BioOne COMPLETE

Hidden Species of Anacardiaceae in the Andean Cloud Forests: A Revision of Schinus Section Myrtifolia

Authors: da Silva Luz, Cíntia Luíza, Mitchell, John Daniel, Daly, Douglas C., Bitencourt, Camila, Oliveira Pierre, Patrícia Maria, et al.

Source: Systematic Botany, 47(4) : 1031-1064

Published By: The American Society of Plant Taxonomists

URL: https://doi.org/10.1600/036364422X16674053033822

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

Systematic Botany (2022), 47(4): pp. 1031–1064
ISSN 0363-6445 (print); ISSN 1548-2324 (online)
© Copyright 2022 by the American Society of Plant Taxonomists
DOI 10.1600/036364422X16674053033822
Date of publication December 12, 2022

Hidden Species of Anacardiaceae in the Andean Cloud Forests: A Revision of *Schinus* section *Myrtifolia*

Cíntia Luíza da Silva Luz,[1,6] John Daniel Mitchell,[2] Douglas C. Daly,[2] Camila Bitencourt,[3] Patrícia Maria Oliveira Pierre,[4] Susan K. Pell,[5] and José Rubens Pirani[1]

[1]Departamento de Botânica, Universidade de São Paulo, Herbário SPF, Rua do Matão 277, São Paulo 05508-900, Brazil; cintia.botanica@gmail.com; pirani@usp.br
[2]Institute of Systematic Botany, The New York Botanical Garden, 2900 Southern Blvd., Bronx, New York 10458-5126, USA; johndanmitchell@gmail.com; ddaly@nybg.org
[3]Programa de Pós-graduação em Ecossistemas Agrícolas e Naturais, Universidade Federal de Santa Catarina, Campus Curitibanos, Rodovia Ulysses Gaboardi, km 3, Curitibanos 89520-000, Brazil; camila.b@posgrad.ufsc.br
[4]Coordenadoria Especial de Ciências Biológicas e Agronômicas, Universidade Federal de Santa Catarina, Campus Curitibanos, Rodovia Ulysses Gaboardi, km 3, Curitibanos 89520-000, Brazil; patricia.pierre@ufsc.br
[5]United States Botanic Garden, 125 First Street SW, Washington, DC 20515, USA; Susan.Pell@aoc.gov
[6]Author for correspondence (cintia.botanica@gmail.com)

Communicating Editor: Diana Jolles

Abstract—*Schinus* comprises 42 species distributed across a broad range of vegetation types in southern South America. The previous phylogenetic study recovered eight well-supported lineages in *Schinus*. The simple-leaved species were grouped in a strongly supported clade that was resolved into five internal clades, one of which is *Schinus* sect. *Myrtifolia.* This is a group with some species reaching the highest elevations attained by Anacardiaceae. The 11 species of this section are mostly endemic to Andean cloud forests from Argentina, Bolivia, and Peru. Here, we present a taxonomic revision of *Schinus* section *Myrtifolia* and provide an identification key, descriptions of taxa including four new species: ***Schinus congestiflora***, ***Schinus obliqua***, ***Schinus tarijensis***, and ***Schinus villosa***, recognize a variety at species level and a new name at a new rank, as well as present synonyms and designate three lectotypes. We also include illustrations, distribution maps, comments on the taxonomy and nomenclature, preliminary conservation assessments, and pollen characterization for three species.

Keywords—Palynology, Sapindales, South America, taxonomy, Tropical Andes, Tucumán-Bolivian Forests, Yungas.

In a reassessment of biodiversity hotspots, Myers et al. (2000) argued that the Tropical Andes should be considered an extraordinarily important candidate for conservation because it encompasses around 45,000 plant species, of which 20,000 are endemic to the region. More recently, Pérez-Escobar et al. (2022), using online specimen databases, produced a floristic synthesis of Andean vascular plant diversity that comprises at least 28,691 plant species, a number that may be underestimated. The Tropical Andes comprise a complex mosaic of high mountains and deep inter-Andean dry valleys (Swenson et al. 2012), where arid habitats are isolated by corridors of mesic habitats, and vice versa, which may provide conditions for micro-allopatric diversification (Mutke et al. 2014).

The Andean orogeny and resulting isolation likely promoted diversification in South America (Antonelli et al. 2009; Luebert and Weigend 2014), where island-like formations might play a crucial role in allopatric speciation (Hughes and Eastwood 2006). The combination of limited gene flow and effective dispersal barriers may have led to considerable radiation in many clades resulting in high numbers of range-restricted species (Hughes and Eastwood 2006; Kier et al. 2009). Moreover, phylogenetic studies of representative Andean plant groups (Chen and Li 2004; Bell and Donoghue 2005; Hughes and Eastwood 2006; Tank and Olmstead 2009) have suggested that high elevations could provide a bridge for migrations of cold-tolerant North American plant lineages occurring in northern South America or vice versa (Hughes and Eastwood 2006; Pennington and Dick 2010). Also, temporal dynamics of landscape heterogeneity such as landslides have been considered as relevant to the generation and maintenance of biodiversity (Kessler 1999; Richter et al. 2009; Mutke et al. 2014).

Within the mosaic of high mountains and deep inter-Andean dry valleys, cloud forests occur on the Andean slopes and extend from Venezuela to northwestern Argentina (Ojeda et al. 2008; Myster 2021). Andean cloud forests are among the most biologically diverse ecosystems in the world (Gentry 1992), with high endemicity for a number of taxa such as birds (Cracraft 1985; Fjeldså and Mayer 1996), rodents (Emmons 1997), orchids (Vásquez and Ibisch 2000; Vásquez et al. 2003), vertebrates (Swenson et al. 2012), Coleoptera: Cerambycidae (Perger and Guerra 2013), fungi (Geml et al. 2014), and angiosperms (e.g. Campanulaceae, see Lagomarsino et al. 2014). Studies have revealed many new species, especially in Southern Yungas in southern Bolivia, of insects (Wolfe and Herbin 2002; Blandin and Gareca 2011; Gareca and Blandin 2011; Perger and Guerra 2012), rodents (Ferro et al. 2010), and plants (Steudel 2011; Särkinen et al. 2015).

Schinus L. is a particularly species rich genus in the Andes, with some species occurring in Andean cloud forests at an altitude of up to 4000 m, whereas the majority of other Anacardiaceae taxa occur in lowland habitats. It comprises approximately 42 species endemic to South America, ranging from the central Andes to southern South America. *Schinus areira* L. and *S. terebinthifolia* Raddi, both commonly known as "pepper trees," and *S. polygama* (Cav.) Cabrera have become invasive species outside their native range, and some *Schinus* species are cultivated. *Schinus* species are found along the Andes in Argentina, Bolivia, Chile, and Peru, where they can be found in the inter-Andean valleys and Andean cloud forests, as well as at low altitudes in southeastern to northeastern Argentina, extending into Uruguay, Paraguay, and southern Brazil. A few endemic Chilean species occur in sclerophyllous forests in a Mediterranean climate.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

The latest taxonomic revision of *Schinus* was provided by Barkley (1957). Aiming to improve our knowledge of the genus, a previous phylogenetic study corroborated its monophyly and recovered eight well-supported lineages in *Schinus* (Silva-Luz et al. 2019). The simple-leaved species were grouped in a strongly supported clade, resolved into five internal clades (Fig. 1A), namely *Schinus* sect. *Atlantica* Silva-Luz & Pirani, *S.* sect. *Duvaua*, *S.* sect. *Montana* Silva-Luz & Pirani, *S.* sect. *Myrtifolia* Silva-Luz & J.D.Mitch., and *S.* sect. *Pilifera* Silva-Luz & J.D.Mitch. As part of an effort to treat all species of the genus, here we focus on a taxonomic revision of *Schinus* section *Myrtifolia* (Fig. 1B), a clade that comprises mostly endemic species from Andean cloud forests of Argentina, Bolivia, and Peru. We provide an identification key, descriptions of existing taxa and four new species, synonymy, comments on taxonomy and nomenclature, preliminary conservation assessments, and pollen characterization for three species.

Materials and Methods

This study was based on fieldwork and examination of herbarium specimens from BA, BAA, CTES, GH, LP, LPB, MCNS, MO, MOL, NY, SI, SPF, US, USM (Thiers 2022). In addition, we supplemented this with field collections and observations in Argentina, Bolivia, and Peru. Measurements were made using a stereomicroscope with 10–60 × magnification using dried herbarium material, with the exception of the floral parts that were rehydrated with water and glycerine. Colors of flowers and fruits were observed in living material or obtained from herbarium label data. Morphological terms follow Beentje and Williamson (2010) and Ellis et al. (2009). Common names and phenological information were taken from herbarium labels and literature.

The genotypic cluster definition was adopted here as the species concept, in which groups of individuals with shared features are separable from other clusters by morphological discontinuities, sometimes with few intermediates when in contact (Mallet 1995). Since statistical analyses such as morphometrics were not carried out, we have not recognized varieties, instead describing the variation whenever present. Delimitations of *Schinus* species of this section were based mainly on inflorescence structures and leaf features, especially leaf architecture. We call median internode the portion measured between two floral internodes in the median portion of the inflorescence.

Mature pollen grains were obtained from anthers and stored in microtubes containing acetic acid 99.8%. They were acetolyzed according to the procedure described by Erdtman (1960). Scanned images were obtained using an Olympus BX60 epifluorescence light microscope coupled with an Olympus DP73 digital camera. Pollen grains were measured in CellSens software and characterized morphologically. The polar (P) and equatorial (E) axes and exine thickness were measured for 25 mature pollen grains. P/E values were calculated for each pollen grain measured. The terminology and classification of pollen grain size, pollen surface morphology in equatorial view, and aperture numbers were adopted according to the definitions of Erdtman (1952) and Punt et al. (2007).

For detailed visualization of exine ornamentation, the pollen grains were analyzed with scanning electron microscopy (SEM). These analyses were performed at the Central Electron Microscopy Laboratory (LCME) of the Federal University of Santa Catarina. Anthers from flower buds were submitted to an increasing series of dehydration in ethyl alcohol (50%, 70%, and 100%) and kept in the last series until the preparation of samples for SEM. For sample preparation, a drop of 100% ethyl alcohol containing the anthers was deposited on aluminum stubs covered by a carbon tape. Under a Leica EZ stereoscopic microscope, each anther was carefully sectioned longitudinally with the aid of histological needles to release the pollen grains. Then, a drop of HDMS (hexamethyldisilazane) was added to the pollen grains to aid in their dehydration. The stubs containing the samples were placed in a desiccator. Twelve hours after drying, the supports were sputter-coated (SCD050) with gold for metallization of pollen grains. Scanned images were obtained with a JEOL JSM-6390LV scanning electron microscope.

Distribution maps were based on the specimen records using QGIS 2.6.1 (QGIS Development Team 2015). Global topographic elevation model (GTOPO30) was used to create digital elevation model (DEM) with a resolution of 30 arc-seconds for South America (Danielson and Gesch 2011). The ecoregion shapefile was downloaded from the World Wildlife Fund (2012) and follows the classification system based on ecoregions (Dinerstein et al. 2017). When geographic coordinates were not available on specimen labels we used maps of the region to attribute them using specimen collection details. The preliminary conservation status of each species was assessed using IUCN (2022) guidelines based on the GeoCat analyses (Bachman et al. 2011) combined with field knowledge. Extent of occurrence (EOO) and area of occupancy (AOO) were calculated using GeoCat (www.geocat.kew.org) with a cell width of 2 km for AOO calculations.

Results and Discussion

Distribution and Ecology—Species of *Schinus* sect. *Myrtifolia* are found in the Andean forests of Argentina, Bolivia, and Peru, mostly in cloud forests at the higher elevations, or in ecotonal areas between these forests and more arid vegetation types such as Bolivian Montane Dry Forest, Central Andean Puna, Central Andean Wet Puna, Dry Chaco, and High Monte (Fig. 1C). In Bolivia and Peru, the cloud forests are referred to as Bolivian and Peruvian Yungas ecoregions (Olson et al. 2001) or simply the Yungas (Cabrera and Willink 1973). These forests are found all along the eastern side of the Central Andes following the eastern slopes of the Marañón River in Peru to central Bolivia, between the Moist Puna to the west and the lowlands of the Amazon to the east (Cabrera and Willink 1973).

At its southern extreme, the Bolivian and Peruvian Yungas is replaced by a distinctive assemblage of plant species recognized as the Southern Andean Yungas (Olson et al. 2001) or Tucumán-Bolivian forest (Schulenberg et al. 1997). This ecoregion is isolated from southwestern Santa Cruz Department in Bolivia and extends over isolated north-south oriented mountain chains in Chuquisaca and Tarija departments in Bolivia to northwestern Argentina (Churchill and Lozano 2009). To the west, it is bordered by the Xeric Puna, and to the east by the Bolivian Chiquitanía and the Gran Chaco in Bolivia and Argentina (Josse et al. 2009).

Most species of *Schinus* sect. *Myrtifolia* occur in Andean cloud forests in Southern Andean Yungas and Bolivian Yungas. For example, *Schinus gracilipes* I.M.Johnst. (Fig. 2A), *S. myrtifolia* (Griseb.) Cabrera (Fig. 2A), *S. meyeri* F.A.Barkley (Fig. 2B), and *S. venturii* F.A.Barkley (Fig. 2B) are found mostly in Southern Andean Yungas, while *S. congestiflora* Silva-Luz and Pirani (Fig. 3A), *S. minutiflora* Silva-Luz and Pirani (Fig. 3A), *S. obliqua* Silva-Luz and J.D.Mitch. (Fig. 3A), and *S. villosa* Silva-Luz and J.D.Mitch. (Fig. 3A) occur in Southern Andean Yungas and Bolivian Yungas or in ecotonal areas between these Andean cloud forests and arid vegetation types (e.g. Central Andean Puna and Bolivian Montane Dry Forest). *Schinus subtridentata* (Kuntze) Silva-Luz (Fig. 3B) and *S. tarijensis* Silva-Luz and J.D.Mitch. (Fig. 3B) are distributed in Central Andean Puna and Bolivian Montane Dry Forest, however they show a preference to grow in slopes where patches of Andean cloud forests develop. *Schinus microphylla* I.M.Johnst. (Fig. 3B), the northernmost species, is the only taxon of this section that reaches Peru and is disjunct, occurring mostly in Peruvian Yungas and Central Andean Wet Puna, with few populations in Bolivian Yungas and Bolivian Montane Dry Forest.

