jalisco, with a narrow ecological distribution in terms of the kinds of vegetation and elevation range it occupies (table 2).

Hyptis rhytidea is one of two species assigned by Epling (1934, 1941) to sect. *Rhytidea*. The similarity of *H. cualensis* to the former suggests it should be placed in the same section according to Epling’s proposal. Harley & Pastore (2012) left sect. *Rhytidea* without being placed in any of the genera they recognized, but stating that it belongs probably to *Condea* Adanson (1763: 504), because it was recovered as sister group of such genus in the cladograms shown by Pastore *et al.* (2011). However, *H. rhytidea* was not sampled in that research. Furthermore, using the key to genera they provide leads to *Mesosphaerum* instead of *Condea*.

Conservation assessment:—*Hyptis cualensis* appears to be in danger of extinction, based on its restricted geographic distributional range and population size.

No subpopulation estimated to contain more than 250 mature individuals, so it should be classified as endangered [EN, criteria C2a (i)] according to the IUCN (2008).

Additional specimen examined:—MEXICO. Jalisco. Puerto Vallarta: Ojo de Agua, 100 m al SO de donde nace el arroyo Las Trancas, zona rocosa, 20º31'00.3"N 105º12'8.2", 1219 m, 19 February 2013 (fl), *A. Flores-Argüelles & A.R. Romero-Guzmán 644* (IBUG!); Ojo de Agua, 2 km al SO de donde nace el arroyo Las Trancas, 20º31'30"N 105º11'14.6"W, 1139 m, 30 April 2013 (fr) *A. Flores-Argüelles & A.R. Romero-Guzmán 660* (IBUG!); Ojo de Agua, aprox. 400 m de donde nace el arroyo Las Trancas, siguiendo el cauce, 20º30'55.9"N 105º11'54.6"W, 1104 m, 25 August 2013 (fr), *A. Flores-Argüelles & A.R. Romero-Guzmán 798* (IBUG!).

***Hyptis macvaughii* J.G.González & Art.Castro *sp. nov.* (Figs. 1 and 3)**

Hyptis subtilis Epling affinis sed indumento trichomatum ramosis, petiolis plus minusve brevioribus [1.7–3.1(–4) *vs.* 2.7–6.1 cm), plus floribus per verticillastum (30–40 *vs.* 15–21), pedicellis longioribus (6.7–15 *vs.* 4–5.8 mm), calycum dentibus in florem (0.2–0.4 *vs.* 0.5–0.6 mm) et in fructum (usque ad 0.5 *vs.* 0.8 mm) plus minusve brevioribus, corollarum tubo longiore [(4.6–)5.2–6.4 *vs.* 2–2.7 mm], stylo longiore [(8.7–)10–11.6 *vs.* 4.3–4.9 mm), plus nuculis fertilibus (4 *vs.* 1) et magnioribus (1.2–1.4 × 0.8–0.9 *vs.* 1.5–2.1 × 1.4–1.6 mm).

Type:—MEXICO. Nayarit. Compostela: 3.5 km al O de Las Mesilla por la carretera 200D rumbo a Las Varas, 15–20 km antes de llegar a esta población, 285 m, 21 November 2013 (fl, fr), *J.G. González-Gallegos & A. Castro-Castro 1547* (holotype IBUG!, isotypes CIIDIR!, ENCB!, IEB!, MEXU!, ZEA!).

Shrub 1–2.5 m tall, stems covered with branched hairs and puberulent, young branches reddish, scarcely aromatic. Leaves with petioles 1.7–3.1(–4) cm long, densely covered with branched hairs and puberulent; leaf blade lanceolate, 6.2–14.5(–17) × (1.5–)2.5–5.6 cm, acute to attenuate at the apex, rounded at the base and slightly oblique, margin serrate, both surfaces covered with branched hairs, mainly in the veins, and beneath. Flowers with pedicels (6.7–)9–15 mm long directly attached to a thicken portion of floral axes, arranged in lax to dense spiciform terminal inflorescence, 18–40 cm long (sometimes the spiciform inflorescences branched and forming a raceme), each node composed by a verticillaster with 30–40 flowers, floral bracts linear, 0.7–2.2(–4) mm long, bracteoles linear 0.8–1.2 mm long; inflorescence axes, floral bracts and pedicels covered with appressed hairs and sometimes with branch hairs as those in the stems and leaves; inflorescences become pendulous and flowers resupinate as the axis is overcome by the weight. Calyx tube 2–3.2 mm long and 1.8–2.1 mm wide at the throat in flower, up to 5–5.5 × 2.5–3 mm in fruit, calyx teeth 0.2–0.4 mm long in flower, up to 0.5 mm long in fruit, densely covered with pale purple branched hairs. Corolla dull violet to lavender, sparsely pilose at the apex including the lobes; tube (4.6–)5.2–6.4 mm long, 1.5–2 mm wide at the throat, lobes subequal, 2–2.5(–2.9) mm long. Stamens 4, attached at 3.6–5.5 mm of corolla tube length; filament 1.7–2.5 mm, pilose; thecae 0.2–0.7 mm long. Style (8.7–)10–11.6 mm long, long exserted, white, and glabrous, without stylopodium, bifurcate at the apex, the branches acute. Mericarps 4, ovoid, triquetrous, 1.2–1.4 × 0.8–0.9 mm, black, tiny verrucose, and glabrous.

Distribution, habitat, and phenology:—*Hyptis macvaughii* inhabits in southern Nayarit, in the municipality of Compostela (figure 1). It grows in savannoid vegetation and ecotones of this with tropical subdeciduous forests, from 200–400 m elevation. It shares habitat with *Alvaradoa amorphoides* Liebm., *Barleria oenotheroides* Dum. Cours., *Bursera fagaroides* (Kunth) Engl. var. *elongata* McVaugh & Rzed., *Brosimum alicastrum* Sw., *Byrsonima crassifolia* (L.), Kunth, *Chamaedora pochutlensis* Liebm., *Cochlospermum vitifolium* (Willd.) Spreng., *Cryosophila nana* (Kunth) Blume ex Salomon, *Curatella americana*, *Dioscorea* sp., *Erythroxylum havanense* Jacq., *Glossostipula blepharophylla* (Standl.) Lorence, *Hyptis suaveolens* (L.) Poit., *Mandevilla subsagittata* (Ruiz & Pav.) Woodson, *Maranta arundinacea* L., *Miconia saxicola* Brandegee, *Quercus acutifolia* Née, *Q. aristata*, *Vitex mollis* Kunth, *V. pyramidata* B.L.Rob., *Tabebuia* sp., *Waltheria lundelliana* J.G.Saunders, *Zamia* sp. and several species of grasses. It flowers and fructifies from September to December and probably extending until March.

Etymology:—*Hyptis macvaughii* is dedicated in recognition to the efforts of Rogers McVaugh (1909–2009), an outstanding botanist who greatly contributed to the exploration and knowledge of western Mexican flora. This new name is one of many more coined to honor his contributions (Carvajal & González-Villarreal 2012).