Taxa of *Schinus* section *Myrtifolia* are often sympatric with species of *Schinus* sect. *Schinus* and *S.* sect. *Pilifera*. For example, the 11 species of *Schinus* sect. *Myrtifolia* may co-occur in

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

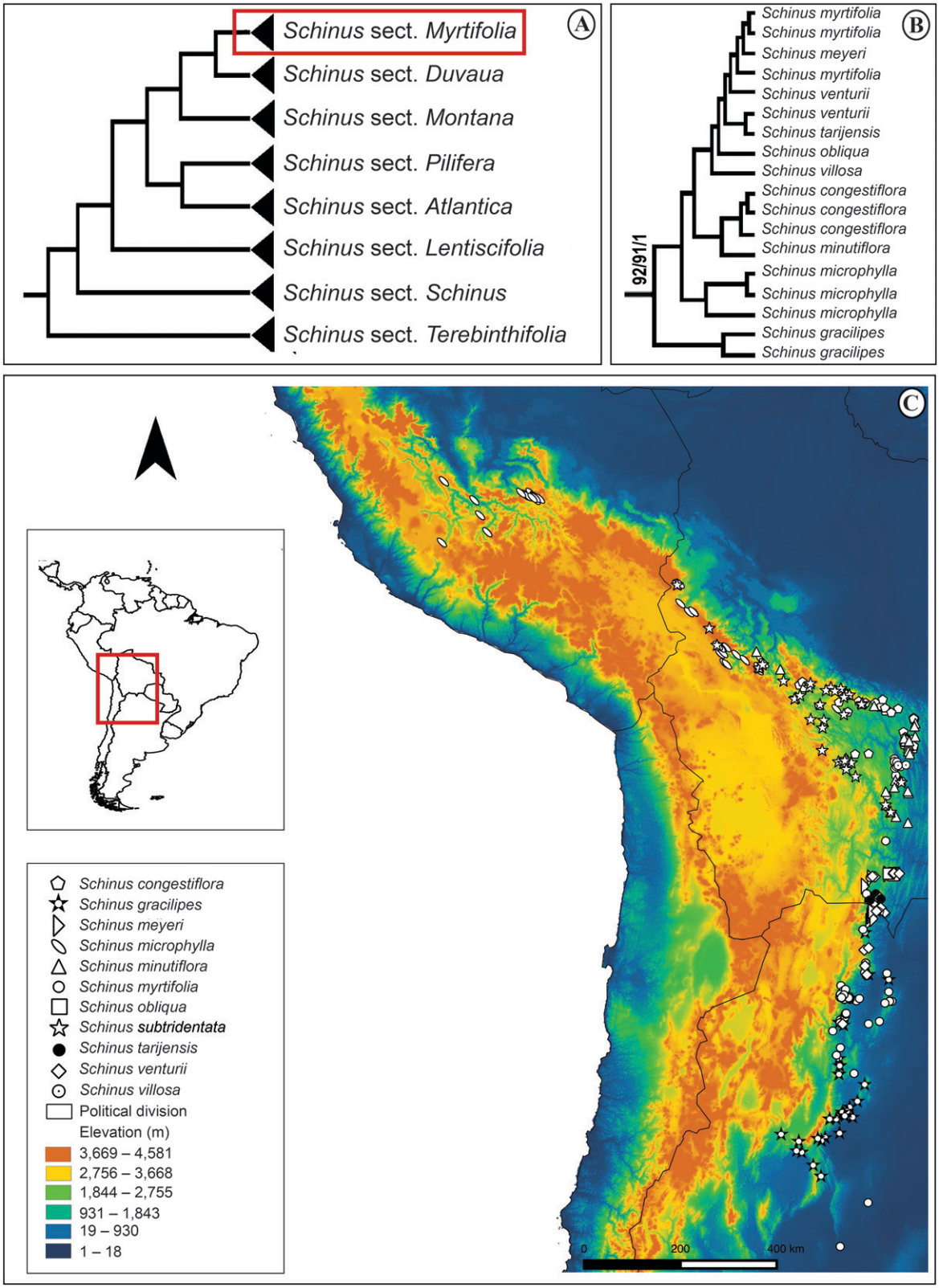


FIG. 1. A. Simplified phylogenetic tree of *Schinus* based on the combined pool of post-burn trees from Bayesian analyses of the combined plastid and nuclear DNA regions, highlighting the position of *S.* sect. *Myrtifolia* (modified from Silva-Luz et al. 2019). B. Phylogeny of *Schinus* sect. *Myrtifolia* with parsimony bootstrap, maximum likelihood bootstrap, and posterior probability values, respectively (modified from Silva-Luz et al. 2019). C. Geographical distribution of *Schinus* sect. *Myrtifolia* plotted on digital elevation model (1 km resolution) of South America.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

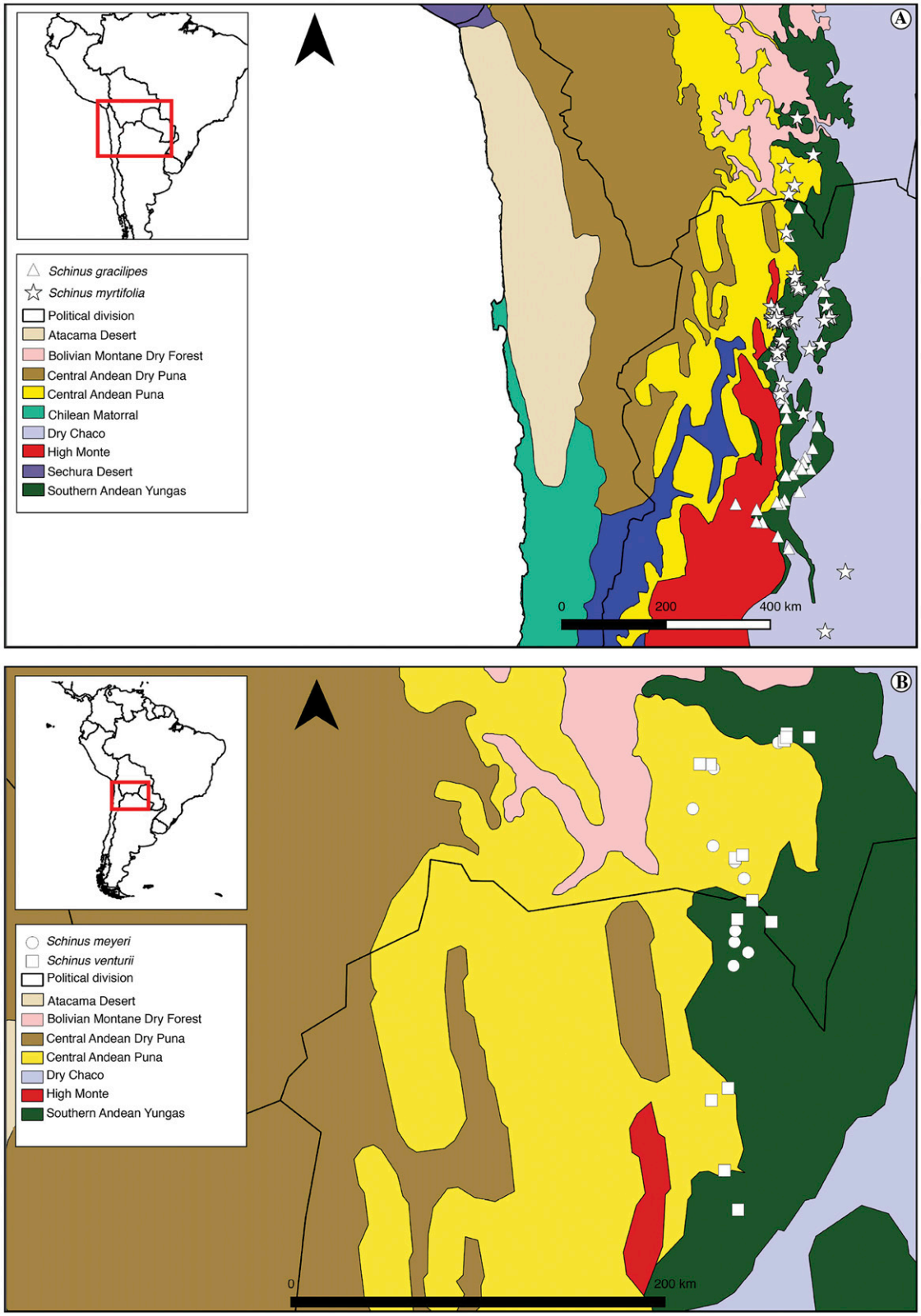


FIG. 2. A. Geographical distribution of *Schinus gracilipes* and *S. myrtifolia*. B. Geographical distribution of *Schinus meyeri* and *S. venturii*.

sympatry with *S. pilifera* I.M.Johnst. (*S.* sect. *Pilifera*) and *S. areira* (*S.* sect. *Schinus*) but differ from the two latter species by having tetramerous flowers (vs. pentamerous flowers), and simple leaves, while *S. areira* has compound leaves. *Schinus congestiflora*, *Schinus microphylla*, *S. minutiflora*, and *S. subtridentata* can be found in the same area as *S. pearcei* Engl. (*S.* sect. *Pilifera*) but are readily recognized due to their simple leaves and pseudoracemose inflorescences, whereas the latter species has dissected leaves and paniculate inflorescence. *Schinus gracilipes*, *S. meyeri*, *S. myrtifolia*, and *S. venturii* may

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

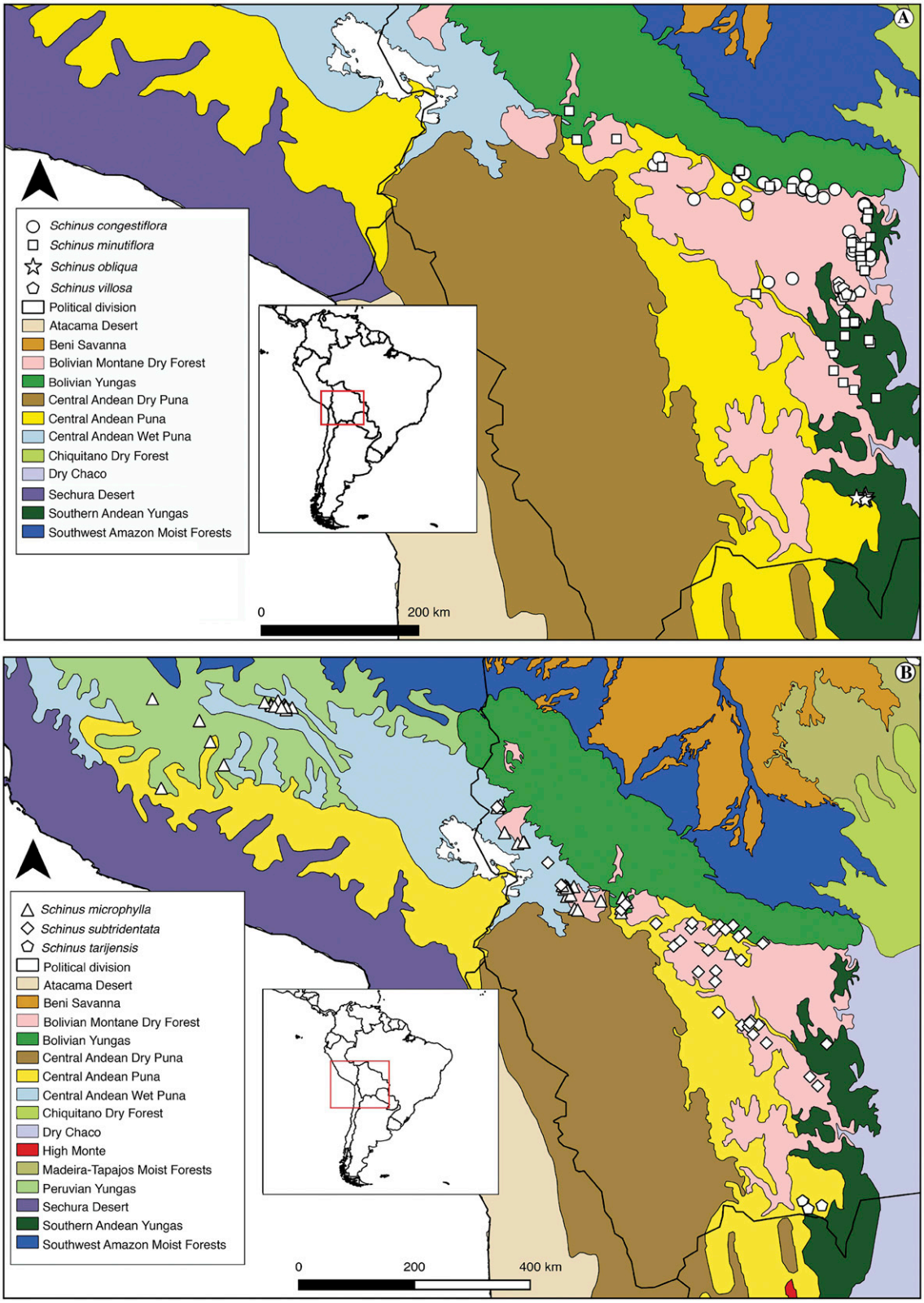


FIG. 3. A. Geographical distribution of *Schinus congestiflora*, *S. minutiflora*, *S. obliqua*, and *S. villosa*. B. Geographical distribution of *Schinus microphylla*, *S. subtridentata*, and *S. tarijensis*.

co-occur with *S. bumelioides* I.M.Johnst. (*S.* sect. *Pilifera*) but they differ by having unarmed branches (vs. armed branches).

Some *Schinus* sect. *Myrtifolia* taxa occur in evergreen *Podocarpus* L'Hér. ex Pers. (Podocarpaceae) and *Weinmannia* L. (Cunoniaceae) forests, as well as in deciduous forests with *Alnus acuminata* Kunth (Betulaceae). On steep slopes, at higher elevations, *Schinus* sect. *Myrtifolia* also occurs in remnant and relictual *Polylepis* Ruiz & Pav. (Rosaceae) forests

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

while at lower elevations (between 1000–1500 m), it occurs in Myrtaceae forests, especially with species of *Myrcianthes* O.Berg.

Systematics, Taxonomy, and New Species—*Schinus* sect. *Myrtifolia* comprises 11 species, including *S. gracilipes* (Fig. 4A–G), *S. meyeri* (Fig. 4H–L), *S. venturii* (Fig. 4M–R), *S. microphylla* (Figs. 5A–E, 6A–B), and *S. myrtifolia* (Figs. 5F–L, 6C–F), which were previously recognized by Barkley as part of *S.* subg. *Duvaua* sect. *Pseudoduvaua*, with the exception of *S. microphylla*, a species formerly placed in *S.* subg. *Duvaua* sect. *Duvaua* (Barkley 1957). According to Barkley's circumscription, species from the former section are distinguished from taxa of the latter section by their unarmed branches. However, the phylogenetic study of *Schinus* indicated that thorns are a homoplasic character state, which has arisen independently at least five times within the simple-leaved *Schinus* lineage (Silva-Luz et al. 2019). In addition, four new species described here and two species recognized at a new rank are also part of *Schinus* sect. *Myrtifolia: S. congestiflora* (Figs. 7A–E, 8A–G), *S. minutiflora* (Fig. 8H–P), *S. obliqua* (Fig. 9A–G), *S. villosa* (Fig. 9H–M), *S. tarijensis* (Fig. 10A–H), and *S. subtridentata* (Fig. 10I–P).

Species delimitation issues are addressed for *Schinus andina* (Engl.) I.M.Johnst., a superfluous name (see discussion under *S. microphylla*) and *S. myrtifolia.* Macbride (1951) suggested recognizing *Schinus andina* as a variety under *S. microphylla*, whereas Barkley (1957), commenting on *S. andina*, pointed out the presence of characters that could place it either in *S. microphylla* or in *S. myrtifolia.* Our morphological study of *Schinus* sect. *Myrtifolia* revealed several taxonomic circumscription problems. Detailed morphological study of numerous exsiccatae indicate that specimens previously identified as *Schinus andina* or *S. myrtifolia* can be divided into seven species (Fig. 11), which we recognize as *S. congestiflora*, *S. microphylla* s.s., *S. minutiflora*, *S. myrtifolia*, *S. subtridentata, S. tarijensis*, and *S. villosa*.

These species are delimited in an attempt to disentangle complexity and misidentified specimens in this section, taking into account the morphological traits observed in a wider sampling and a careful nomenclatural revision of the whole section. However, the delimitation of species that occur in sympatry is still a difficult issue because of some degree of overlap in morphological characters, especially between *Schinus congestiflora, S. minutiflora*, and *S. subtridentata*. A numerical list of taxa, an index to scientific names in *Schinus* sect. *Myrtifolia*, and a list of exsiccatae are shown in Appendices 1, 2, and 3 respectively.

Morphology—Sections in *Schinus* are characterized by a combination of character states; *S.* sect. *Myrtifolia* comprises armed and unarmed species that can be recognized by the presence of simple leaves, secondary vein framework that is conspicuously cladodromous, tetramerous flowers with petals longer than stamens, and lax fruiting branches. The often laterally compressed fruit may be a synapomorphy (Silva-Luz et al. 2019). Species of *Schinus* sect. *Duvaua* can also present tetramerous flowers, but their petals are shorter than the stamens, the leaves have craspedodromous secondary veins, and fruiting branches are congested. Flowers of *Schinus* sect. *Lentiscifolia* are also tetramerous, but that section differs by its pinnately compound leaves.

Of the morphological characters used to delimit species of *Schinus* sect. *Myrtifolia*, the inflorescence length and the internode length at the median portion of the inflorescence are useful morphological characters for delimiting species of *Schinus* sect. *Myrtifolia*. Overall, these inflorescence features are more conspicuous in staminate plants, especially among *Schinus congestiflora*, *S. minutiflora*, and *S. subtridentata*, making it difficult to identify pistillate plants.

Secondary characters, such as inflorescence structure (Barrett and Hough 2013), are commonly found and can be useful in delimiting taxa (Lloyd and Webb 1977) in sexually dimorphic angiosperms (e.g. dioecy). In *Schinus*, including in *S.* sect. *Myrtifolia,* larger staminate inflorescences may bear a larger number of flowers than the smaller, pistillate inflorescences (Fleig 1989; Lenzi and Orth 2004).

Palynology—Pollen descriptions for *Schinus* species are scarce in the literature including a few species from other sections (Markgraf and D'Antoni 1978; Cruz-Barros and Granito 1997; Barros et al. 1999; Takeda et al. 2000). Thus, we provide the first study of pollen descriptions for *Schinus* sect. *Myrtifolia.*

Here we investigate pollen grains of *Schinus congestiflora*, *S. microphylla*, and *S. myrtifolia*, which have a tricolporate type of aperture and are of medium size (with polar diameters ranging between 25–50 μm). However, pollen grains of the three species analyzed showed variation in their morphological characters such as shape, exine ornamentation pattern, and thickness (Table 1; Fig. 12A–L).

Previous studies have demonstrated that pollen shape in *Schinus* is variable; for example *S. areira* (reported as "*S. molle* L. var. *areira* (L.) DC.") and *S. molle*, both belonging to *S.* sect. *Schinus*, have pollen grains that are subprolate and prolate, respectively, whereas in *S. patagonica* (Phil.) I.M.Johnst. ex Cabrera (*S.* sect. *Montana*) and *S. polygama* (*S.* sect. *Duvaua*) pollen grains are prolate spheroidal (Markgraf and D'Antoni 1978). Pollen grains of *Schinus terebinthifolia* (*S.* sect. *Terebinthifolia*) have been described as prolate spheroidal (Cruz-Barros and Granito 1997), as prolate (Barros et al. 1999), and as subprolate (Takeda et al. 2000). Variation in pollen shape was also observed in species of *S.* sect. *Myrtifolia*, in which *Schinus congestiflora* and *S. myrtifolia* have a prolate spheroidal shape, while *S. microphylla* has subprolate shape.

Exine sculpturing varies among *Schinus* species; for instance *S. areira, S. molle,* and *S. polygama* have a striate-reticulate exine (Markgraf and D'Antoni 1978); *S. patagonica* has a striate-perforated exine (Markgraf and D'Antoni 1978); and *S. terebinthifolia* has a reticulate exine (Cruz-Barros and Granito 1997; Barros et al. 1999). Taxa of *Schinus* sect. *Myrtifolia* also vary in pollen surface characteristics; for example *S. congestiflora* shows a striate exine sculpturing (Fig. 12B, D), while *S. microphylla* and *S. myrtifolia* have a reticulate-striate exine sculpturing (Fig. 12F, H, J, L). In addition to macromorphological characters (described below), the pattern of pollen ornamentation provides evidence for recognizing new taxa described herein, such as *Schinus congestiflora*.

More efforts should be directed to the palynological study of *Schinus* sect. *Myrtifolia* given the utility of pollen characters in taxon delimitation.

Phylogeny—The clade comprising species of *Schinus* sect. *Myrtifolia* is strongly supported by maximum parsimony, maximum likelihood, and Bayesian analyses (bootstrap and posterior probability values: 92/91/1, respectively) (see Silva-Luz et al. 2019). Future *Schinus* systematic studies should consider using a phylogenomic approach, since the reconstruction of the phylogeny (Silva-Luz et al. 2019) showed a low level of genetic divergence among individuals of recent co-ancestry, which is likely due to rapid speciation events.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

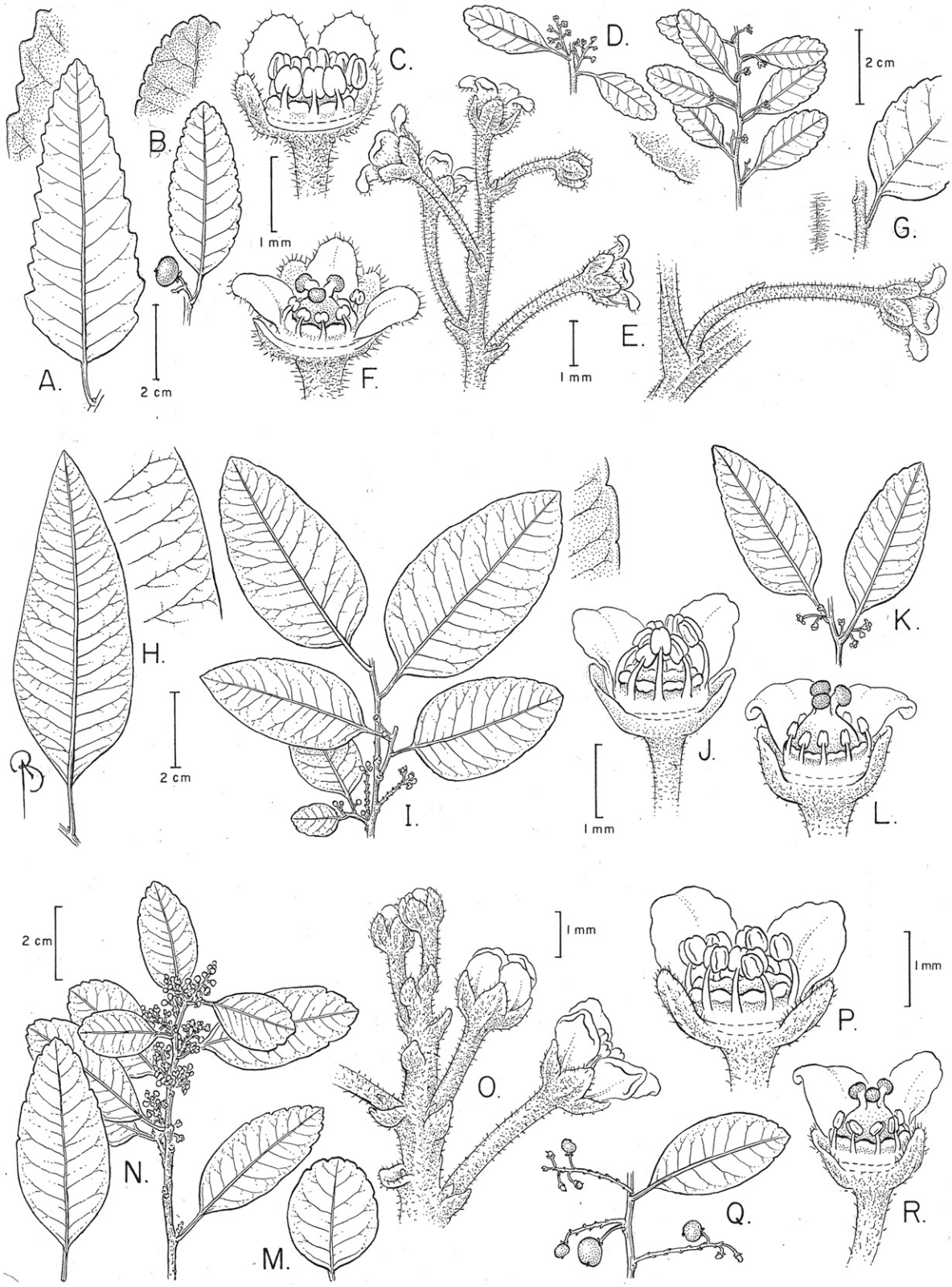


FIG. 4. A–G. *Schinus gracilipes*. A. Leaf plus detail of the margin, and secondary and tertiary veins (inset). B. Fruiting branchlet plus detail of the margin, and secondary and tertiary veins (inset). C. Staminate flower with two petals and one sepal removed. D. Flowering branchlet plus detail of the indumentum and margin on leaf (inset). E. Inflorescence plus detail of the flower insertion, bract, and bracteoles. F. Pistillate flower. G. Branchlet plus detail of the indumentum (inset). H–L. *Schinus meyeri*. H. Leaf plus detail of the secondary and tertiary veins (inset). I. Flowering branchlet plus detail of the venation and margin on leaf (inset). J. Staminate flower with two petals and one sepal removed. K. Flowering branchlets. L. Pistillate flower with two petals and one sepal removed. M–R: *Schinus venturii*. M. Leaf. N. Flowering branchlet. O. Staminate inflorescence. P. Staminate flower with two petals and one sepal removed. Q. Fruiting branchlet. R. Pistillate flower with two petals and one sepal removed. A: *P.R. Legname and A.R. Cuezzo 4194*; B, F: *O. Dionisio 110*; C–E: *D. Olea 30*; G: *M. Lillo1163*; H–J: *M.M. Schiavone et al. 11883C*; K–L: *S. Gallegos et al. 305*; M–P: *J.C. Solomon 10927*; Q–R: *F. Zenteno et al. 4517*. Drawings by Bobbi Angell.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use



FIG. 5. A–E. *Schinus microphylla*. A. Sterile branchlet plus detail of the leaf. B. Leaf plus detail of the venation and margin (inset). C. Flowering inflorescence. D. Staminate inflorescence. E. Staminate flower with two petals and one sepal removed. F–L. *Schinus myrtifolia*. F. Flowering branchlet. G. Inflorescence. H. Staminate flower with two petals and one sepal removed. I. Leaf plus detail of the venation and margin on distal portion (inset). J. Leaf plus detail of the venation and margin on distal portion (inset). K. Pistillate flower plus detail of the flower with two petals and one sepal removed. L. Fruiting branchlet. A–B: *C.L. Silva-Luz and L.F. Luz 337*; C–E: *S.G. Beck 4228*; F–H: *C.L. Silva-Luz and L.F. Luz 325*; I–J: *C.L. Silva-Luz and L.F. Luz 322*; K–L: *C.L. Silva-Luz and L.F. Luz 242*. Drawings by Bobbi Angell.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use



FIG. 6. A–B. *Schinus microphylla.* A. Flowering branchlets with staminate flowers. B. Flowering branchlets (note the glossy blade and the venation). C–F. *Schinus myrtifolia.* C. Habit. D. Unbranched pseudoraceme with staminate flowers. E. Branchlet with immature fruit. F. Branchlet with mature fruit and pistillate inflorescence in development. Photos: C. L. Silva-Luz.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use



FIG. 7. *Schinus congestiflora*. A. Habit. B. Flowering branchlet with staminate inflorescences (note conspicuous marginal secondary vein). C. Fruiting branchlets. D. Branchlet with staminate flowers. E. Branchlet with imature fruit and pistillate inflorescence. Photos: C. L. Silva-Luz.

TAXONOMIC TREATMENT

Schinus sect. ***Myrtifolia*** *Silva-Luz & J.D.Mitch.* TYPE: S. myrtifolia *(Griseb.) Cabrera (≡* Cybianthus myrtifolius *Griseb.).*

Dioecious tree(lets) or shrubs. **Branches** erect or prostrate, unarmed or rarely branchlets ending in inconspicuous or conspicuous thorns, lenticellate. **Trichomes** simple, barbed, barbellate, bulbous or clavate-glandular, erect, sometimes

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

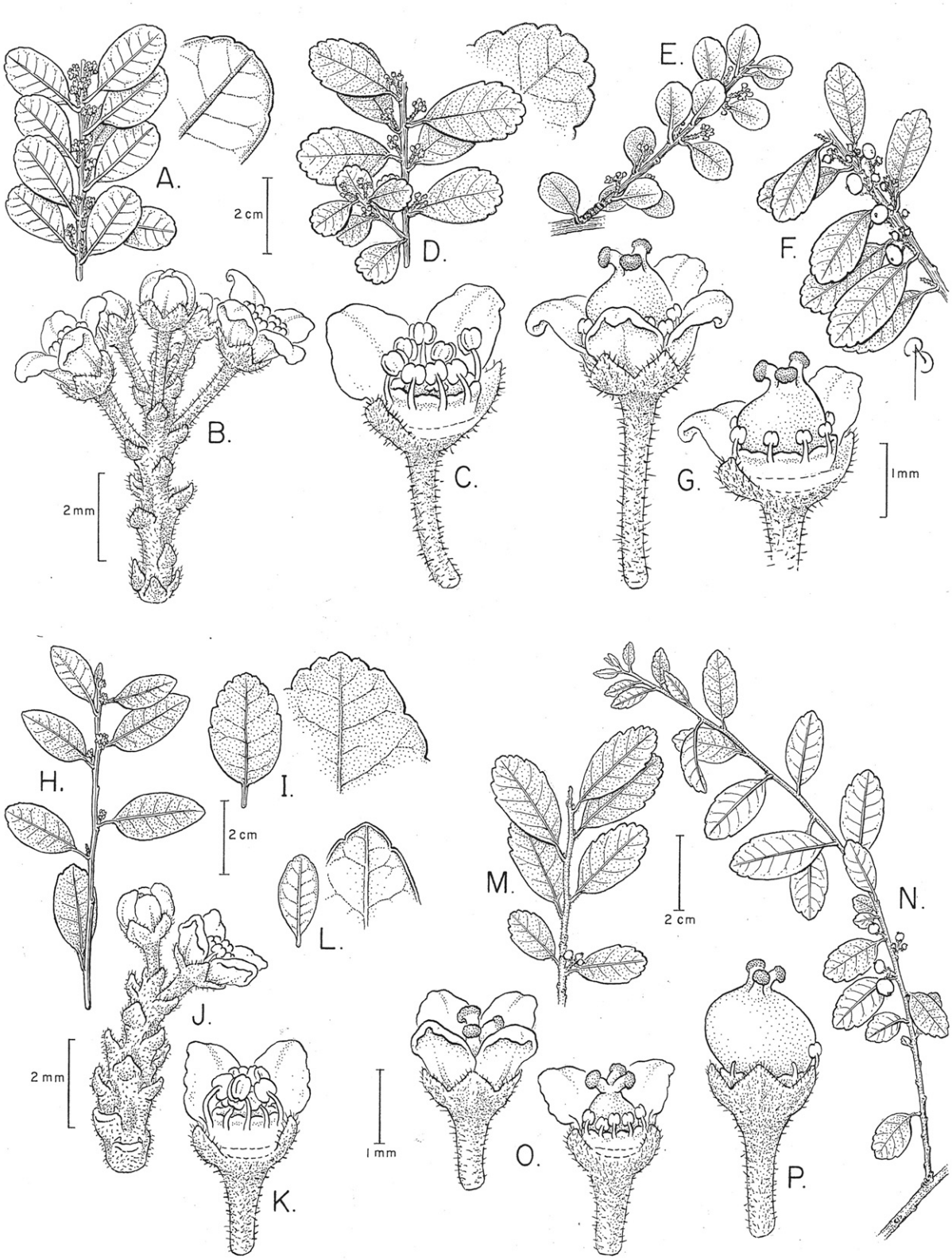


FIG. 8. A–G. *Schinus congestiflora*. A. Flowering branchlet plus detail of the venation and margin on distal portion of leaf (inset). B. Staminate inflorescence. C. Staminate flower at anthesis with two petals and one sepal removed. D. Flowering branchlet plus detail of the venation and margin on distal portion of leaf (inset). E. Flowering branchlet. F. Fruiting branchlet. G. Pistillate flower at anthesis plus detail of the flower with two petals and one sepal removed. H–P: *Schinus minutiflora*. H. Flowering branchlet. I. Leaf plus detail of the venation and margin on distal portion (inset). J. Staminate inflorescence. K. Staminate flower with two petals and one sepal removed. L. Leaf plus detail of the venation and margin on distal portion (inset). M–N. Fruiting branchlet. O. Pistillate flower at anthesis plus detail of the flower with two petals and one sepal removed. P. Immature fruit in development. A–C: *M.H. Nee 45301*; D: *M.H. Nee and M. Mendoza 52504*; E: *M.H. Nee and D. Atha 50015*; F–G: *J.C. Solomon and M. Nee 16041*; H–L: *M. Moraes* and *I. Vargas 1809*; M–P: *M. Serrano et al. 6985*. Drawings by Bobbi Angell.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