Taxonomic relationships:—*Hyptis macvaughii* can be easily distinguished from the members of sect. *Umbellatae* Epling (1949: 197) by means of its flowers directed attached to the thicken portion of the main floral axes instead of forming an umbel or panicle through the insertion of pedicels to a secondary floral axis (peduncle), together with its inconspicuous linear floral bracts and indumenta composed of branched hairs throughout stems, leaves, inflorescence axes, pedicels and calyces (figure 3). *Hyptis subtilis* Epling (1934: 79) is its morphologically most similar species, but *H. macvaughii* can be separated from this because of the peculiarities already mentioned about the inflorescence without a peduncle and plant indumenta composed of branched hairs; the slightly shorter petioles [1.7–3.1(–4) *vs.* 2.7–6.1 cm in *H. subtilis*], more flowers per floral node (30–40 *vs.* 15–21), longer pedicels (6.7–15 *vs.* 4–5.8 mm), slightly shorter calyx teeth in flower (0.2–0.4 *vs.* 0.5–0.6 mm in flower) and in fruit (up to 0.5 *vs.* 0.8 mm), longer corolla tube [(4.6–)5.2–6.4 *vs.* 2–2.7 mm), longer style [(8.7–)10–11.6 *vs.* 4.3–4.9 mm), and production per flower of 4 fertile mericarps instead of only 1 and these smaller (1.2–1.4 × 0.8–0.9 *vs.* 1.5–2.1 × 1.4–1.6 mm), are other characters that supports the recognition of the former. The elevation range and kind of vegetation both species occupy are not substantially different, both grow in tropical environments, though the distribution of *H. macvaughii* is much more restricted (figure 1, table 3).

Hyptis iodantha Epling (1939: 16) is the third representative of sect. *Umbellatae* in Mexico; the three species altogether constitute an interesting case of disjunction since the other species of this section grow in South America (Argentina, Bolivia, Brazil, Colombia, Paraguay, Peru, and Uruguay) without any continuous connection between both areas of distribution (Fernández-Alonso 2010). Finally, *H. macvaughii* would belong to the genus *Condea* according to the proposal of Harley & Pastore (2012).

Conservation assessment:—*Hyptis macvaughii* appears to be in danger of extinction, based on its limited geographic range. It should be classified as endangered [EN, criteria B2a] according to the IUCN (2008). Changes in land use are the greatest threat to this species.

Additional specimen examined:—MEXICO. Nayarit. Compostela: 5–6 miles W of Mazatán, 350 m, 17 September 1960 (fl), *R. McVaugh 19093* (MICH!); 8 km above (E of) Las Varas, new road to Compostela, 200 m, 20 December 1970 (fl), *R. McVaugh 25584* (MICH!); 11 km by road E of Las Varas toward Compostela, 200 m, 28 October 1971 (fl), *J.V.A. Dieterle 3933* (MICH!); along highway 200, W of Compostela, 2.5 miles W Mesillas, 280 m, 9 October 1978 (fl), *T.F. Daniel 1070* (MICH!); 3.5 km al O de Las Mesillas por la carretera 200D rumbo a Las Varas, 15–20 km antes de llegar a esta población, 285 m, 15 August 2013 (fr), *J.G. González-Gallegos & A. Castro-Castro 1536* (IBUG!, IEB!, MEXU!, ZEA!).

Key to species of tribe Hyptidinae in western Mexico

1. Inflorescence lax capitate generally with less than 5 flowers; calyx lobes reflexed in fruit (downwardly oriented); mericarps cymbiform.......... *Marsypianthes chamaedrys*
– Inflorescences variable, racemiform to spiciform, if capitate, these are compact and built by more than 10 flowers, except in *Hyptis suaveolens* which has 5 or less flowers per cyme; calyx lobes straight in fruit (uprightly or laterally, but not downwardly, oriented); mericarps ovoid to flattened..……………………………… 2
2. Plants gynodioecious; calyx lobes thin and resembling spines, laterally oriented, which give to the calyx a five-pointed star appearance in sectional view; corollas white, middle lower corolla lip not thickened and not wrapping the stamens, which are not explosively released.…..…………………………………………………... 3
– Plants monoecious with bisexual flowers; calyx lobes variable in shape and generally uprightly oriented, without a five-pointed star appearance in sectional view; corollas white, blue, purple, violet, to pink, middle lower corolla lip thickened and wrapping the stamens, which explosively releases them when these are mature and in response to vibration.………………………..……………………….…………...…… 4
3. Floral nodes in blossom 5–7 mm diameter; calyx lobes 0.5–0.7 mm long. Plants from northern Jalisco, Nayarit, Durango, Sinaloa, Sonora and Chihuahua ………….……………...…………………………………..… *Asterohyptis seemannii*
– Floral nodes in blossom 8–12 mm diameter; calyx lobes 1.5–3.5 mm long. Plants widely distributed from Sonora (Mexico) to Central America...*Asterohyptis stellulata*
4. Plants with branched hairs in the stems, leaves and inflorescences (in *Hyptis oblongifolia* these hairs are more abundant in the stems and leaves, but sometimes are difficult to be appreciated, and at times are absent).……….........………....…. 5
– Plants without branched hairs.……………………………………………....…….. 7
5. Flowers sessile, arranged in opposite glomeruli throughout the floral axis, with peduncles 3–10 mm long. Plants from oak, pine-oak and montane cloud …………..….. *Hyptis oblongifolia*
– Flowers pedicellate, pedicels 2–14 mm long, directly inserted in floral axis, without a secondary peduncle. Plants typical from roadsides, tropical deciduous forests, savannoid and secondary vegetation.…………………………………………..... 6
6. Leaves ashy green above, white tomentose below; floral axes, pedicels and calyces white due to the pubescence; pedicels 2–3 mm long; calyx teeth 1.5–1.8 mm long. Plants from roadsides, tropical deciduous forests and secondary vegetation; widespread throughout Mexico.……………………………………... *Hyptis albida*
– Leaves bright green in both sides, sparsely pubescent; floral axes, pedicels and calyces pale purple to green; pedicels (6.7–)9–15 mm long; calyx teeth 0.2–0.4 mm long. Plants from savannoid vegetation and subtropical deciduous forests; endemic to southern Nayarit.…………………..………………………….… *Hyptis macvaughii*
7. Inflorescences in spherical glomeruli 1.3–3 cm in diam., covered at the base with an involucre of lanceolate bracts, each glomerulus arranged to leaf axil with a peduncle (1.6–)3–12 cm long; flowers sessile or with pedicels up to 0.5 mm long……………………………………………………………….... *Hyptis capitata*
– Inflorescences spiciform and racemiform, if similar to a glomerulus, then less than 10 mm in diam., without an involucre at the base, not arranged to leaf axil (but to a inflorescence axis) and peduncles shorter than 2 cm long; flowers mostly with pedicels 1 mm long..……………………………………………………………… 8
8. Leaves coriaceous, petioles 2–10(–11.5) mm long; inflorescences compact with sessile flowers, arranged in sessile pectinate opposite cymes or with peduncles up to

5 mm long ……………………... 9

– Leaves thin, petioles regularly longer than 15 mm long; inflorescences lax with sessile to pedicellate flowers, arranged in glomeruli with peduncles longer than 8 mm long …..…………………………………………………………………………………….... 10

9. Peduncle bracts composed by reduced leaves throughout the inflorescence; flowers per cyme 3–7; bracteoles 3.5–5.4(–7.4) mm long; calyx bilabiate, upper lip composed by three connate teeth, lower lips composed by the other two teeth; calyx tube 2.4–2.9 × 2.5–2.6(–3) mm in flower, and 7–7.4 × 3.5–3.8 mm in fruit; calyx teeth 2.5–4.5 mm long in flower and 7.3 mm long in fruit; mericarp (1.9–)2.5–2.6 × (1–)1.4–1.6 mm. Plants widespread in Jalisco, Nayarit, and southern Sinaloa and Durango, from (400–)1600–2000(–2200) m elevation.……………… *Hyptis rhytidea*