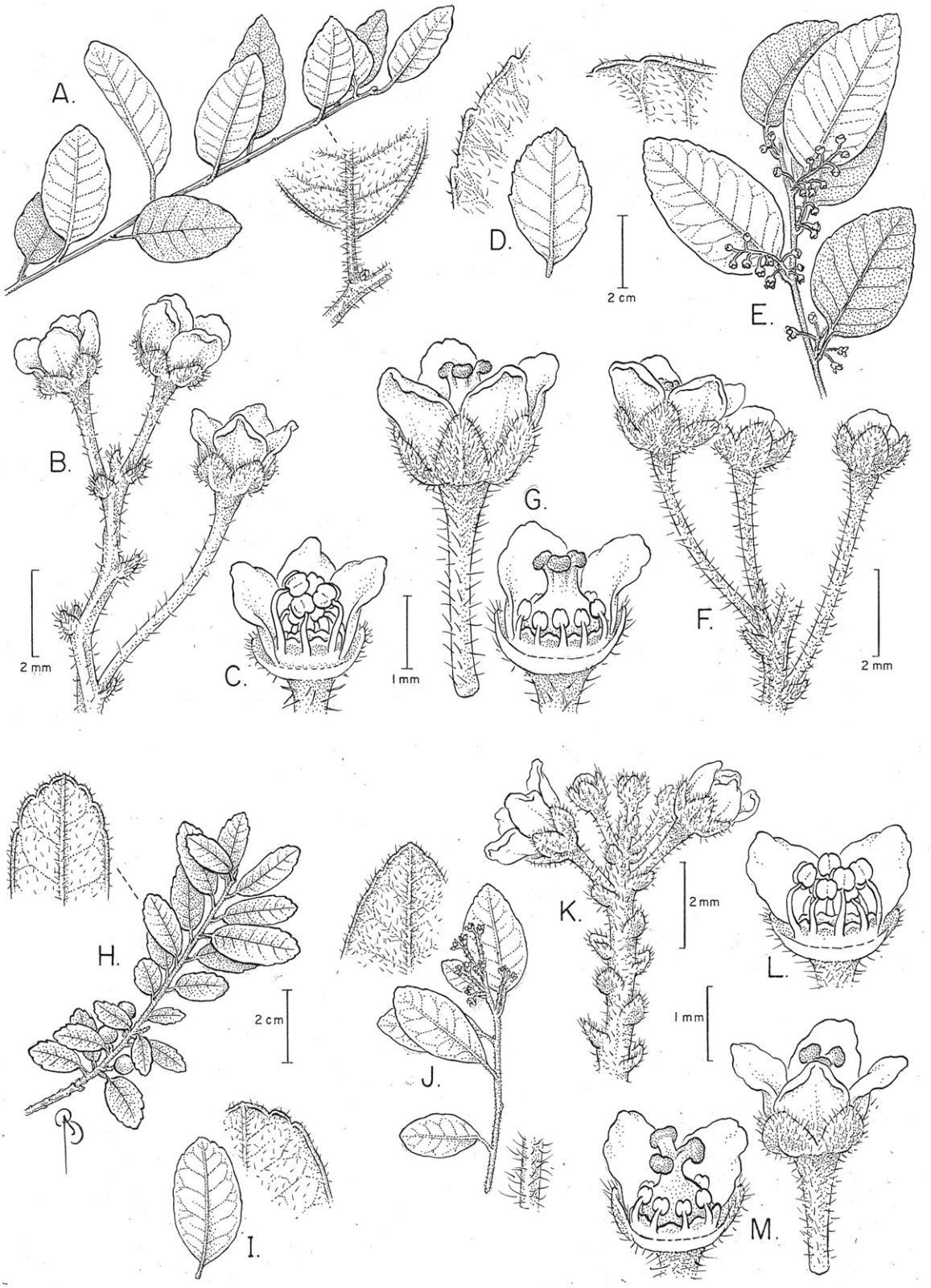


FIG. 9. A–G. *Schinus obliqua*. A. Sterile branchlet plus detail of the indumentum (inset). B. Inflorescence. C. Staminate flower with one petal and one sepal removed. D. Leaf plus detail of the indumentum, venation, and margin (inset). E. Flowering branchlet plus detail of the indumentum, venation, and margin on leaf (inset). F. Pistillate inflorescence. G. Pistillate flower plus detail of the flower with two petals and one sepal removed. H–M. *Schinus villosa*. H. Fruiting branchlet plus detail of the indumentum, venation, and margin on leaf (inset). I. Leaf plus detail of the indumentum, venation, and margin on distal portion (inset). J. Flowering branchlet plus detail of the indumentum and margin on distal portion of leaf, and the indumentum on branch (inset). K. Inflorescence. L. Staminate flower with two petals and one sepal removed. M. Pistillate flower plus detail of the flower with two petals and one sepal removed. A–E: *J.R.I. Wood 11623.II*; F–G: *J.C. Solomon 11623.I*; H–I: *J. Villalobos et al. 1016*; J–L: *J.R.I. Wood 12708*; M: *M. Moraes and I. Vargas 1834*. Drawings by Bobbi Angell.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

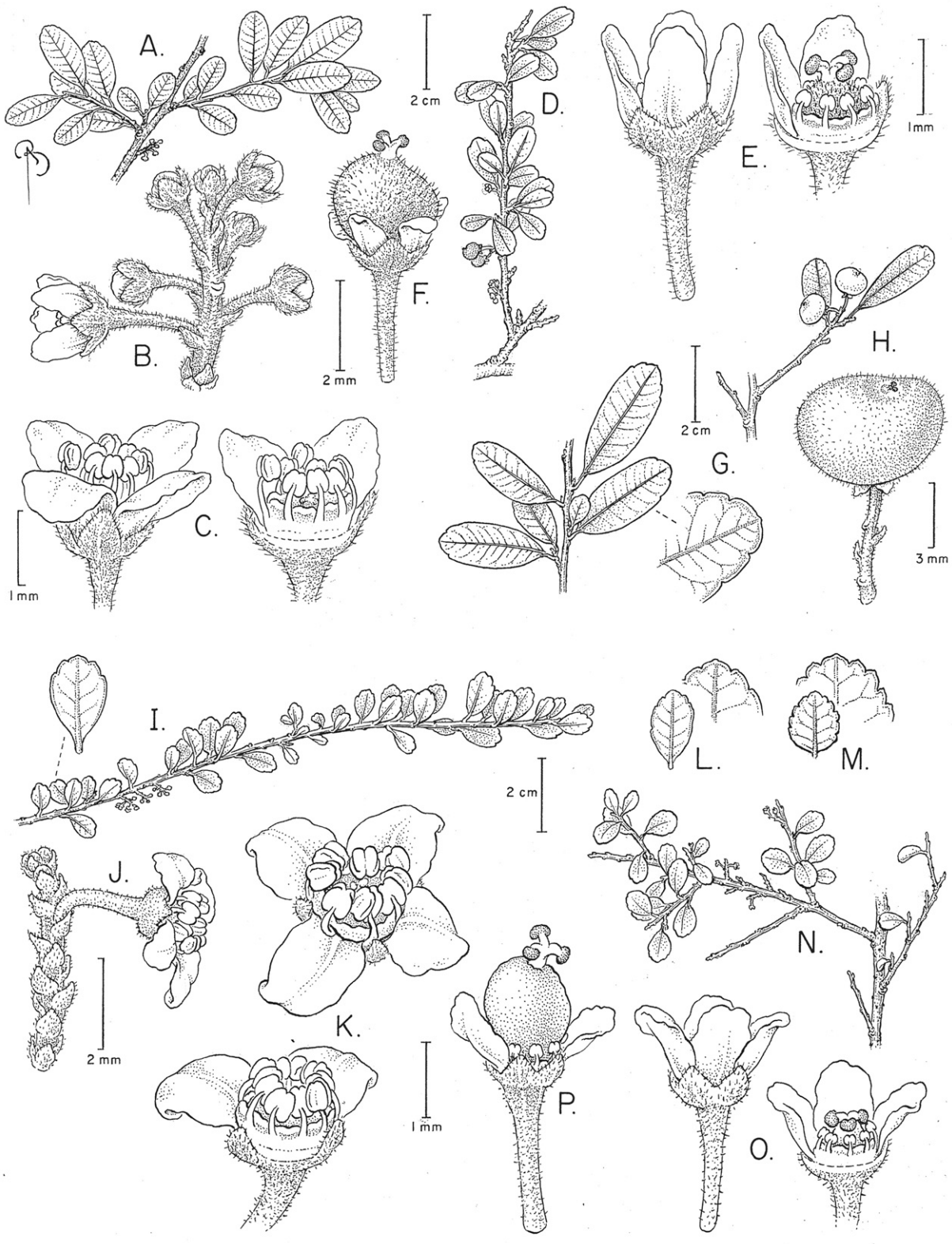


FIG. 10. A–H. *Schinus tarijensis*. A. Flowering branchlet. B. Staminate inflorescence. C. Staminate flower plus detail of the flower with two petals and one sepal removed. D. Flowering and fruiting branchlet. E. Pistillate flower plus detail of the flower with two petals and two sepals removed. F. Immature fruit in development. G. Sterile branchlet plus detail of the venation and margin on distal portion of leaf (inset). H. Fruiting branchlet plus detail of the fruit indumentum. I–P. *Schinus subtridentata*. I. Flowering branchlet plus detail of the leaf (inset). J. Staminate inflorescence. K. Upper view of the staminate flower plus detail of the flower with two petals removed. L–M. Leaf plus detail of the venation and margin on distal portion. N. Flowering branchlet. O. Pistillate flower plus detail of the flower with one petal and two sepals removed. P. Immature fruit in development. A–C: *S.G. Beck et al. 26058*; D–F: *M. Serrano et al. 5050*; G–H: *F. Zenteno et al. 3657*; I–K: *J.F. Casas 7790*; L: *S.G. Beck et al. 18051*; M: *S.G. Beck 4376*; N–P: *M. Kessler 2977*. Drawings by Bobbi Angell.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

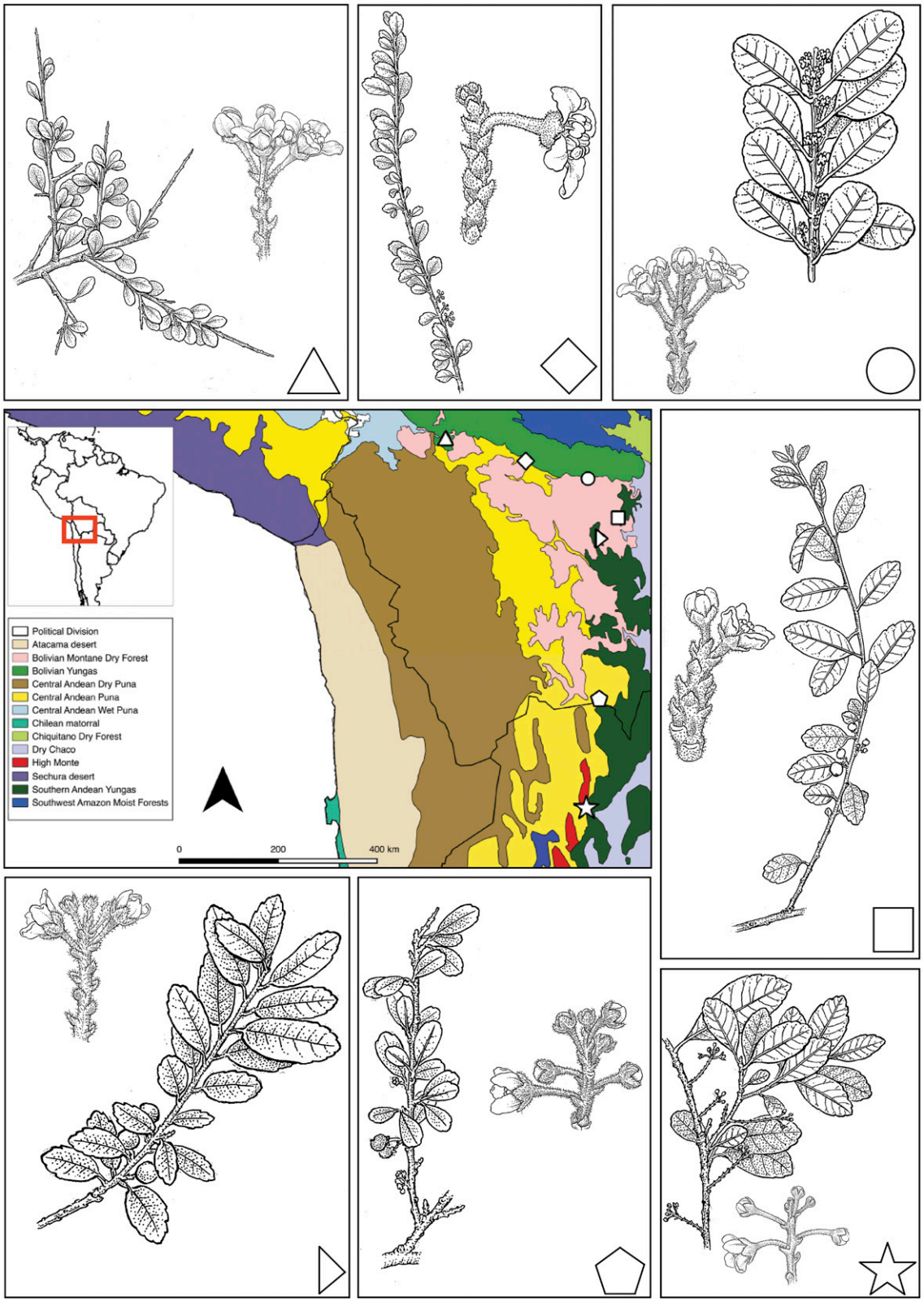


FIG. 11. Geographical distribution of *Schinus congestiflora* (◯), *S. minutiflora* (□), *S. microphylla* (△), *S. myrtifolia* (☆), *S. subtridentata* (◇), *S. tarijensis* (⬠), and *S. villosa* (▷), depicting morphological variation of leaves and staminate inflorescences between these species. For a better visualization, only one record of each species is shown in the map, which represents the area where most of the records are concentrated. Complete geographical distribution can be seen in Figs. 2–3. Drawings by Bobbi Angell.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

TABLE 1. Pollen morphological characteristics of *Schinus* sect. *Myrtifolia*. P = polar diameter; E = equatorial diameter.