– Peduncle bracts composed by reduced leaves only at the base of the inflorescence and then differentiated into linear structures; flowers per cyme 7–10; bracteoles 1.3–2.2 mm long; calyx actinomorphic, without two sets of teeth; calyx tube 1.6–2.5 × 1.6–2 mm in flower, and 3.1–3.5 × 2.5–2.7 mm in fruit; calyx teeth 0.8–1.3 mm long in flower, and up to 1.5 mm long in fruit; mericarp 1.6–1.8(–1.9) × 0.8–1 mm. Plants exclusive of the Pacific slopes of Sierra de El Cuale, Jalisco, growing from 1100–1227 m elevation.……………......……………………………….… *Hyptis cualensis*

10. Inflorescences spiciform cylindrical, compact (floral axis surface is hidden by flowers and floral bracts); floral bracts linear (less than 0.5 mm wide) with rigid central vein and ciliated at margin; flowers sessile with calyces hidden by floral bracts ……………………………………………………………..…... *Hyptis spicigera*

– Inflorescences racemiform, very rarely with spiciform appearance; floral bracts ovate (more than 1 mm wide) to linear, without rigid central vein and not ciliated at margin; most flowers with pedicels at least 1 mm long, calyces not completely hidden by floral bracts ………………..………………………………………….…….. 11

11. Floral bracts ovate to ovate-lanceolate; calyces tubular ………..…. *Hyptis mutabilis*

– Floral bracts linear; calyces infundibuliform ……………………..……………….. 12

12. Inflorescences in purple lax racemes; pedicels 3–12 mm long; calyx lobes triangular, less than 0.5 mm long, which gives to the calyx a truncate appearance at apex……………………………..……..……………………..…... *Hyptis subtilis*

– Inflorescences in green to yellowish compact racemes; pedicels absent or shorter than 3 mm long; calyx lobes linear or shortly triangular at base and then linear, longer than 1 mm, hence the calyx without a truncate appearance at apex.……………………………………………………………………..……. 13

13. Flowers up to 5 in each cyme; calyx tube 5–8 mm long and 6–7 mm wide at the throat, in fruit (there is a striking difference between flowering and fruiting calyx tube size in a same individual)………...……...………….……..... *Hyptis suaveolens*

– Flowers 10 or more in each cyme; calyx tube 2–4 mm long and less than 2.5 mm wide at the throat, in fruit (size difference between flowering and fruiting calyx tubes in the same individual is not apparent).…...…………………………………...……... 14

14. Flowers in compact spherical glomeruli, densely white tomentose, the hairs hidding almost whole floral bracts and calyx tubes, usually with branched hairs mainly in the leaves and stems, but which sometimes are difficult to be appreciated ……………………………………………………..………..... *Hyptis oblongifolia*

– Flowers in hemispherical glomerulus or pectinate cymes, not densely tomentose, the hairs not hidding floral bracts and calyx tubes, never with branched hairs……..…. 15

15. Calyx lobes linear (triangular only in the base for 1/4 to 1/5 of its length), with a ring of hairs clearly defined inserted internally in the throat and projecting between the lobes..…………………………………………………………………….... 16

– Calyx lobes triangular, with a ring of hairs diffusely or well-defined inserted internally in the throat but not projecting between the lobes……..……..………… 17

16. Flowers arranged in pectinate cymes with peduncles 1–2 mm long; calyx tube surrounded with a thickened vein just below its apical portion, being perpendicular to calyx lobes.………………………….……………...……………. *Hyptis pectinata*

– Flowers arranged in not pectinate cymes with peduncles 10–30 mm long; calyx tube without a thickened vein surrounding it at its apical portion.……… *Hyptis urticoides*

17. Stems, petioles, and leaves without glandular-capitate hairs; leaf blades 1.6–5.5 × 0.9–3.7 cm, rounded to short cuneate at the base, irregularly serrate at the margin; flowers arranged in pectinate cymes, peduncles 3–7 mm long; calyx 2.6–3.7 mm long in flower, with a diffuse ring of hairs internally inserted just below the throat. Plants only known from western sides of Sierra del Halo, Jalisco, eastern Sierra de Coalcomán, and northeastern slopes of Sierra Madre del Sur in Guerrero .... *Hyptis pseudolantana*

– Stems, petioles, and lower leaf blade surface covered with glandular-capitate hairs; leaf blades 6–10 × 4–6 cm, cordate at the base, serrate at the margin; flowers in spherical glomerulus, peduncles 8–20 mm long; calyx 4–5.9 mm long in flower, with a well-defined ring of hairs internally inserted below the throat. Plants only known from the mountain range in San Sebastián del Oeste and Sierra de El Cuale, Jalisco …………………………………...……………………...……..... *Hyptis pinetorum*

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FIGURE 1. Distribution map of *Hyptis pseudolantana* (squares), *H. cualensis* (triangles), and *H. macvaughii* (dots) in Mexico.

FIGURE 2. *Hyptis pseudolantana* terminal spiciform inflorescences (A), cyme, calyx and corolla detail (B, D), and habit (C). *Hyptis cualensis* terminal spiciform inflorescences (E), pectinate opposite cymes, calyx and corolla detail (F, G), and infructescence (H).

FIGURE 3. *Hyptis macvaughii* spiciform and racemose terminal inflorescences (A, C, E), stem (B), verticillaster, calyx and corolla detail (D), infructescence (F-G).

TABLE 1. Morphology, habitat, and distribution comparison among *Hyptis pseudolantana* and morphological similar species.

	Hyptis pseudolantana	*H. pinetorum*	*H. pectinata*	*H. urticoides*
Distribution of glandular-capitate hairs	only on the calyces	on the stems, leaves (mainly on lower surface), and inflorescences (floral axis and bracts, pedicels and calyces)	none structure with glandular-capitate hairs	restricted to the calyces
Leaves				
Petiole length (mm)	(1–)6–20	(18–)30–55	(7.5–)10–30(–50)	0.5–2(–3.9)
Blade shape	ovate to ovate-elliptic	ovate to triangular-ovate	ovate to ovate-deltoid	lanceolate to ovate-lanceolate
Blade size (cm)	(1.5–)1.6–7.1 × 0.9–4.1	(5–)6–10.5 × (3.2–)4–6.5(–9.8)	1.7–3.5(–8) × (1.3–)2–4.5	3–8 × (1.4–)2.5–5
Inflorescence				
Arrangement	pectinate cymes, each one with 3–8.7 mm long peduncles	spherical cymes, each one with (8–)12–30 mm long peduncles	pectinate cymes, each one with 1–2.5(–3.7) mm long peduncles	pectinate cymes, each one with 10–25 mm long peduncles
Floral bract				
Shape	linear	linear-lanceolate to linear-elliptic	linear	linear
Length (cm)	1.4–2.8	1.9–4.3	1.9–3.1(–4)	1.8–3.2
Pedicel				
Length (mm)	0–0.5	0–0.5	< 0.1	0–0.1
Calyx				
Tube size (mm)	(1.7–)2.2–3.5(–5) × 1.6–1.8	3–4.5 × 1.2–1.9	0.9–1.2 × 0.5–0.7	1.4–2.6 × 1.2–1.6
Teeth length	0.9–1.5	1–1.4	0.5–0.7	1.1–1.5
Teeth shape	triangular	triangular	linear	linear
Corolla				
Tube size (mm)	(5.1–)6.5–7.3 × (1.5–)2.3–2.8	5–6.5(–7.6) × 1.8–2.1	1.4–1.5 × 0.2–0.3	3.2–4.3 × 0.5–1
Androecium				
Filament length (mm)	(1.2–)1.5–1.6(–2.4)	1.2–1.4	0.2–0.4	0.5–1
Gynoecium				
Style length (mm)	(3.3–)4.4–6.3	6.2–7.7	1.1–1.7	2.4–4.4
Mericarp				
Size (mm)	1–1.3 × 0.6–0.8	1–1.2 × 0.5–	0.6–0.9 × 0.2–	1.1–1.4 × 0.6–

		0.7	0.3	0.8
Habitat	pine-oak and oak forests and ecotones with tropical deciduous forest	pine-oak and montane cloud forests	tropical deciduous forests and secondary vegetation of pine-oak forests	tropical deciduous and subdeciduous, oak forests, secondary vegetation of pine-oak and montane cloud forests
Elevation (m)	(1400–)1650 –2200	900–2000	(40–)800–1700	(50–)600–2100
Distribution	Mexico. Jalisco and Michoacán	Mexico. Jalisco.	Widely distributed in America from the United States to Perú, Brasil and the Antilles; introduced in tropical Africa and Asia. In Mexico almost in all the states except for those from Baja California Peninsula.	Widely distributed from Mexico to Panamá. In Mexico almost in all the states except for the northern ones and those from the Yucatán Peninsula.

TABLE 2. Characters, habitat, and distribution comparison between *Hyptis cualensis* and *Hyptis rhytidea*.

	Hyptis cualensis	*Hyptis rhytidea*
Leaves		
Petiole length (mm)	5.6–9.6(–11.5)	4–8(–14)
Blade shape	lanceolate to narrow lanceolate	elliptic-lanceolate to lanceolate
Blade size (cm)	5.7–9.9 × 0.8–2	5–11.5 × 1.6–3.1
Inflorescence		
Length	(6.5–)10.5–21	15.5–24
Floral bract		
Shape	Foliaceus (ovate) at the base of the inflorescence, and differentiated into linear structures toward the apex	Foliaceus (ovate-elliptic) throughout the floral branch
Length (mm)	(2.5–)4–12	(2–)6.4–13.3(–21.2)
Peduncle		
Length (mm)	1.2–4.6	(2.6–)3.4–5.7
Flowers		
Flowers per cyme	7–10	3–7
Bracteole length (mm)	1.3–2.2	3.5–5.4(–7.4)
Calyx		
Tube size (mm)	1.6–2.5 × 1.6–2 in flower; 3.1–3.5 × 2.5–2.7 in fruit	2.4–2.9 × 2.5–2.6(–3) in flower; 7–7.4 × 3.5–3.8 in fruit

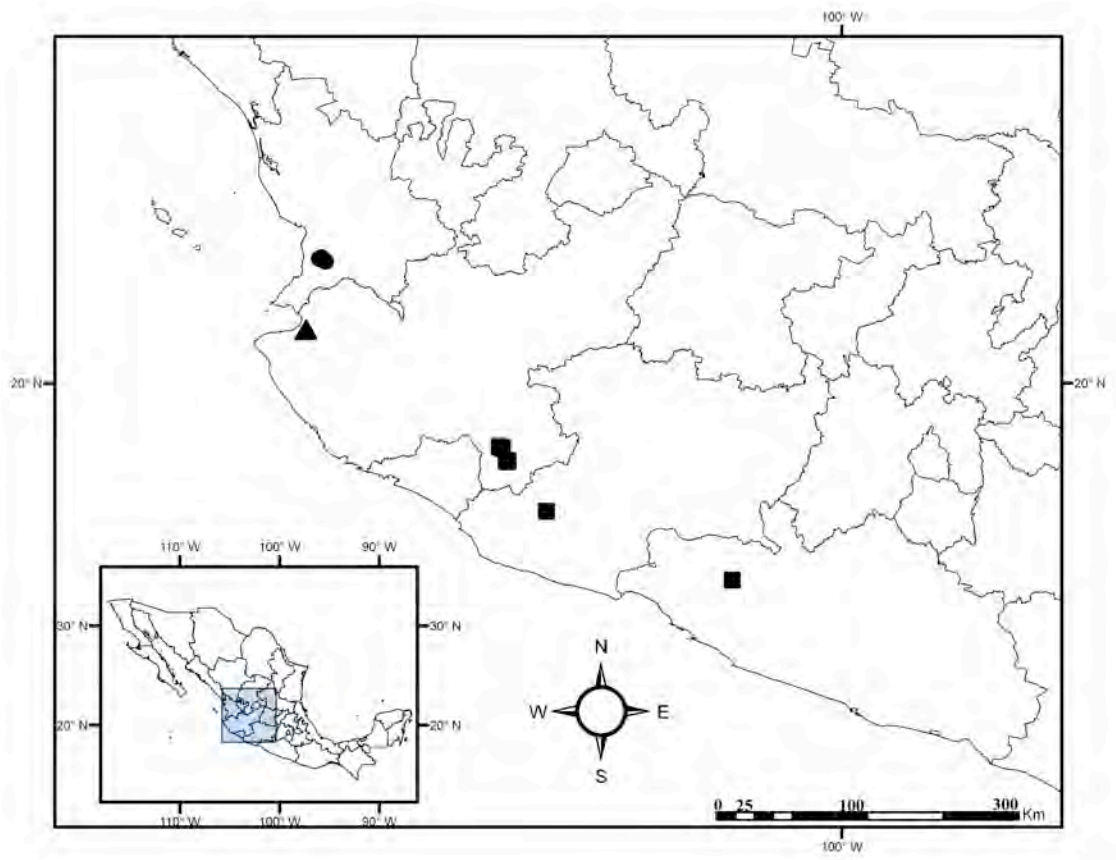
	Hyptis cualensis	*Hyptis rhytidea*
Teeth length (mm)	0.8–1.3 in flower; 1.5 in fruit	2.5–4.5 in flower; 7.3 in fruit
Corolla		
Color	pink	lavender, violet, blue, purple, or pink
Tube size (mm)	5.6–6.2 × 1.3–2.4	5.5–6.9 × 1.7–2(–3.4)
Lobes length (mm)	1.7–2.1	1.3–1.9(–2.6)
Androecium		
Filament length (mm)	1.7–2.7	1.8–2.6
Theca length (mm)	0.5–0.8	0.5–0.8
Gynoecium		
Style length (mm)	5–7.8	5.7–7
Mericarp		
Size (mm)	1.6–1.8(–1.9) × 0.8–1	(1.9–)2.5–2.6 × (1–)1.4–1.6
Habitat	oak forests and ecotones of this with tropical deciduous forests	pine-oak, oak and tropical deciduous forests
Elevation (m)	1100–1227	(400–)1600–2000(–2400)
Distribution	Mexico: Jalisco	Mexico: Durango, Jalisco, Nayarit, and Sinaloa

TABLE 3. Character, habitat, and distribution comparison between *Hyptis macvaughii* and *Hyptis subtilis*.