Taxon/Author	Voucher/Locality Collection date	P (μm)	E (μm)	P/E ratio	Shape	Exine thickness (μm)	Exine sculpturing
Schinus congestiflora Silva-Luz and Pirani	*C.L. Silva-Luz and L.F. Luz 251* Cochabamba - Bolivia 13 Jan 2014	28.74 (24.94–32.3)	27.06 (23.26–31.57)	1.06	Prolate spheroidal	1.741 (1.4–2.18)	Striate
Schinus microphylla I.M.Johnst.	*C.L. Silva-Luz and L.F. Luz 334* Cusco - Peru 12 Jan 2015	25.92 (20.09–31.8)	21.29 (18.45–25.54)	1.21	Subprolate	1.42 (1.00–2.12)	Reticulate-striate
Schinus myrtifolia (Griseb.) Cabrera	*C.L. Silva-Luz and L.F. Luz 244* Tarija - Bolivia 9 Jan 2014	27.93 (25.47–30.37)	25.67 (22.32–28.75)	1.08	Prolate spheroidal	1.88 (1.51–2.08)	Reticulate-striate

appressed, falcate, nutant, sigmoid or straight, transparent, sometimes cream-colored. **Leaves** simple, alternate, sometimes clustered at stem apex; petiole canaliculate or semiterete; margin entire, crenate, crenate-serrate, or erose (usually only on distal portion); rarely lobed on distal portion; flat, revolute or undulate; chartaceous, coriaceous or membranaceous; usually drying brown or greenish, paler below; primary venation pinnate; secondary veins cladodromous; marginal secondary vein present, sometimes inconspicuous; tertiary veins freely ramified, sometimes not visible. **Inflorescences** axillary or terminal, the staminate inflorescences pseudoracemes, thyrsoids, or rarely panicles, cymes or flowers solitary, axes often branched at base; the pistillate inflorescences usually pseudoracemes, sometimes thyrsoids, rarely flowers solitary; axes green, greenish-yellow or cream-colored; bracts monomorphic, plicate, or sometimes dimorphic and foliose on staminate flowers; pedicel often articulated, sometimes the articulation not visible. **Flowers** unisexual, 4-merous, diplostemonous; sepals united at base, aestivation apert, green; petals free, aestivation imbricate, cream-colored or white, with a midvein

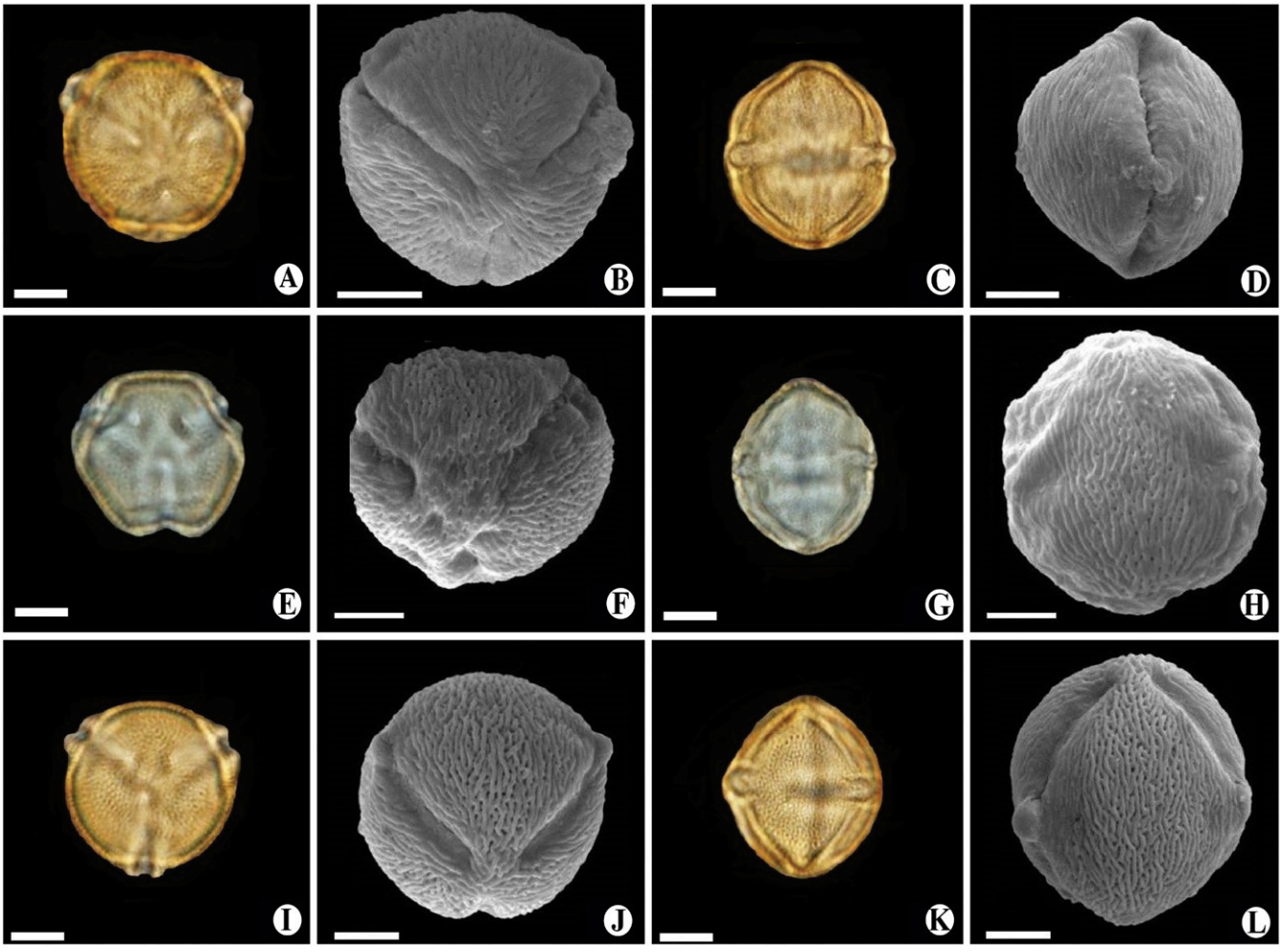


FIG. 12. Light micrographs and SEMs of the *Schinus* pollen grains. A–B. *Schinus congestiflora*: Polar view of pollen grains with three apertures and striate exine sculpturing. C–D. *Schinus congestiflora*: Equatorial view of pollen grains. E–F. *Schinus microphylla*: Polar view of pollen grains with three apertures and reticulate-striate exine sculpturing. G–H. *Schinus microphylla*: Equatorial view of pollen grains. I–J. *Schinus myrtifolia:* Polar view of pollen grains with three apertures and reticulate-striate exine sculpturing. K–L. *Schinus myrtifolia:* Polar view of pollen grains. Scale bars: A, C, E, G, I, K = 10 μm; B, D, F, H, J, L = 5 μm.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

that sometimes branches near apex or from median portion toward apex, spreading at anthesis, usually recurved. **Staminate flowers** with antesepalous stamens longer than the antepetalous ones; anthers yellowish; disk annular, 8-lobed or -sulcate, yellow, glabrous or rarely hirsute; pistillode ovoid and acuminate, stigmas not developed, often red. **Pistillate flowers** with antesepalous staminodes often longer than antepetalous ones; antherodes small and sterile; disk annular, often forming a rim; pistil green, reddish-green or red; ovary globose, often laterally compressed; style with 3 slightly bilobed, capitate stigmas; ovule with funicle subapically attached. **Drupes** globose, ovoid or obovoid, often laterally compressed, sometimes the apex slightly oblique; exocarp thin, friable when dry, splitting from the resinous mesocarp, red, pink, or pinkish-red, sometimes the surface with visible stomata; clavate-glandular, hirsute, strigose or glabrous; sepals, petals, staminodes and stigmas persistent.

KEY TO *SCHINUS* SECTION *MYRTIFOLIA*

1. Adaxial surface of leaves with secondary veins essentially flat or prominulous medially and impressed toward margin, if also flat or prominulous in the entire blade (*S. meyeri*), the costal secondary veins in 14–24 pairs, or impressed in the entire blade (*S. myrtifolia*), the tertiary veins impressed, visible or barely visible . . . 2
   2. Leaves (broadly) elliptic or oblong, rarely ovate; bracts monomorphic; staminate inflorescences consisting of unbranched pseudoracemes . . . *S. myrtifolia*
   2. Leaves ovate, ovate-lanceolate or lanceolate; bracts dimorphic; staminate inflorescences of several types but always branched, rarely the staminate flowers solitary . . . 3
      3. Leaf margin crenate, crenate-serrate, twice-serrate, or erose throughout the whole margin of the blade; flower pedicel articulated; petals with entire midvein . . . *S. gracilipes*
      3. Leaf margin entire or entire proximally and crenate, crenate-serrate, twice crenate or erose distally; flower pedicel not appearing articulated; petals often with branched midvein . . . 4
         4. Branches and petiole villous or clavate-glandular; leaves with secondary vein angle smoothly increasing toward base; fruiting pedicel villous or hirsute . . . *S. obliqua*
         4. Branches and petiole puberulous, sparsely clavate-glandular or glabrous, rarely hirsute; leaves with secondary vein angle variable throughout; fruiting pedicel puberulous or clavate-glandular . . . 5
            5. Leaves membranaceous, sometimes chartaceous; tertiary veins visible; staminate inflorescences often lax pseudoracemes; petals with midvein often branching from median portion toward apex . . . *S. meyeri*
            5. Leaves chartaceous; tertiary veins barely visible; staminate inflorescences often congested pseudoracemes; petals with midvein sometimes branching only at apex . . . *S. venturii*
1. Adaxial surface of leaves with secondary veins consistently flat, impressed or prominulous; costal secondary veins in 4–12 pairs; tertiary veins flat or not visible . . . 6
   6. Leaves often clustered at stem apex; secondary vein angle smoothly decreasing toward base, or if angle uniform (*S. tarijensis*), the staminate flower with pistillode 0.8 mm long and pistillate flowers with pistil 1.4–1.5 mm long . . . 7
      7. Thorny plants; leaves with costal secondary veins in 4–6 pairs; adaxial surface often glossy; bracts dimorphic; staminate flowers with the portion of the pedicel distal to articulation 0.6–0.8 mm long; pistillate flowers with pistil glabrous; drupes 4–4.3 × 5–6 mm . . . *S. microphylla*
      7. Unarmed plants; leaves with costal secondary veins in 8–9 pairs; adaxial surface dull; bracts monomorphic; staminate flowers with the portion of the pedicel distal to articulation ca. 1.2 mm long; pistillate flowers with pistil densely hirsute or clavate-glandular; drupes 6–7 × 6.2–8 mm . . . *S. tarijensis*
   6. Leaves sparse throughout the stem; secondary vein angle uniform, variable or smoothly increasing toward base; staminate flower with pistillode 0.2–0.5 mm long; pistillate flowers with pistil 0.7–1.1 mm long overall . . . 8
      8. Leaves coriaceous; spacing of secondary veins often regular; tertiary veins not visible . . . *S. subtridentata*
      8. Leaves membranaceous or chartaceous; spacing of secondary veins often irregular; tertiary veins visible, sometimes not visible . . . 9
         9. Both surfaces of leaves usually densely villous, hirsute, or clavate-glandular or sometimes sparsely pubescent; bracts dimorphic; both surfaces of the petals pilose along midvein and margin, otherwise sparsely tomentose or glabrous . . . *S. villosa*
         9. Both surfaces of leaves glabrous, puberulous, or sparsely clavate-glandular, rarely sparsely hirsute; bracts monomorphic; both surfaces of the petals glabrous, sometimes minutely puberulous along midvein . . . 10
            10. Leaves usually (broadly) obovate, sometimes ovate or oblong, rarely orbicular, clustered at stem apex; marginal secondary vein conspicuous; pistillate flowers with pedicel articulation visible, pistil 0.7–0.8 mm long . . . *S. congestiflora*
            10. Leaves usually (broadly) ovate, sometimes elliptic or obovate, sparse throughout the stem; marginal secondary vein inconspicuous; pistillate flowers with pedicel articulation visible, pistil 0.9–1.1 mm long . . . *S. minutiflora*

1. ***Schinus congestiflora*** Silva-Luz & Pirani, sp. nov. TYPE: BOLIVIA. Departamento Santa Cruz, Provincia Florida, 6 km (by air) NE of Mairana, Campamento La Yunga, [-18.083°, -63.9277°], 1950 m alt., 21 July 1994, *M.H. Nee 45301* (holotype: LPB!, isotypes: MO–2054346!, NY!).

Shrubs or tree(lets) 1–5 m tall, similar to *Schinus minutiflora* and *S. tarijensis* because of their unarmed branches and nearly equivalent leaf dimensions. *Schinus congestiflora* differs from the before mentioned taxa by its smaller pistil 0.7–0.8 mm long (vs. 0.9–1.1 mm long and 1.4–1.5 mm long, respectively).

Unarmed shrubs or tree(lets), 1–5 m tall. **Branches** erect, pilose or puberulous. **Trichomes** simple or barbellate and transparent, or clavate-glandular and transparent or orangish-brown; erect or appressed, straight, arcuate, nutant, or slightly sigmoid, 0.04–0.1 mm long on branches and leaves, and 0.04 mm long on inflorescences. **Leaves** clustered at stem apex; petiole 1–5 mm long, canaliculate or semi-terete, on abaxial surface puberulous or pilose, on adaxial surface puberulous or clavate-glandular; blade (0.7–0.9–) 1.5–3 (–3.5) × 1–1.6 (–1.9–2.2) cm, essentially (broadly) obovate, sometimes ovate or oblong, rarely orbicular; apex obtuse, rounded, rarely truncate; medially (sub)symmetrical, basal insertion (sub)symmetrical, basal width symmetrical or asymmetrical, base acute, rarely obtuse, rounded or decurrent; margin entire or entire on proximal portion, crenate or crenate-serrate on distal portion, slightly revolute on proximal portion, conspicuously puberulous or clavate-glandular, especially at base; texture chartaceous; costal secondaries in 6–8 pairs, spacing often irregular, course straight, arcuate or sinuous, angle uniform or inconsistent; marginal secondary vein 0.08–0.2 mm in width, conspicuous; tertiary veins barely visible; on abaxial side the midvein prominent or prominulous proximally and prominulous or flat distally, secondary veins often flat, sometimes impressed, tertiary veins flat, puberulous or clavate-glandular on midvein, especially at base, rest of surface sparsely

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

clavate-glandular, sometimes puberulous, rarely hirsute; on adaxial side the midvein prominulous proximally and impressed distally, secondary veins slightly impressed or flat, tertiary veins flat, sparsely clavate-glandular; dull on both surfaces. **Inflorescences** axillary or terminal, clavate-glandular or puberulous; bracts monomorphic, 0.3–0.7 × 0.5–0.8 mm, deltate; bracteoles 0.2–0.3 × 0.1–0.2 mm, ovate; bracts and bracteoles puberulous or clavate-glandular on both surfaces, conspicuously glandular on margin. **Staminate inflorescences** 5–13 mm long, flowers in congested pseudoracemes, often branched at base and densely branched distally, median internodes 0.5–1.5 mm long. **Staminate flowers** with pedicel 1.3–2.5 mm long, portion distal to articulation 0.5–0.7 mm long or the articulation not visible, puberulous or clavate-glandular, bracteoles subtending pedicel; sepals 0.3–0.6 × 0.4–0.8 mm, ovate or deltate, pilose or puberulous on both surfaces, conspicuously clavate-glandular on margin; petals 1.3–1.6 × 1–1.2 mm, ovate, convex, midvein often branching at apex, essentially glabrous, sometimes minutely puberulous at midvein on both surfaces; antesepalous and antepetalous stamens 0.8–1 and 0.5–0.7 mm long, respectively; anthers 0.3–0.4 mm, (broadly) oblong or ovate in dorsiventral view, oblong in lateral view; disk 0.1–0.4 mm tall and ca. 0.08 mm thick, glabrous; pistillode 0.3–0.4 mm long. **Pistillate inflorescences** 3–14 mm long, flowers in lax pseudoracemes, median internodes 0.5–1 mm long. **Pistillate flowers** with pedicel 1.1–2.5 mm long, the articulation not visible, puberulous or clavate-glandular, bracteoles subtending pedicel; sepals 0.3–0.5 × 0.5–0.6 mm, ovate, pilose or puberulous on both surfaces, conspicuously clavate-glandular on margin; petals 1–1.2 × 0.6–0.9 mm, ovate or oblong, concave, midvein often branching at apex, essentially glabrous, sometimes minutely puberulous at midvein on both surfaces; pistil 0.7–0.8 mm long, glabrous; ovary globose, style 0.1 mm long or indistinct; antesepalous and antepetalous staminodes 0.3–0.4 mm long and 0.2–0.3 mm long, respectively, antherodes 0.1–0.2 mm long; disk 0.1–0.4 mm tall and ca. 0.08 mm thick, glabrous. Fruiting pedicel 1.5–2.5 mm long, portion distal to articulation 0.7–0.8 mm long or the articulation not visible, puberulous, pilose or clavate-glandular. **Drupes** 4–5.5 × 4.5–6.4 mm, globose, laterally compressed, exocarp red, glabrous. Figures 3A, 7A–E, 8A–G.

Vernacular Names—Luyo-luyo (*M. Cárdenas* 2308; *I.G. Vargas and E. Prado 1305*), rahjarahja (*S. Jiménez et al. 488*), yurumilla (*C.S. Toledo 11916*).

Phenology—Flowering records are from January–December, and fruiting records are from December–June and August–September.

Distribution and Habitat—*Schinus congestiflora* is endemic to Bolivia, occurring in Santa Cruz and Cochabamba departments, but also with a few records in Chuquisaca. It occurs in Southern Andean Yungas and Bolivian Yungas, as well as in ecotonal areas between Andean cloud forests and Central Andean Puna or Bolivian Montane Dry Forest, where it is often found in shrubby areas of dry steep hillsides (Fig. 3A). It inhabits in relictual forests with *Prumnopitys* Phil., *Podocarpus*, *Alnus acuminata*, and *Weinmannia* sp., between 1700–3191 m, also in areas with *Baccharis* spp., *Lithraea molleoides* (Vell.) Engl., *Schinus areira*, *Erythrina falcata* Benth., and *Dodonaea viscosa* Jacq. It is often distributed along shrubby areas with patches cleared for cultivation or pasture.