	Hyptis macvaughii	*Hyptis subtilis*
Leaves		
Petiole length (cm)	1.7–3.1(–4)	2.7–6.1
Blade shape	lanceolate to narrow lanceolate	ovate-lanceolate to lanceolate
Blade size (cm)	6.2–14.5(–17) × (1.5–)2.5–4(–5.6)	8.5–15 × 3.3–8.8
Inflorescence		
Length (cm)	18–40	20–30
Peduncle length (mm)	0	5–11
Floral bract		
Shape	linear	linear
Length (mm)	0.7–2.2(–4)	3.7–5.7
Flowers		
Flowers per node	30–40	15–21
Bracteole length (mm)	0.8–1.2	0.6–2.5
Pedicel length (mm)	(6.7–)9–15	4–5.8
Calyx		
Tube size (mm)	2–3.2 × 1.8–2.1 in flower; 5–5.5 × 2.5–3 in fruit	2.6–3.6 × 1.3–1.9 in flower; 5–5.4 × 2.3–2.5 in fruit
Teeth length (mm)	0.2–0.4 in flower; 0.5 in fruit	0.5–0.6 in flower; 0.8 in fruit

	Hyptis macvaughii	*Hyptis subtilis*
Corolla		
Color	dull violet to lavender	dull violet to lavender
Tube size (mm)	(4.6–)5.2–6.4 × 1.5–2	2–2.7 × 1.6–2
Lobes length (mm)	2–2.5(–2.9)	2–2.6
Androecium		
Filament length (mm)	1.7–2.5	1.8–2.2
Theca length (mm)	0.2–0.7	0.5–0.7
Gynoecium		
Style length (mm)	(8.7–)10–11.6	4.3–4.9
Mericarp		
Size (mm)	1.2–1.4 × 0.8–0.9	1.5–2.1 × 1.4–1.6
Habitat	savannoid vegetation and ecotones of this with tropical subdeciduous forests	tropical subdeciduous forests and rarely into oak forests
Elevation (m)	200–400	(60–)200–600(–1000)
Distribution	Mexico: Nayarit	Mexico: Colima, Estado de México, Guerrero, Jalisco, Michoacán, Nayarit and Oaxaca

Figure 1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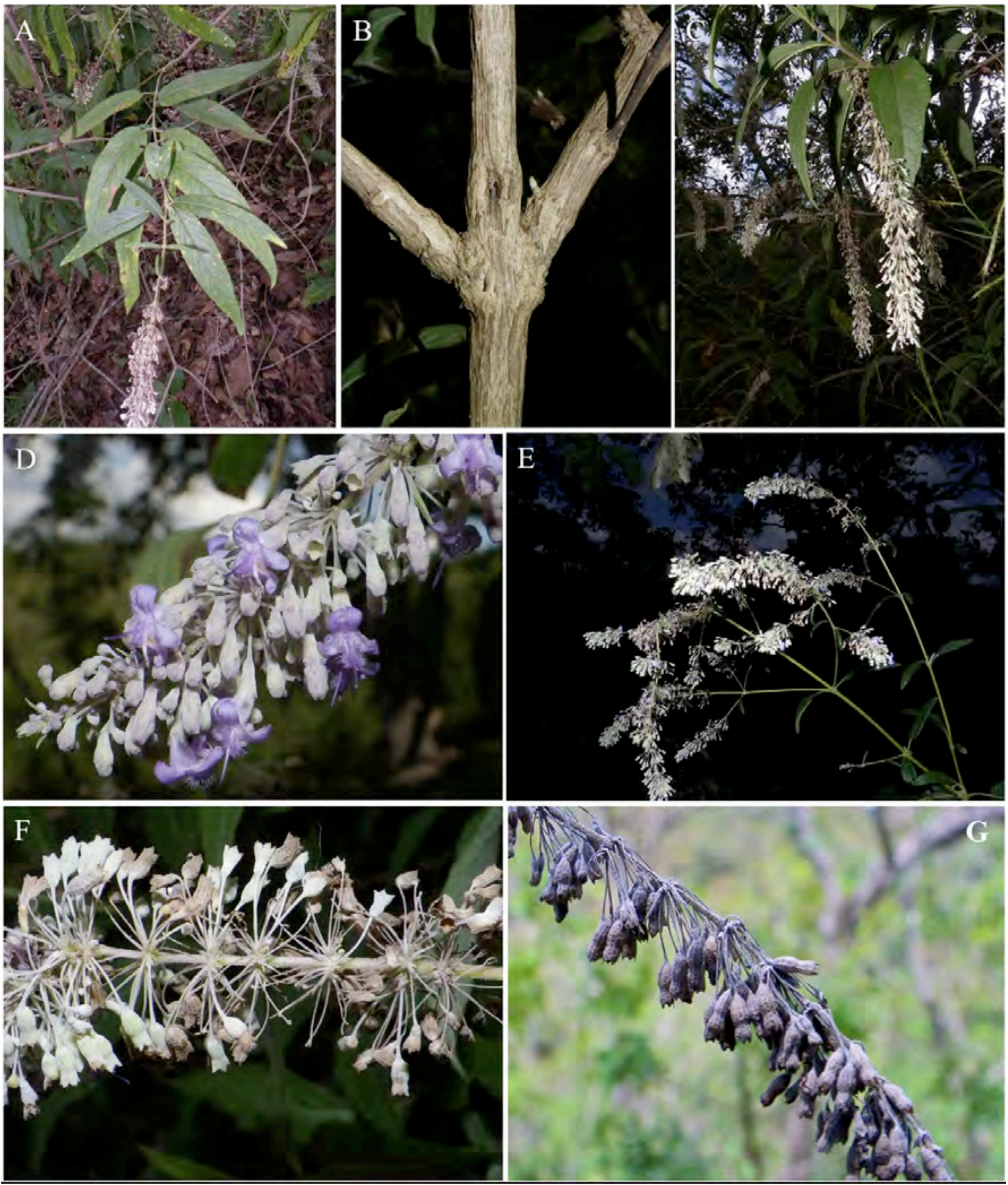
100° W

Figure 2

Figure 3



Capítulo 5. Discusión general, perspectivas y conclusiones

Discusión general, perspectivas y conclusiones

Sistemática de Salvia *sección* Membranaceae

La revisión morfológica de la sección implicó la consulta de 1 041 especímenes y la generación de una base de datos con igual número de registros. Se decidió reconocer únicamente 12 especies en contraste a las 15 señaladas por Epling (1939, 1940). Se generaron descripciones completas y estandarizadas para todas las especies, para la mayoría de ellas se contaba nada más con la descripción original. Se afirmaron los límites entre taxones semejantes y se discutieron aquellos problemáticos. En este aspecto se respalda la postura de sumergir a *Salvia rubiginosa* y *S. zacuapanensis* dentro de *S. mocinoi* debido a que presentan un continuo de variación que no permitiría una separación clara. La distinción de estás especies en gran medida había obedecido a aspectos subjetivos de variación en pubescencia de tallo y hoja (Epling, 1939; Standley & Williams, 1973; Klitgaard, 2012). También se fundamenta que *Salvia lophanthoides* debe reconocerse como una especie distinta de *S. mocinoi*, en contraste con la postura de Klitgaard de sumergirla como su sinónimo (2012). Se documenta la forma ovoide y coloración café jaspeada de los mericarpios de *Salvia verecunda*, lo que contradice su ubicación en la subsección *Elscholtzioideae* (Epling, 1939), ya que este grupo se define por presentar mericarpios lenticulares.

Se solicitaron fotografías de algunos especímenes para corroborar su determinación, entre ellos *Crone 15/9/00* (MJG), el cual había sido incorporado en análisis filogenéticos previos bajo el nombre de *Salvia mocinoi* (Walker & Sytsma, 2007; Jenks et al., 2013), cuando en realidad corresponde a *S. setulosa*.

El análisis de máxima parsimonia de la matriz morfológica recuperó a la sección *Membranaceae* y a la subsección *Elscholtzioideae* como monofiléticas, pero a *Lophanthoideae* como parafilética. El soporte de los clados fue bajo y la mayoría sin alguna sinapomorfia que los respaldara. Para la sección *Membranaceae* se obtuvo la textura de sus brácteas (membranáceas y reticulado nervadas) como sinapomorfia, mientras para el clado de *S. bupleuroies* y *S. lasiocephala* lo fue la forma lenticular de sus mericarpios. Lo anterior refleja un grado elevado de homoplasia en los caracteres como lo registrado en análisis con base a caracteres morfológicos de otros grupos vegetales (Roalson et al., 2002; Henderson, 2011). Sin embargo, aunado a la contradicción de la morfología de *S. verecunda* y su posición en *Elscholtzoideae* (Epling, 1939) es suficiente para refutar el valor de distinguir subsecciones dentro de *Membranaceae*. De querer reconocer a *Elscholtzioideae* habría que establecer siete subsecciones nuevas, varias monotípicas y con bajo soporte. Por tanto, aquí se prefiere acabar con el reconocimiento de las subsecciones.

Los resultados fueron semejantes en los análisis de secuencias de ADN (ITS, ETS y *trn*L-F) respecto a la sección *Membranaceae*, ya que ésta se recuperó como monofilética junto con la subsección *Elscholtzioideae*, mientras *Lophanthoideae* se mostró como un grupo parafilético. La evidencia molecular también soporta la postura de no reconocer subsecciones dentro de *Membranaceae*. Por otra parte, los datos moleculares contradicen la postura de Klitgaard (2012) de sumergir a *Salvia subpatens* como sinónimo de *S. patens*, y por tanto, respalda lo señalado por González-Gallegos & Gama-Villanueva (2013) respecto a reconocerla como una especie diferente. También se obtuvo a *S. albiterrarum* como especie hermana de *S. platyphylla*, la primera con rasgos morfológicos del síndrome ornitófilo de polinización y la segunda del melitófilo (Wester & Claßen-Bockhoff, 2011), de manera que bien pudieran servir para estudiar el efecto que los polinizadores tienen como detonantes en la diversificación del género, tal cual había sido sugerido antes (González-Gallegos & Castro-Castro, 2013).

Respecto a la sección *Sigmoideae*, Se refuta el reconocimiento de las subsecciones *Cymulosae* y *Eusigmoideae* de Epling (1939) y Espejo y Ramamoorthy (1993), ya que los dos miembros de *Cymulosae* (*Salvia chalarothyrsa* y *S. thyrsiflora*) no conforman un clado, sino que aparecen más relacionados con especies de *Eusigmoideae*. Las especies de *Cymulosae* se caracterizan por presentar cimas en cada nodo floral en lugar de flores con los pedicelos insertados directo al eje floral. De ahí se deduce que que la configuración peculiar de las inflorescencias de *Cymulosae* surgió en dos ocasiones independientes. Los resultados también demuestran que Espejo y Ramamoorthy (1993) mezclaron especímenes de dos taxones bajo el nombre de *Salvia ramamoorthyana*, ya que algunos corresponden en realidad a *Salvia nepetoides* Kunth. Debido a que que designaron como tipo un ejemplar de *S. nepetoides*, el nombre de *S. ramamoorthyana* tendrá que ser sumergido en automático como su sinónimo. Y para el segundo grupo de especímenes que sí corresponden a un taxón nuevo, deberá designárseles un nuevo nombre con su respectiva descripción.

Diversidad y distribución Lamiaceae en el occidente de México

Con base en la cantidad de especímenes del occidente de México encontrados en los herbarios consultados, se señala que los estudios de diversidad vegetal en esta área deben contemplar como primordial la consulta de los herbarios CIIDIR, HUAA, IBUG, IEB, MEXU, MICH y el de la Universidad Autónoma de Zacatecas. Estos herbarios son complementarios y en conjunto ofrecen una panorámica adecuada de la diversidad de la región.

En el occidente hay 20 géneros y 163 especies de labiadas nativas o naturalizadas. Éstas son de las cifras más altas registradas para estados o regiones del país y lo mismo aplica en menor grado a la diversidad encontrada en Jalisco (17 géneros y 137 especies), el estado que ocupa la mayor superficie dentro de la región (Cowan, 1983; Sousa & Cabrera-C., 1983; Argüelles et al., 1991; González-Elizondo et al., 1991; Téllez-Valdés, 1995; Rodríguez-Jiménez & Espinoso-Garduño, 1996a, 1996b; Villarreal-Quintanilla, 2001; Domínguez-Vázquez et al., 2002; Calderon de Rzedowski & Rzedowski, 2005; Berumen-Cornejo, 2006; Zamudio & Galván-Villanueva, 2011).

La riqueza del género *Salvia* en las entidades cuya superficie total fue incluida (Aguascalientes, Colima y Jalisco) en este estudio, superaró la que Ramamoorthy & Elliott (1998) recopilaron en su análisis de la riqueza del género por estados del país (23, 23 y 85 spp. *vs.* 2, 2, y 49 spp., respectivamente). Por tanto, las cifras dadas en esa publicación deben de tomarse con cautela, algo que ya podía asumirse a partir de los trabajos de Domínguez-Vázquez et al. (2002) y Cornejo-Tenorio & Ibarra-Manríquez (2011).

Se descubrieron 24 taxones nuevos, 21 especies y tres infraespecíficos (García-Peña & González-Gallegos, 2013; González-Gallegos & Castro-Castro, 2012, 2013; González-Gallegos et al., 2012a, 2012b; Iltis et al., 2012; González-Gallegos, 2013;

González-Gallegos & Vázquez-García, 2013; González-Gallegos et al., 2013). Lo que va acorde con la tendencia general en el descubrimiento de taxones nuevos de la familia en México, y lo que da testimonio de la necesidad de su revisión.

Se registraron por primer ocasión *Hyptis pseudolantana*, *Lepechinia flammea*, *Salvia unicostata*, y *Scutellaria blepharophylla* para el occidente del país. A escala de estados también fueron registros nuevos *Salvia chalarothyrsa* para Colima, *Asterohyptis seemannii*, *Hedeoma plicata*, *Salvia crucis*, *S. unicostata* y *Scutellaria blepharophylla* para Jalisco, *Salvia angustiarum*, y *S. brachyodonta* y *S. platyphylla* para Zacatecas. De estos hallazgos *H. pseudolantana* y *L. flammea* son los más notables, debido a que ambas especies se conocían del sur, la primera de Guerrero y a partir sólo de la colección tipo (Epling, 1941), y la segunda de Guerrero y Oaxaca (Martínez-Gordillo & Lozada-Pérez, 2009).