Preliminary Conservation Status—The IUCN threat status of *Schinus congestiflora* was evaluated as Near Threatened (NT) based on the extent of occurrence (EOO = 35,793.94 km^2) and as Endangered (EN) according to area of occupancy (AOO = 176.00 km^2). There are numerous collections of this species, but mainly from the road network in Bolivia. Low collection densities in the area of distribution are probably due to access and fieldwork deficiencies. Also, populations are known within Amboró National Park, thus we assign a preliminary IUCN threat status of Near Threatened (NT).

Taxonomic Notes—Specimens of *Schinus congestiflora* are often identified in herbaria as *S. myrtifolia*, however some characters can be used to differentiate them. *Schinus congestiflora* has leaves that are broadly obovate, sometimes ovate or oblong, rarely orbicular (Figs. 7B–C, 8A, D, F), whereas *S. myrtifolia* has leaves that are broadly elliptic or oblong or rarely ovate (Figs. 5F, I, J, L, 6E), secondary veins slightly impressed or flat on the adaxial surface (vs. impressed or flat medially and impressed toward margin on the adaxial surface), costal veins in 6–8 pairs (vs. 8–16 pairs), staminate inflorescences 5–13 mm long, arranged in congested pseudoracemes, often branched at base and densely branched distally, as seen in Fig. 7B (vs. unbranched staminate pseudoracemes 15–30 mm long, see Figs. 5F, 6D), and pistillate inflorescences with 0.5–1 mm long median internodes (vs. 2–3.5 mm long).

Specimens of *Schinus congestiflora* sometimes have leaves that are smaller (ca. 0.7–0.9 cm) and orbicular (Fig. 8E) and so could resemble *S. subtridentata*. When these species occur sympatrically (i.e. Cochabamba department), *Schinus congestiflora* can be recognized by its unarmed branches as seen in Fig. 7A, C (vs. inconspicuously thorny, see Fig. 10I, N), chartaceous leaves (vs. coriaceous), staminate flowers with pedicels 1.3–2.5 mm long (vs. 1.4–1.6 mm long), and by the pistillate inflorescences with 0.5–1 mm long median internodes (vs. 1–1.5 mm long).

It can be difficult to separate *Schinus congestiflora* and *S. minutiflora* when populations occur sympatrically (e.g. Santa Cruz department) because the former species sometimes has ovate leaves (Fig. 8F) as in *S. minutiflora* (Figs. 8H, I, N), and pistillate inflorescences with similar length (3–14 mm in *S. congestiflora* and 5–9 mm in *S. minutiflora*). But they may be separated by the leaves that are clustered at the stem apex, the pedicel articulation is not visible in the pistillate flowers, and pistil length of 0.7–0.8 mm in *S. congestiflora*, while in *S. minutiflora* leaves are sparse throughout the stem, the pedicel articulation is visible in the pistillate flowers, and pistil length is 0.9–1.1 mm.

Representative Specimens—**Bolivia.** —Chuquisaca: Hernando Siles, Sapsi, Dec 1988, *O. Murguia and T. Muñoz 228*, fl. (LPB, NY); Belisario Boeto, hacienda Monte Grande, 42 km al NE de Serrano, 2600–2700 m alt., 20 Jun 1993, *C.S. Toledo 11916*, fr. (CTES). —Cochabamba: Carrasco, rota 7 de Santa Cruz a Cochabamba, ca. 4 km de Monte Punku, [-17.573°, -65.315°], 2958 m alt., 13 Jan 2014, *C.L. Silva-Luz and L.F Luz 250*, fr. (NY, RB, SPF); Siberia-Copachuncho, a unos 155 km de la ciudad de Cochabamba, próximos al pueblito de Copachuncho [-17.772°, -65.039°], 2847 m alt., 22 Sep 2007, *J. Teran et al. 1125*, fr. (MO); rota 7 de Santa Cruz a Cochabamba, ca. 4 km de Monte Punku, [-17.570°, -65.331°], 3053 m alt., 13 Jan 2014, *C.L. Silva-Luz and L.F. Luz 251*, fl. (NY, RB, SPF); localidad de Palca, 10 km al norte de la carretera antigua, entre Valle Hermoso y Totora, [-17.737°, -64.956°], 2500–2830 m alt., 12 Oct 2008, *I. Linneo and M. Mendizabal 1536*, fl. (MO, USZ); Siberia, *J.P. Altamirano et al. 474*, fr. (MO); 63.5 km al este del puente sobre el rio Pucara (Punata) por el camino entre Cochabamba y Santa Cruz (9.2 km al oeste del camino a Pocona), [-17.533°, -65.366°], 3000 m alt., 4 Feb 1987, *J.C Solomon and R.M. King 15916*, fl. (LP, LPB, MO, NY, SI); Cocapata, old road from Cochabamba to Santa Cruz, km 114, 24 Jul 1994, *P. Acevedo-Rodriguez 6574*, fl. (NY, US); km 135 hacia Totora, proximidades del lugar llamado Cañada Hornillas, 3000 m alt., 21 Mar 1999, *M. Mercado 2087*, fl. (NY). Esteban Arce, camino hacia Torotoro,

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

empezando la bajada hacia rio Caine, 2907 m alt., 2 Jan 2005, *J.R.I. Wood et al. 21299*, fl. (LPB). Mizque, proximidades a la comunidad de Coto-Coto, 19 Feb 1999, *M. Mercado 2048*, fr. (NY); 23.9 km E of Epizana on carretera Fundamental 4, 9500 ft. elev., 5 Dec 1975, *C. Davidson 3767*, fl., fr. (MO). Quillacollo, estrada de terra em direção à Morochata, [-17.284°, -66.310°], 3191 m alt., 14 Jan 2014, *C.L. Silva-Luz and L.F. Luz 252*, fl., fr. (NY, RB, SPF). —Santa Cruz: Florida, ridgetop called Musural Loma ata Abra La Cruz, 4 km (by air) NE of Mairana, [-18.100°, -63.900°], 2050 m alt., 2 Jun 1991, *M.H. Nee 40732*, fl. (LPB, NY, SI); 7 km (by air) NE of Mairana, on dirt road northeast of "Yungas", [-18.083°, -63.916°], 2100 m alt., 2 Jun 1991, *M.H. Nee 40702*, fl. (MO, NY); La Yunga, 7,5 km NE de Mairana, [-18.083°, -63.916°], 1880 m alt., 14 Mar 1997, *M. Saldías et al. 4960*, fr. (MO, USZ); valley along small stream (quebrada Yunga), along road from Mairana to Yunga de Mairana, 11.8 km (by road), 5 km (by air) NE from the main square at Mairana, 1700 m alt., 11 Apr 1998, *M.H. Nee and E. Chávez 48946*, fl. (MO, NY); 6 km (by air) NE of Mairana, campamento La Yunga, [-18.094°, -63.917°], 1950 m alt., 21 Jul 1994, *M.H. Nee 45301*, fl. (holotype: LPB, isotypes: MO, NY, SI); 3.2 km N of Campamento Yungas of Parque Nacional Amboró, 6.5 km (by air) NE of Mairana, [-18.067°, -63.917°], 2100 m alt., 6 Jun 1998, *M.H. Nee 49631*, fl. (CTES, NY). Manuel María Caballero, 6.5 km (by air) N of Comarapa, [-17.850°, -64.533°], 2380 m alt., 3 Aug 2003, *M.H. Nee et al. 52432*, fl. (MO, NY); Comarapa, 2800 m alt., 20 Oct 1928, *J. Steinbach 8346*, fl. (GH, NY); along highway from Cochabamba to Comarapa, 5.5 km (by road) NW of Torrecillas, [-17.833°, -64.642°], 2600 m alt., 10 Jul 1998, *M.H. Nee and D. Atha 50015*, fl. (MO, NY); 4.5 km (by air) N of Comarapa, [-17.867°, -64.525°], 2200 m alt., 27 Nov 1999, *M.H. Nee 50716*, fl. (LPB, NY, SI); Parque Nacional Amboró, Cerro Bravo, juntas del río Alizar y Amparo, [-17.950°, -64.400°], 2000 m alt., 7–15 Jun 1992, *I.G. Vargas et al. 1508*, fl. (LPB, MO, NY); just south of Amboró National Park, Cerro Bravo, [-17.850°, -64.533°], 2300–3000 m alt., 20 Jun 1995, *J. Abbott and A. Jardim 17233*, fl. (CTES, MO, NY, UZM); Parque Nacional Amboró, Cerro Bravo, cerca Comarapa, 2600 m alt., 23 Jun 1995, *A. Jardim and R. Abbott 2108*, fl., fr. (MO, NY, USZ); Parque Nacional Amboró, La Siberia, 25 km al NW sobre la carretera de Comarapa hacia Cochabamba, entrada al Astillero, [-17.816°, -64.616°], 2570 m alt., 9 May 1993, *I.G. Vargas et al. 2389*, fr. (CTES, LPB, NY, MO); 6.5 km (by air) N of Comarapa, [-17.850°, -64.533°], 2380 m alt., 3 Aug 2003, *M.H. Nee et al. 52429*, fl. (NY); rio camino a San Mateo, [-17.737°, -64.738°], 1830 m alt., 10 Apr 2004, *D. Soto et al. 156*, fl. (BOLV, MO); comunidad La Laguna (entrando 8 km desde arriba de Torrecillas), [-17.809°, -64.615°], 2800 m alt., 7 Nov 2003, *I.G. Vargas 7046*, fl. (MO, NY, USZ); Parque Nacional Amboró, Torresillas, trayecto entre Estancia Las Abras y Laguna Brava, [-17.800°, -64.616°], 2500–3000 m alt., 8–9 May 1992, *I.G. Vargas and E. Prado 1305*, fl. (CTES, MO, NY); 3 km SW of Laguna Brava, 5.7 km (by road) N of turnoff from the Comarapa-Cochabamba highway, [-17.816°, -64.616°], 2725 m alt., 6 Aug 2003, *M.H. Nee and M. Mendoza 52504*, fl. (MO, NY); Siberia, Larka Pampa, [-17.841°, -64.734°], 2950 m alt., 20 Sep 2003, *E. Fernández et al. 2498*, fl. (BOLV, MO). Vallegrande, rota 22 de Guadalupe a Ipita, [-18.665°, -63.924°], 2297 m alt., 6 Jan 2014, *C.L. Silva-Luz and L.F. Luz 234*, fr. (NY, RB, SPF); about 10 km S of Vallegrande on the road to Pucará, 2250–2300 m alt., 22 Apr 1987, *J. Brandbyge 730*, fr. (LPB, MO); Tacaso, ca. 18 km sur de Vallegrande, camino a Pucará, [-18.600°, -64.100°], 2300 m alt., 26 Feb 2002, *L. Arroyo et al. 1839*, fl. (MO, NY, USZ); Pueblo de Vallegrande, ca. 2 km N del Pueblo, [-18.483°, -64.100°], 2082 m alt., 19 Jan 2003, *M. Mendoza and E. Calzadilla 444*, fl. (LPB, USZ); Huasacañada, 5 km al de la ciudad de Vallegrande, [-18.516°, -64.083°], 2050 m alt., 3 Nov 1990, *I.G. Vargas 817*, fl. (MO, NY); Huasacañada, [-18.531°, -64.097°], 2050 m alt., 10 Sep 1989, *I.G. Vargas 310*, fl. (NY, USZ); 6.5 km (by air) SW of Guadalupe on road to Pucara, at turnoff to Santa Ana, [-18.600°, -64.116°], 2675 m alt., 15 Dec 1990, *M.H. Nee 40331*, fl. (MO, NY); Camino de Vallegrande, 12 a 15 km antes de la comunidad de Loma Larga, [-18.676°, -63.916°], 2363 m alt., 24 Aug 2008, L. *Arroyo et al. 3969*, fr. (MO, NY, UZM).

2. Schinus gracilipes I.M.Johnst., J. Arnold Arbor. 19(3): 257. 1938. Type: Argentina. Tucumán, Trancas, Tapia, 750 m alt., 29 Aug 1925, *S. Venturi 3887* (holotype: GH 00049176!, isotypes: LIL000748 [photo]!, MO–260753!, SI000726!, US 00095715!).

Schinus gracilipes var. *pilosa* F.A.Barkley, Brittonia 5(2): 180. 1944, as "*pilosus*". Type: Argentina. Tucumán province, Trancas, 1700 m alt., 19 Apr 1926, *S. Venturi 4173* (holotype: US 00095716!, isotypes: LIL000749 [photo]!, LP 011021!).

Unarmed tree(lets), sometimes shrubs, 2–10 m tall. **Branches** prostrate, glabrous, sparsely pilose, puberulous, or clavate-glandular, sometimes densely villous. **Trichomes** simple, barbellate or bulbous and transparent, ferrugineous or cream-colored, or clavate-glandular and transparent, yellow or orangish-red; erect or appressed, straight, sigmoid or nutant, 0.03–0.5 mm long on branches, leaves and inflorescences. **Leaves** sparse throughout the stem; petiole 5–12 mm long, canaliculate or semi-terete, on abaxial surface glabrous, on adaxial surface puberulous, strigose or clavate-glandular, sometimes tomentose or villous; blade 2.5–5.8 × 1.4–2.5 cm, ovate or ovate-lanceolate; apex obtuse, sometimes acute, rounded or straight; medially subsymmetrical or asymmetrical, basal insertion symmetrical or asymmetrical, basal width (sub)symmetrical, base obtuse, cuneate or decurrent, sometimes rounded or truncate; margin crenate, crenate-serrate, twice-serrate, or erose, (slightly) revolute on proximal portion, undulate, sometimes villous, tomentose or strigose; texture membranaceous or chartaceous; costal secondaries in 7–16 pairs, spacing irregular, course straight or arcuate, angle inconsistent, uniform or smoothly increasing toward base; marginal secondary vein 0.08–0.2 mm in width, conspicuous; tertiary veins often visible; on abaxial side the midvein prominent, prominulous or flat, secondary veins flat, tertiary veins flat, sparsely pilose, strigose, puberulous or clavate-glandular, sometimes villous, tomentose, or strigose on midvein; on adaxial side the midvein prominulous proximally and flat distally, secondary veins flat or prominulous medially and impressed toward margin and apex, tertiary veins impressed, sparsely pilose, strigose, puberulous or clavate-glandular, sometimes conspicuously villous, tomentose or strigose on midvein; dull on both surfaces. **Inflorescences** axillary or terminal, puberulous, pilose or clavate-glandular, sometimes densely villous; bracts dimorphic, smaller ones 0.4–1 × 0.4–1 mm, ovate, lanceolate or deltate, larger ones 2.1–3.4 × 1.1–1.7 mm, obovate; bracteoles 0.4–0.8 × 0.2–0.5 mm, ovate; bracts and bracteoles pilose, puberulous or clavate-glandular, sometimes densely villous on both surfaces. **Staminate inflorescences** 10–45 mm long, flowers in thyrsoids or panicles, sometimes pseudoracemes, median internodes 2.5–5 mm long. **Staminate flowers** with pedicel 2–6 mm long, portion distal to articulation 1.1–3.1 mm long, hirsute, pilose or clavate-glandular, sometimes villous, bracteoles subtending pedicel; sepals 0.4–1.1 × 0.4–0.9 mm, ovate or oblong, pilose, puberulous or clavate-glandular, sometimes densely villous on both surfaces, conspicuous on margin; petals 1.4–2 × 0.8–1.2 mm, ovate or obovate, slightly concave, midvein entire, densely ciliate, sometimes sparsely villous or puberulous on margin; antesepalous and antepetalous stamens 0.7–1 and 0.6–0.8 mm long, respectively; anthers 0.2–0.4 mm long, ovate or oblong in dorsiventral view, oblong in lateral view; disk 0.3–0.5 mm tall and ca. 0.06–0.2 mm thick, glabrous; pistillode 0.3–0.5 mm long. **Pistillate inflorescences** 6–10 mm long, flowers in pseudoracemes, sometimes in thyrsoids, median internodes 0.5–1.7 mm long. **Pistillate flowers** with pedicel 2–3.5 mm long, portion distal to articulation 0.9–2.5 mm long, hirsute, pilose or clavate-glandular, sometimes villous, bracteoles subtending pedicel; sepals 0.6–0.9 × 0.5–0.9 mm, ovate, pilose, puberulous or clavate-glandular, sometimes densely villous on both surfaces, conspicuous on margin; petals 1–1.7 × 0.7–1 mm, ovate or oblong, concave, midvein entire, densely ciliate, sometimes sparsely villous or puberulous on margin; pistil 0.8–1.2 mm long, glabrous; ovary globose, style 0.1(–0.4) mm long; antesepalous and antepetalous staminodes 0.3–0.5 mm long and 0.3–

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

0.4 mm long, respectively, antherodes 0.2–0.3 mm; disk 0.3–0.5 mm tall and ca. 0.06–0.2 mm thick, glabrous. Fruiting pedicel 3.5–7 mm long, portion distal to articulation 1.7–2.1 mm long, puberulous or clavate-glandular. **Drupes** 6–7.7 × 4.6–5.3 mm, obliquely ovoid, laterally compressed, exocarp red, glabrous or sparsely clavate-glandular, sometimes glabrescent. Figures 2A, 4A–G.