Se reconoció una diversidad alta en los municipios de Cuautitlán, Autlán de Navarro, Mascota, Talpa de Allende y San Sebastián del Oeste, lo que coincide y da soporte a resultados similares previos (Vázquez-García et al., 1995; Vázquez-García et al., 2000; Reynoso-Dueñas et al., 2006). Los hábitats templados se confirman como los de mayor riqueza de labiadas (Ramamoorthy & Elliott, 1998; Domínguez-Vázquez et al., 2002; Cornejo-Tenorio & Ibarra-Manríquez, 2011), pero se encontraron también en forma considerable en el bosque tropical caducifolio. Algunas especies en el área de estudio incluso se restringen a bosques tropicales, se trata de: *Aegiphila skutchii*, *Callicarpa acuminata*, *Hyptis spicigera*, *Marsypianthes chamaedrys*, *Salvia brachyodonta*, *S. coccinea*, *S. ibugana*, *S. languidula*, *S. lasiantha*, *S. lasiocephala*, *S. pringlei*, *S. purpurea*, *S. sessei*, *S. uruapana*, *Scutellaria sublitoralis* y *Vitex hemsleyi*. La provincia de la Faja Volcánica Transmexicana fue la más rica, lo que puede tener relación con la hipótesis de una diversificación rápida y ligada a la complejidad orográfica del país, donde la mezcla de valles y montañas estimularon la evolución de la familia (Ramamoorthy & Elliott, 1998).

La concentración de especies por criterios espaciales se obtuvo en valores intermedios de latitud, longitud y altitud, los que correspondend con las áreas en que hay una mayor proporción de bosques templados. De ahí que el fenómeno pueda obedecer más a la afinidad con estos bosques que a un patrón latitudinal, longitudinal o altitudinal. En análisis por cuadrícula estandarizada (el promedio de la longitud máxima de los taxones como el largo y ancho de cada unidad), recobró a las sierras de Cacoma, Cerro Viejo, Coalcomán, El Cuale, Juchipila, Manantlán, Mazamitla, San Sebastián del Oeste, San Juan, Valle de Atemajac y volcanes de Colima, como los principales reservorios de la diversidad de la familia en el occidente. Estas aréas coinciden en menor o mayor grado con los municipios señalados también como de mayor riqueza. Varios de los puntos quedan hacia la vertiente del Pacífico en el estado de Jalisco, región que ya se ha señalado antes como de importancia por su riqueza vegetal (Villaseñor, 1993; Villaseñor & Ibarra-Manríquez, 1998; Delgadillo-M. et al., 2003; Vargas-Amado et al., 2013).

Taxones nuevos y novedades morfológicas

Se descubrieron 24 taxones nuevos, lo que incluye 21 especies y tres de categoría infraespecífica. De ellos, 13 de las especies y los tres infraespecíficos fueron ya publicadas y el resto se encuentra en proceso de serlo. En seguida se presenta la lista de los taxones nuevos, con datos sobre su hábito y color de corola, distribución con el estado y municipio, tipo de vegetación y rango altitudinal en que crece:

Cunila jaliscana (García-Peña & González-Gallegos, 2013). Hierba perenne a subarbusto de corolas blancas. Jalisco: Autlán de Navarro, Cuautitlán, Mascota, San Sebastián del Oeste, Talpa de Allende y Villa Purificación. Bosque de pino y encino, bosque de oyamel, bosque mesófilo de montaña y en ocasiones a la orilla de cultivos en zonas templadas, 1 500-2 500 m.

Hyptis cualensis (González-Gallegos et al. 2014). Arbusto de corolas rosa. Jalisco: Puerto Vallarta. Bosque de pino-encino y vegetación sabanoide, 1 100-1 227 m.

Hyptis macvaughii (González-Gallegos et al. 2014). Arbusto de corolas violeta pálido o lavanda. Jalisco: Puerto Vallarta; Nayarit: Compostela. Vegetación sabanoide y ecotonos con bosque tropical subcaducifolio, 200-400 m.

Salvia albicalyx (González-Gallegos, 2013). Arbusto perenne de corolas magenta. Durango: El Mezquital. Ecotonos de bosque de encino con bosque tropical caducifolio, 1 500-1 600 m.

Salvia albiterrarum (González-Gallegos & Castro-Castro, 2013). Hierba perenne de corolas magenta. Jalisco: Cuautla. Bosque de encino-pino, 1 900- 2 000 m.

Salvia cacomensis (González-Gallegos et al., 2012a). Subarbusto de corolas magenta. Jalisco: Villa de Purificación. Bosque mesófilo de montaña, 1 300-1 400 m.

Salvia carreyesii (González-Gallegos et al., 2013). Hierba perenne de corolas violeta oscuro. Jalisco: Puerto Vallarta. Ecotonos de bosque tropical subcaducifolio con bosque de encino, 980-1 100 m.

Salvia concolor var. *iltisii* (González-Gallegos et al., 2012b). Hierba perenne o subarbusto de corolas azul obscuro. Jalisco: Cuautitlán. Bosque mesófilo de montaña, 2 300-2 500 m.

Salvia cualensis (González-Gallegos & Castro-Castro, 2012). Hierba perenne de corolas azul claro. Jalisco: Cabo Corrientes, Mascota, Puerto Vallarta y Talpa de Allende. Ecotonos de bosque de pino-encino y bosque tropical caducifolio, 1 130-1 600 m.

Salvia cualensis var. *perezii* (González-Gallegos & Castro-Castro, 2012). Hierba perenne de corolas azul claro. Jalisco: Cabo Corrientes y Puerto Vallarta. Ecotonos de bosque de pino-encino y bosque mesófilo de montaña, 940-1 130 m.

Salvia ibugana (González-Gallegos et al., 2013). Hierba perenne de corolas azul claro. Jalisco: Cabo Corrientes, Puerto Vallarta y San Sebastián del Oeste. Bosque tropical subcaducifolio y palmar secundario, 550-600 m.

Salvia meera (González-Gallegos et al., 2012b). Hierba perenne de corolas blancas. Jalisco: Cuautitlán. Bosque de pino y enicno, 1 500-1 800 m.

Salvia pugana (González-Gallegos & Castro-Castro, 2013). Hierba perenne de corolas magenta claro. Jalisco: Atenguillo, Cuautla, Mixtlán, Tecolotlán y Tenamaxtlán. Bosque de pino, bosque de encino-pino y bosque de pino-encino, (1 577-) 1 830-2 150 m.

Salvia ramirezii (González-Gallegos et al., 2013). Hierba perenne de corolas azul claro. Jalisco: Mascota, Puerto Vallarta y Talpa de Allende. Bosque tropical caducifolio y ecotonos con bosque de pino-encino, 600-1 640 m.

Salvia rogersiana (González-Gallegos et al., 2012b). Hierba perenne de corolas azul obscuro a moradas. Jalisco: Autlán de Navarro y Talpa de Allende. Bosque mesófilo de montaña y bosque de encino, (1 100-) 1 800-
1 900 m.

Salvia santanae (González-Gallegos et al., 2012b). Jalisco: Tolimán. Hierba perenne de corolas azul oscuro a morada. Bosque mesófilo de montaña y bosque de encino (1 800-) 2 100-2 300 m.

Salvia tilantongensis (González-Gallegos & Aguilar-Santelises, 2014). Arbusto de corolas rojas. Oaxaca: Santiago Tilantongo. Bosque de encino, 2 600-2 800 m.

Salvia topiensis (González-Gallegos, 2013). Arbusto perenne de corolas blancas. Durango: Canelas y Topia. Bosque de encino y bosque de pino-encino, (1 450-) 1 900-2 320 m.

Salvia vazquezii (Iltis et al., 2012). Hierba perenne de corolas magenta. Jalisco: Tolimán; Colima: Minatitlán. Bosque mesófilo de montaña, 1 900- 2 560 m.