Vernacular Names—Blanquillo (Barkley 1957), horcomolle (Barkley 1957; Cabrera 1938), horco-molle (Barkley 1957), molle (*A.T. Hunziker 19161*; *M. Lillo 5710*; *F. Schickendantz 293*; *R. Schreiter 3312*; *S. Venturi 3650*), molle blanco (*S. Venturi 198*), molle de la quebrada (Barkley 1957; Cabrera 1938), molle del cerro (*P. Jörgensen 991*; *R. Schreiter 6547*; *S. Venturi 9571*, *10260*), molle trepador (*S. Venturi 3887*), sacha duraznillo (*A.A. Vaca 167*).

Phenology—It has been collected flowering in August–April, and fruiting records are from August–February and April.

Distribution and Habitat—*Schinus gracilipes* is endemic to northwest Argentina, distributed in Catamarca, Jujuy, Salta, and Tucumán provinces, with dense populations concentrated in the last two provinces. Plants of this species are tree(lets) or sometimes shrubs, often prostrate or supported by nearby trees, occurring on slopes and mountains of the Southern Andean Yungas in association with *Alnus*, *Podocarpus*, and *Polylepis* forests, between 750–2900 m, and also distributed in ecotonal areas between Andean cloud forests and Dry Chaco or High Monte (Fig. 2A).

Preliminary Conservation Status—IUCN lists *Schinus gracilipes* var. *pilosa* as Vulnerable (VU) (Prado 1998), but, here, we do not recognize this variety. Thus, the IUCN threat status of *Schinus gracilipes* was evaluated as Least Concern (LC) based on the extent of occurrence (EOO = 61,063.61 km^2) and as Endangered (EN) according to area of occupancy (AOO = 124.00 km^2). We assign a preliminary IUCN threat status of Endangered EN B2ab(i,ii,iii) based on the area of occupancy. Threats to this species are related to annual and perennial non-timber crops, as well as livestock farming and ranching (Prado 1998).

Taxonomic Notes—Barkley (1944) described *Schinus gracilipes* var. *pilosa* F.A.Barkley based on specimens whose branches, leaves, and inflorescences are densely villous (Fig. 4G). However, indumentum of *Schinus gracilipes* varies in both type (i.e. pilose, strigose, puberulous, villous, tomentose, strigose, or clavate-glandular) and density, with no other supporting characters for the recognition of varieties. Like Muñoz (2000) we consider *Schinus gracilipes* var. *pilosa* to be part of the morphological variation of *S. gracilipes* and have recognized it in synonomy here.

This species can be recognized by a crenate, crenate-serrate, twice-serrate, or erose leaf margin throughout the whole blade (Fig. 4A, B, D), versus leaves often being only non-entire on the distal portions of the blade in other *Schinus* species. *Schinus gracilipes* sometimes has pistillate inflorescences that are usually pseudoracemes or sometimes thyrsoids and petals with densely ciliate, sometimes sparsely villous or puberulous margins (Fig. 4C, E, F). Both characters are uncommon in other species of *Schinus* sect. *Myrtifolia*. *Schinus gracilipes* may occur in sympatry with *S. myrtifolia* in Salta and Jujuy provinces but differs by the leaf margin and inflorescence characters mentioned above. *Schinus myrtifolia* has leaves with entire margins or that may be slightly crenate on distal portions (Figs. 5F, I, J, L, 6E–F), unbranched pseudoracemes (Figs. 5F, 6D), and petals that are essentially glabrous or rarely puberulous or clavate-glandular on both surfaces (Fig. 5G, H, K).

Representative Specimens—**Argentina.** —Catamarca: Sierra de Ambato (Falda E.), subiendo desde El Rodeo hacia el cerro Manchado, 2700–2900 m alt., 23/25 Feb 1967, *A.T. Hunziker 19161*, fl. (CORD, NY, SI); Sierra Ambato (Falda O), alrededores de Las Casitas, frente a El Rincón, 2500 m alt., 20 Feb 1970, *A.T. Hunziker and L. Ariza 20419*, sterile (MBM, NY); Las Juntas, entre 1600 y 1750 m alt., 4 Apr 1995, *C.S. Toledo et al. 13440*, fr. (CTES). —Jujuy: Santa Bárbara, Santa Cornelia, 1 Mar 1911, *C.L. Spegazzini 1362*, fl. (LP). —Salta: quebrada San Lorenzo, Nov 1919, *L. Hauman s.n.*, fl. (BA 27535); Guachipas, Cuesta del Lajar, ruta 9, 23 km al SE de Guachipas, 1900–2000 m alt., 16 Jan 1990, *L.J. Novara and S. Bruno 9393*, fl. (MCNS, SI); Sierra de La Candelaria, 1700 m alt., 23 Sep 1929, *S. Venturi 9571*, fl., fr. (GH, LIL, LP, MO, NY, SI); Guachipas, Cuesta del Lajar, 1850–1900 m alt., 27 Oct 1991, *A. Charpin 23037*, fl. (G, NY, SI). —Tucumán: Trancas, 1700 m alt., 19 Apr 1926, *S. Venturi 4173*, fl. (holotype: US, isotypes: LIL, LP, MO - *S. gracilipes* var. *pilosa*); proximidades Laguna del Tesoro, 2000 m alt., 6 Nov 1966, *A.A. Vaca 267*, fl. (ICN, LIL); camino desde Tafí del Valle hacia Las Carreras, a 2 km de Tafí del Valle, Cerro El Pelado, [-26.850°, -65.567°], 2130 m alt., 9 Feb 2002, *A.M. Cialdella et al. 67*, fr. (CTES, SI); Garabatal, 30 Nov 1944, *D. Olea 30*, fl. (LIL, ICN, NY); Sala Ancajulio, 15 Dec 1944, *D. Olea 110*, fl., fr. (GH, LIL, NY); Tafí del Valle, Garabatal, 1600 m, 25 Oct 1930, *R. Schreiter 6547*, fl., fr. (GH, LIL, NY); Tafí del Valle, 2000 m alt., 11 Nov 1929, *S. Venturi 10260*, fl. (LIL, MO, NY); Chigligasta, camino dique Pueblo Viejo, 13 Jan 1965, *P.R. Legname and A.R. Cuezzo 4194*, fr. (LIL, NY); río Cochuna, 1000 m alt., 3 Nov 1930, *R. Schreiter 6461*, fl. (LIL, NY); Siambón, quebrada de Matadero, 1200 m alt., 8 Dec 1888, *M. Lillo 1163*, fl. (LIL, NY); Anfama, 24 Jan 1935, *A. Castellanos s.n.*, fl. (BA 19200); Tafí del Valle, 17 Sep 1997, *M. Dematteis and G. Seijo 751*, fl. (CTES, GH, MBM); Trancas, Tapia, 750 m alt., 29 Aug 1925, *S. Venturi 3887*, fl., fr. (holotype: GH, isotypes: LIL, LP, MO, SI, US); Monteros, road from Acheral to Tafí del Valle, ca. km 34.5, trail from the road (top of ridge) to the river, 2 Jan 1988, *J.S. Bricker et al. 182*, fr. (MO, NY); cuesta del Hualincho, 2500 m alt., 10 Apr 1904, *D. Rodriguez 29*, fl. (GH, LIL, NY, SI); Burruyacu, Cerro de Medina, 1200 m alt., 1 Mar 1914, *Moretti 2038*, sterile (LIL, NY); quebrada de La Hoyada a la Cuesta de Los Bravos, 1600 m alt., 30 Sep 1924, *R. Schreiter 3312*, fl. (LIL, NY); cumbre Sierra San Javier, 1300 m alt., 24 Oct 1897, *M. Lillo 2060*, fl. (LIL, NY); Tafí del Valle, 2000 m alt., 9 Feb 1907, *M. Lillo 5710*, fr. (LIL, NY).

3. Schinus meyeri F.A.Barkley, Lilloa 33(14): 295. 1973. Type: Argentina. Salta, Santa Victoria, Los Toldos, Huaico Chico, 1700 m alt., 19 Aug 1971, *F.B. Vervoorst and P.R. Legname 4494* (holotype: LIL [photo]!, isotypes: GH 00049181!, US!).

Unarmed tree(lets), sometimes shrubs, 3–8 m tall. **Branches** prostrate, glabrous, puberulous, or clavate-glandular, rarely hirsute. **Trichomes** simple, sometimes barbellate, and transparent or cream-colored or clavate-glandular and transparent or orangish-red; erect or appressed, straight or sigmoid, 0.03–0.1 mm long on branches, leaves and inflorescences. **Leaves** sparse throughout the stem; petiole 7–17 mm long, (deeply) canaliculate, glabrous, puberulous or clavate-glandular, rarely hirsute on both surfaces; blade 4.2–8.8 × 2.5–4.5 cm, ovate or ovate-lanceolate; apex acute, rarely obtuse, often straight, sometimes rounded; medially (sub)-symmetrical, basal insertion (sub)symmetrical, basal width (sub)symmetrical or asymmetrical, base obtuse, cuneate or decurrent, sometimes rounded; margin often entire, sometimes entire on proximal portion and crenate or erose on distal portion, slightly revolute on proximal portion, puberulous or strigose, sometimes pilose on proximal portion; texture often membranaceous, sometimes chartaceous; costal secondaries in 14–24 pairs, spacing irregular, course arcuate, angle inconsistent; marginal secondary vein 0.04–0.1 mm in width, inconspicuous; tertiary veins visible; on abaxial side the midvein prominent proximally and prominulous distally, secondary veins consistently flat, or prominulous or flat

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

medially and impressed toward margin, tertiary veins flat, clavate-glandular, rarely hirsute or pilose; on adaxial side the midvein prominulous proximally and flat distally, secondary veins flat or prominulous, sometimes flat medially and impressed toward margin, tertiary veins impressed, puberulous, rarely hirsute on veins; dull on both surfaces. **Inflorescences** axillary or terminal, puberulous, pilose or clavate-glandular; bracts dimorphic, smaller ones 0.5–1 × 0.7–1 mm, deltate or (broadly) ovate, larger ones 1.7–2.3 × 0.8–1.5 mm, oblong or lanceolate; bracteoles 0.3–0.4 × 0.2–0.3 mm, ovate; bracts and bracteoles pilose, puberulous or clavate-glandular on both surfaces. **Staminate inflorescences** 15–55 mm long, flowers in lax pseudoracemes, often branched at base, sometimes thyrsoids, cymes or solitary, median internodes 2.1–5 mm long. **Staminate flowers** with pedicel (2.5–)3.5–8 mm long, the articulation not visible, puberulous or clavate-glandular, sometimes bracteoles present on the pedicel; sepals (0.6–)0.8–1.2 × 1–1.2 mm, (broadly) ovate, glabrous, puberulous or clavate-glandular on both surfaces, sometimes conspicuous on margin; petals 1.7–2.2 × 1.3 mm, (broadly) oblong or ovate, concave, midvein branching from median portion toward apex, glabrous on both surfaces, puberulous on margin; antesepalous and antepetalous stamens 1–1.3 and 0.7–1 mm long, respectively; anthers 0.3–0.4 mm long, ovate in dorsiventral and lateral views; disk 0.5 mm tall and ca. 0.1 mm thick, glabrous; pistillode 0.3–0.5 mm long. **Pistillate inflorescences** 15–25 mm long, flowers in pseudoracemes, median internodes 3–7.4 mm long. **Pistillate flowers** with pedicel 3.5–7.5 mm long, the articulation not visible; sepals 1.3 × 1–1.4 mm, (broadly) ovate, glabrous, puberulous or clavate-glandular on both surfaces, sometimes conspicuous on margin; petals 1.5–1.8 × 1–1.1 mm, ovate, slightly concave, midvein branching from median portion toward apex, glabrous on both surfaces, puberulous on margin; pistil 1.4 mm long, glabrous; ovary globose, laterally compressed, style 0.1–0.2 mm long; antesepalous and antepetalous staminodes 0.6–0.7 mm long and 0.5–0.4 mm long, respectively, antherodes 0.3 mm long; disk 0.5 mm tall and ca. 0.1 mm thick, glabrous. Fruiting pedicel 4–13 mm long, the articulation not visible, puberulous or clavate-glandular, sometimes bracteoles along the pedicel. **Drupes** 6.6 × 6.5 mm, obliquely ovoid, laterally compressed, exocarp pink, glabrous or sparsely clavate-glandular. Figures 2B, 4H–L.

Vernacular Names—Cantarito (*Coro-Rojas* 1428; *N. Hilgert and Guillermo 2339*), chirimolle (*N. Hilgert* 2149; *N. Hilgert and P. Arenas 1446*; *N. Hilgert and G. Gil 2339*), chirimollo (*N. Hilgert 1482*).

Phenology—Flowering records are from August–December, March, and June, and fruiting records are from October–February.

Distribution and Habitat—*Schinus meyeri* is found from southern Bolivia (Tarija department) to northwest Argentina (Salta province). It is found in Southern Andean Yungas, as well as in ecotonal areas between Andean cloud forests and Central Andean Puna (Fig. 2B), in association with *Podocarpus*, *Alnus*, and Myrtaceae forests, between 1138–2200 m.

Preliminary Conservation Status—IUCN lists *Schinus meyeri* as Vulnerable (VU) threat status (Moraes et al. 2019), here we assign a preliminary IUCN threat status of Endangered EN B1ab(i,ii,iii)+2ab(i,ii,iii) based both on extent of occurrence (EOO = 3,022.97 km^2) and area of occupancy (AOO = 44.00 km^2). The relatively few records of this species within or near the Tariquía Flora and Fauna National Reserve, a relatively large protected area in Bolivia, may truly reflect the current distribution and density of *Schinus meyeri*, or could be a result of insufficient collecting in this area.

Taxonomic Notes—*Schinus meyeri* and *S. venturii* have similar distributions and morphology. Barkley (1973) differentiated *Schinus meyeri* from *S. venturii* based on height of the plant, leaf margin, and lobing of the flower disk. Although detailed morphological analysis showed overlapping in the features chosen by Barkley, *Schinus meyeri* can be distinguished from *S. venturii* using other morphological characters. *Schinus meyeri* has a deeply canaliculate petiole (vs. semi-terete or slightly canaliculate), leaves that are often membranaceous, sometimes chartaceous (vs. usually chartaceous), tertiary veins visible, as seen in Fig. 4H (vs. tertiary veins barely visible, see Fig. 4M, N), the staminate inflorescences in lax pseudoracemes, sometimes thyrsoids, cymes or solitary flowers, as seen in Fig. 4I (vs. staminate inflorescences in congested pseudoracemes, rarely solitary flowers, see Fig. 4N), and petals with the midveins often branching beginning at the median portion (vs. midvein sometimes branching at apex).

Schinus meyeri and *S. obliqua* may co-occur also in Southern Andean Yungas of Bolivia, but the species differ because the former has leaves for which the angle is inconsistent in the costal secondary veins and inflorescences with oblong or lanceolate bracts of 1.7–2.3 mm long; whereas the latter species has leaves for which the angle is smoothly increasing toward base in the costal secondary veins (Fig. 9A, D, E) and inflorescences with obovate or oblanceolate bracts of 2.5–6.5 mm long.