Salvia vazquezii subsp. *tancitaroensis* (Iltis et al., 2012). Hierba perenne de corolas magenta. Michoacán: Tancítaro. Bosque mesófilo de montaña, 2 000-2 360 m.

Salvia sp. 1. (en preparación). Hierba perenne o arbusto de corolas azul claro. Durango: El Mezquital; Zacatecas: Valparaíso. Bosque de pino y encino, 2 300-2 500 m.

Salvia sp 2. (en preparación). Hierba perenne corolas azules. Jalisco: Tecalitlán. Bosque de encino, 1 150-1 400 m.

Scutellaria cuevasiana (González-Gallegos & Vázquez-García, 2013). Hierba perenne de corolas magenta o rara vez blancas. Jalisco: Aután de Navarro, Ayutla, Casimiro Castillo y Talpa de Allende. Bosque mesófilo de montaña, bosque de pino-encino y bosque de galería, (1 000-) 1 400-1 800 (-2 900) m.

Scutellaria sublitoralis (González-Gallegos & Vázquez-García, 2013). Hiera perenne de corolas blancas. Jalisco: La Huerta y Puerto Vallarta; Nayarit: Bahía de Banderas. Bosque tropical subcaducifolio, 50-125 m.

En cuanto a novedades morfológicas, se describió una especie de *Salvia* sección *Sigmoideae* en la que se puede hipotetizar que la característica de rama inferior del estilo con forma de “s” se perdió (González-Gallegos & Castro-Castro, 2013), la cual se presenta en el resto de las especies y puede considerarse como una sinapomorfia de la sección ya que en el presente trabajo se recuperó como un grupo monofilético. Se trata de *S. albiterrarum*, la cual en los análisis filogenéticos realizados pertenece claramente a *Simoideae*. Otro aspecto novedoso consistió en hacer notar la presencia de bractéolas en los especies de la sección, algo no abordado en revisiones anteriores del grupo (Epling, 1939; Espejo & Ramamoorthy, 1993). Se describieron morfologías contrastantes entre plantas juveniles y maduras (en floración o fructificación) en *S. carreyesii* y protuberancias dendriformes en tallos, peciolos y ejes florales de *S. ibugana* (González-Gallegos et al., 2013), una característica sin precedentes para el género. Se encontró corteza exfoliante en *S. tilantongensis* (González-Gallegos & Aguilar-Santelises, sometido a publicación), rasgo que requiere ser evaluado en el género, debido a que no existen reportes claros de su presencia en otras especies.

Perspectivas

La revisión de *Salvia* sección *Membranaceae* revela que el conocimiento de las especies en función del número de especímenes resguardados en herbarios, está sesgado. Se encontraron muy pocos especímenes de *Salvia langlassei*, *S. lophanthoides* y *S. verecunda*. Es recomendable que se planifiquen esfuerzos de colecta para dar una mejor representación de ellas. De igual forma, la mayor riqueza de la sección se ubica en la colindancia entre Guerrero y Oaxaca, zona en que la exploración botánica también es insuficiente y donde los esfuerzos son necesarios.

En los análisis filogenéticos se requiere incrementar el muestreo de taxones y la obtención de secuencias de ADN para dar más claridad y soporte a los resultados. En especial es aconsejable que se incluyan más muestras del complejo de *Salvia mocinoi* (*S. mocinoi*, *S. rubiginosa*, *S. zacuapanensis*) para dar mayor soporte o contradecir la postura que aquí se ha tomado de sumergirlas todas bajo el nombre de la primera. Un estudio filogeográfico en este conjunto sería idóneo. El incremento del muestreo debe enfocarse también en incrementar la representación de especies y secciones del subgénero *Calosphace*, ya que al momento, aunque *Membranaceae* resulta monofilético, no es clara su posición ni su grupo hermano.

El análisis de diversidad revela varios puntos interesantes. Por un lado la intensidad de colecta en el polígono de estudio es muy desigual, existen zonas con muchos registros y muchas otras con pocos o inclusive ninguno, ya sea en término de municipios o cuadrados de área dependiente de la amplitud de la distribución de los taxones. Las zona con exploración deficiente de hecho es amplia: incluye la mayor parte de Colima, oeste de Guanajuato, costa sur, sur y noreste de Jalisco, oeste y suroeste de Michoacán, y sur de Zacatecas. Es probable que esta situación se extrapole a otros grupos vegetales. Es crítico que se genere un plan de prioridades de exploración para el occidente, y sería interesante que éste se pueda elaborar cotejando aquellos grupos para los que se cuenta ya con bases de datos confiables y completas.

Las novedades morfológicas, biogeográficas y taxones nuevos descritos, indican que es apremiante continuar estimulando el desarrollo de inventarios florísticos y floras regionales para obtener una visión más certera de la diversidad vegetal del país.

Conclusiones

Salvia sección *Membranaceae* es un grupo monofilético. Una de sus subsecciones es monofilética (*Elscholtzioideae*) y la otra parafilética (*Lophanthoideae*). Se propone como innecesario e impráctico el reconocimiento de subsecciones para *Membranaceae*, por tanto se descartan. La sección se encuentra anidada dentro del grupo denominado como "core Calosphace" (Jenks et al., 2013), pero no es clara su posición ni la identidad de su grupo hermano. La sección está integrada por 12 especies. Dos taxones controvertidos respecto su reconocimiento como especies válidas: *Salvia rubiginosa* y *S. zacuapanensis*, deben considerarse como sinónimos de *S. mocinoi* ya que en conjunto conforman un continuo de variación morfológica que no permite la división de su diversidad en unidades claras. La mayor diversidad del grupo se concentra en la confluencia de los estados de Guerrero y Oaxaca, y en segundo orden en la de los estados de Jalisco y Nayarit.

El occidente de México alberga 20 géneros y 163 especies de labiadas nativas o naturalizadas, mientras el estado de Jalisco (el cual ocupa la mayor porción del occidente) tiene 17 géneros y 137 especies. Éstas cifras posicionan a ambos dentro de los de mayor riqueza en el país. *Hyptis pseudolantana*, *Lepechinia flammea*, *Salvia unicostata* y *Scutellaria bleparophylla* son registros nuevos para la flora de la región. Los municipios de Cuautitlán (58 spp.), Autlán de Navarro (47 spp.), Mascota (45 spp.), Talpa de Allende (44 spp.), San Sebastián del Oeste (37 spp.), Zapopan (36 spp.) y Jocotepec (35 spp.) son los más ricos en especies de Lamiaceae. Los bosques templados (bosque de pino y encino, bosque de pino y bosque mesófilo de montaña) y el bosque tropical caducifolio son los más ricos con 75-80% de las especies en conjunto. Entre las provincias con porciones en el occidente, la Faja Volcánica Transmexicana (121 spp.), la Costa Pacífica Mexicana (84 spp.) y la Sierra Madre Occidental (71 spp.) reunieron la mayor cantidad de especies. En el aspecto espacial la riqueza se concentró en valores intermedios de longitud (-105.0º a -102.5º), latitud (19.5º a 20.0º), y altitud (1 300 a 2 400 m). En las sierras de Cerro Viejo, El Cuale, Manantlán, San Sebastián del Oeste y el Valle de Atemajac se ubicaron la mayor cantidad de sitios de área estandarizada (21 km^2), con valores de 31 a 50 especies.

La intensidad de colecta en el occidente de México es muy desigual, por lo que es crítico que se ejecute un plan de colecta en áreas prioritarias para solucionar esta problemática.

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