Schinus meyeri and *S. myrtifolia* have overlapping distributions in the Southern Andean Yungas of Argentina (Salta province) and Bolivia (Tarija department), but *S. meyeri* can be distinguished by having ovate or ovate-lanceolate leaves with obtuse bases (Figs. 4H, I, K), and staminate and pistillate inflorescences with median internodes 2.1–5 mm and 3–7.4 mm long, respectively. *Schinus myrtifolia* has broadly elliptic or oblong, rarely ovate leaves with acute, rarely obtuse bases (Figs. 5F, I, J, L), and staminate and pistillate inflorescences with median internodes with 0.8–1.8 mm and 2–3.5 mm long, respectively.

Representative Specimens—**Argentina.** —Salta: Santa Victoria, aprox. 5 km de Los Toldos, camino a Lipeo, 5 Dec 2005, *M.M. Arbo et al. 9084*, fl. (CTES, MBM, MCNS); Baritú, casa de Epifania Ruiz, 27 Sep 1996, *N. Hilgert* and *P. Arenas 1446*, fl. (MCNS); PN Baritú. Baritú, 10 Jan 1999, *N. Hilgert 2149*, fr. (MCNS); camino de Toldos al Parque Nacional Baritú, campos de altura al sur de Toldos [-22.333°, -64.716°], 16 Nov 2002, *F.O. Zuloaga et al. 7795*, fr. (SI); Los Toldos, entre municipalidady El Arrazay, 3–4 km al sur del pueblo, 1600 m alt., 16 Mar 1986, *L.J. Novara 5145*, fl. (MCNS); Los Toldos, camino a Huaico Chico, 1650 m alt., 14 Dec 1973, *P.R. Legname and A.R. Cuezzo 10007C*, fr. (CTES, LIL, US); camino de Los Toldos a Lipeo, a 12 km de Los Toldos, 1800 m alt., 5 Oct 1973, *P.R. Legname and A.R. Cuezzo 9757C*, fl. (CTES, LIL, NY, US); Los Toldos, 19 Jun 1999, *N. Hilgert and G. Gil 2339*, fl. (MCNS); 1 km de Los Toldos, camino a Finca Los Nogales, orillas del Arroyo Huaico Grande, 20 Nov 2001, *O. Morrone et al. 3824*, fl. (MO, SI); 3 km de Los Toldos a Lipeo, 1600 m alt., 9 Nov 1975, *M.M. Schiavone et al. 11707C*, fl. (CTES, LIL, MO); camino del Lipeo a Los Toldos, ca. 10 km de Los Toldos, 8 Nov 1975, *M.M Schiavone et al. 11883C*, fl. (LIL, NY); Los Toldos, Cerros al E del Pueblo, margen S del rio Toldos, 1700–1900 m alt., 2 Nov 1989, *L.J. Novara et al. 9100*, fl. (MCNS, SI); Los Toldos, Huaico Chico, 1700 m alt., 19 Aug 1971, *F.B. Vervoorst and P.R. Legname 4494*, fl. (holotype: LIL, isotypes: GH, US). **Bolivia.** —Tarija: Aniceto Arce, El Sunchal, 2000 m alt. 9 Feb 2006, *S. Gallegos et al. 305*, fr. (LPB, NY); Tarija, 76 km hacia Bermejo, pasando Padcaya, 1960 m alt., 20 Oct 1983, *S.G. Beck and M. Liberman 9616*, fl., fr. (LPB, NY, SI). Burnet O'Connor, 27 km hacia Entre Ríos, 2200 m alt., 22 Oct 1983, *S.G. Beck and M. Liberman 9656*, fl. (LPB, MO, NY, SI, USZ). Cercado, Pampa

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

Redonda, [-21.720°, -64.851°], 2045 m alt., 8 Feb 2006, *F. Zenteno et al. 3593*, fr. (LPB, NY).

4. SCHINUS MICROPHYLLA I.M.Johnst., J. Arnold Arbor. 19(3): 258. 1938, as "*microphyllus*". TYPE: PERU. Apurímac, above Argama, on trail to Andahuylas 3800 m alt., 5 Nov 1935, *J. West 3747* (holotype: GH 00049182!, isotype: UC561231 [photo]!).

Schinus dependens Ortega var. *parviflora* Marchand, Rev. Anacardiac. 164. 1869, as "*parviflorus*". *Duvaua dependens* (Ortega) DC. var. *parviflora* (Marchand) Arechaval., Anales Mus. Hist. Nat. Montevideo 3: 301. 1900. *Schinus polygama* (Cav.) Cabrera fo. *parviflora* (Marchand) Cabrera, Revista Mus. La Plata, Secc. Bot. 2: 34. 1938, as "*polygamus* forma *parviflorus*". *Schinus polygama* (Cav.) Cabrera var. *parviflora* (Marchand) F.A.Barkley, Brittonia 5(2): 176. 1944, as "*polygamus* var. *parviflorus*". TYPE: BOLIVIA. 1839, *J.B. Pentland 18* (P06634216 [photo]!).

Schinus dependens Ortega var. *crenata* Engl., in Mart., Fl. Bras. 12(2): 388. 1876. *Duvaua dependens* (Ortega) DC. var. *crenata* (Engl.) Arechaval., Anales Mus. Hist. Nat. Montevideo 3: 300. 1900. *Schinus dependens* Ortega var. *andina* Engl., in A.DC. & C.DC., Monogr. Phan. 4: 341. 1883, as "*andinus*", nom. superfl. *Schinus andina* (Engl.) I.M.Johnst., J. Arnold Arbor. 19(3): 259. 1938, as "*andinus*", nom. superfl. *Schinus microphylla* I.M.Johnst. var. *andina* (Engl.) J.F.Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 13(3A/1): 252. 1951, as "*microphyllus* var. *andinus*", nom. superfl. TYPE: BOLIVIA. Prov. Larecaja, vicinius Sorata, 2650-2800 m alt., Aug-Jan 1858, *G. Mandon 768* (holotype: G00237063 [photo]!, isotypes: BM000884827 [photo]!, G00237063 [photo]!, GH 00049169!, K000537443 [photo]!, NY 00050884!, P06634200, [photo]!, S [photo]!, US 00095710!).

Thorny tree(lets) or shrubs, 1–3 m tall. **Branches** erect, sparsely strigose, puberulous or densely clavate-glandular. **Trichomes** simple and transparent or clavate-glandular and transparent or orangish-red; erect or appressed, straight, arcuate or slightly sigmoid, 0.03–0.08 mm long on branches, leaves and inflorescences. **Leaves** often clustered at stem apex; petiole 1.5–3.5 mm long, semi-terete, sometimes (slightly) canaliculate, puberulous or clavate-glandular on both surfaces; blade 0.9–2 × 0.6–1 cm, essentially obovate, sometimes oblong or ovate; apex obtuse, rounded; medially subsymmetrical or asymmetrical, basal insertion (sub)symmetrical, basal width (sub)symmetrical, base acute or obtuse, cuneate, decurrent or rounded; margin entire or entire on proximal portion and erose or crenate on distal portion, sometimes slightly lobed on distal portion, slightly revolute, strigose; texture chartaceous or coriaceous; costal secondaries in 4–6 pairs, spacing irregular, course straight or arcuate, angle smoothly decreasing toward base; marginal secondary vein 0.1 mm in width, inconspicuous; tertiary veins not visible; on abaxial side the midvein prominent proximally and prominulous or impressed distally, secondary veins prominulous, flat or impressed, clavate-glandular or sparsely strigose; on adaxial side the midvein prominent proximally and prominulous distally, secondary veins prominulous or impressed, densely clavate-glandular on midvein, rest of surface clavate-glandular or sparsely strigose; often glossy on both surfaces. **Inflorescences** axillary or terminal, pilose, puberulous or clavate-glandular; bracts dimorphic, smaller ones 0.2–0.7 × 0.4–0.8 mm, (broadly) ovate or deltate, larger ones 3.5–3.7 × 2–2.5 mm, obovate; bracteoles 0.1–0.3 × 0.1–0.2 mm, ovate; bracts and bracteoles puberulous, pilose or clavate-glandular on both surfaces. **Staminate inflorescences** 8–11 mm long, flowers in lax pseudoracemes, often branched at base and densely branched distally, median internodes 1.7–3.5 mm. **Staminate flowers** with pedicel 1.5–3 mm long, portion distal to articulation 0.6–0.8 mm long, hirsute or clavate-glandular, bracteoles subtending pedicel; sepals 0.4–0.8 × 0.5–1 mm, (broadly) ovate or deltate, hirsute or clavate-glandular, conspicuous on margin; petals 1.6–2.1 × 1.3–1.5 mm, ovate or oblong, convex, midvein entire, minutely puberulous or strigose on both surfaces; antesepalous and antepetalous stamens 0.9–1.5 and 0.6–1 mm long, respectively; anthers 0.4–0.5 mm long, (broadly) oblong or ovate in dorsiventral view, oblong in lateral view; disk 0.3–0.5 mm tall, 0.08–0.2 mm thick, glabrous; pistillode 0.4–0.5 mm long. **Pistillate inflorescences** 3–8 mm long, flowers in lax pseudoracemes, median internodes 1.7–2 mm long. **Pistillate flowers** with pedicel 2–3.3 mm long, portion distal to articulation 1.1–1.2 mm long, hirsute or clavate-glandular, bracteoles subtending pedicel; sepals 0.3–0.6 × 0.5–0.8 mm, (broadly) ovate or deltate, hirsute or clavate-glandular, conspicuous on margin; petals 1.3–2 × 1.4–1.5 mm, obovate or oblong, slightly convex or concave, midvein entire, minutely puberulous or strigose on both surfaces; pistil 1–1.3 mm long, glabrous; ovary globose, laterally compressed, style 0.09 mm long or the style not visible; antesepalous and antepetalous staminodes 0.6–0.9 mm long and 0.5–0.7 mm long, respectively, antherodes 0.2–0.3 mm long; disk 0.3–0.5 mm tall, 0.08–0.2 mm thick, glabrous. Fruiting pedicel 1.5–1.8 mm long, portion distal to articulation 0.9–1 mm long, clavate-glandular or puberulous. **Drupes** 4–4.3 × 5–6 mm, globose, exocarp red, glabrous, minutely strigose, hirsute or clavate-glandular. Figures 3B, 5A–E, 6A–B.

Vernacular Names—Checche (*O.F. Cook and G.B. Gilbert 427*), chipiñiku (*T. Ortuño 611*), molle (*L. Vargas and G. Mora 205*), muluaca (*J. West 3747*), roncar (*K. Eynde s.n.* at MOL herbarium), sip'i nuko (*S.G. Beck 11368*).

Phenology—There are flowering records from January–December, and fruiting records from September–November.

Distribution and Habitat—*Schinus microphylla* has a disjunct distribution, occurring in south-central mountains of Peru (Apurímac, Ayacucho, and Cusco departments), in an area considered to be an important center of endemism for birds, mammals, amphibians, and plants (Swenson et al. 2012), and also in Bolivia, in La Paz and represented by one record in Cochabamba department. It can be found in the open shrubby woodland of rocky slopes in Peruvian Yungas, with a few populations reaching Bolivian Yungas, often in association with *Polylepis* forests, between 2140–4000 m. It also occurs in ecotonal areas between these Andean cloud forests and dry areas of Central Andean Wet Puna or Bolivian Montane Dry Forest (Fig. 3B).

Preliminary Conservation Status—IUCN lists *Schinus microphylla* as Least Concern (LC) threat status, see BGCI and IUCN SSC Global Tree Specialist Group (2019a). Here, the IUCN threat status of *Schinus microphylla* was evaluated as Least Concern (LC) based on the extent of occurrence (EOO = 125,610.20 km^2) and Endangered (EN) according to area of occupancy (AOO = 180.00 km^2). We assign the preliminary IUCN threat status of Endangered EN B2ab(iii) because most of the Bolivian records are in the vicinity of La Paz, in an area experiencing habitat loss due to development. Also, no populations are known within the protected area

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

network in Bolivia. In Peru, populations are known nearby Area de Conservación Regional Choquequirao.

***Taxonomic Notes*—**When Macbride (1951) made the new combination *Schinus microphylla* var. *andina* (Engl.) J.F.Macbr., he mentioned that *S. andina* (Engl.) I.M.Johnst. seems to be a variant of *S. microphylla* but less pubescent with coriaceous leaves and smaller inflorescences. *Schinus andina* (Johnston 1938), a name often applied to the Bolivian collections, is a superfluous name because it was based on *Schinus dependens* Ortega var. *andina* Engl., which itself is illegitimate, because in 1883, Engler cited as synonyms two earlier names *Schinus dependens* var. *parviflora* Marchand (1869) and *Schinus dependens* var. *crenata* Engl. (1876).

We examined the type material of *Schinus dependens* var. *crenata* and *S. dependens* var. *parviflora*, and both specimens can be assigned to *S. microphylla.* Neither Cabrera (1938) nor apparently Barkley (1944) saw the type of *Schinus dependens* var. *parviflora* (*Pentland 18,* housed at P herbarium), which was collected in Bolivia; even so, Barkley made the combination *S. polygama* (Cav.) Cabrera var. *parviflora* F.A.Barkley, which he applied to Chilean material that here is considered to be *S. polygama* (species not treated in this taxonomic revision).

According to the morphological analysis of the specimens identified as *Schinus microphylla* and *S. andina,* we identified two morphotypes based mainly on leaf and inflorescence characteristics. The first morphotype we recognize in *Schinus microphylla* has thorns (Figs. 5A, C, 6A), ranging from conspicuously thorny (Peruvian specimens) to inconspicuously so (Bolivian specimens), and branches and leaves with strigose indumentum (something uncommon in other species). Moreover, it has leaves with the secondary vein angle smoothly decreasing toward the base (Fig. 6B), staminate inflorescences with median internodes 1.7–3.5 mm long, staminate flowers with the pedicels 1.5–3 mm long, pistillate inflorescences with median internodes 1.7–2 mm long, and pistillate flowers with pedicels 2–3.3 mm long. The second morphotype, which we recognize as *Schinus subtridentata,* are unarmed plants or may present inconspicuous thorns (Fig. 10N), and branches and leaves with hirsute indumentum. Also, it has leaves with the secondary vein angles uniform, inconsistent or smoothly increasing toward base (Fig. 10I, L, M), staminate inflorescences with median internodes 1–2 mm long, staminate flowers with pedicels 1.4–1.6 mm long, pistillate inflorescences with median internodes 1–1.5 mm long, and pistillate flowers with pedicels 1–2 mm long.

According to the morphological features mentioned above, *Schinus microphylla* has flower structures (i.e. pedicel and median internodes of the inflorescences) larger than *S. subtridentata*. Based on these morphological distinctions, we treat *S. subtridentata* as a distinct species.

Schinus microphylla occurs in sympatry with *S. subtridentata* and *S. minutiflora* in La Paz (Bolivia). The former species is distinct from the latter two species because its branches are usually conspicuously thorny (vs. inconspicuously thorny or unarmed) and it has staminate inflorescences with longer median internodes 1.7–3.5 mm (vs. 1–2 mm, 1–1.4 mm, respectively).

Johnston (1938) reported that the flowers of *Schinus microphylla* are pentamerous, but all specimens of *Schinus* section *Myrtifolia* examined by us have tetramerous flowers.

***Representative Specimens*—Bolivia. —**Cochabamba: Tarata, lands of Humberto Gandarillas, near Anzaldo, 3600 m alt., 8 Jan 1943, *M. Cárdenas et al. 7605*, fl., fr. (GH, MO, US). La Paz: Bautista Saavedra, Charazani, Jatichulaya, 16 Mar 1992, *P. Gutte 104*, fl. (LPB); Charazani, 3230 m alt., en los declives de las calles del Pueblo de Charazani, 4 Aug 1985, *S.G. Beck 11368*, sterile (LPB, NY); bajando de Charazani, [-15.166°, -68.950°], 2874 m alt., 10 Feb 2003, *J.R.I. Wood et al. 18937*, fl. (LPB); Area Natural de Manejo Integrado Apolobomba, Charazani, [-15.180°, -68.995°], 3187 m alt., 4 Sep 2004, *A. Fuentes and C. Aldana 6711*, fl., fr. (LPB, MO); Charazani, en los declives de las calles del pueblo de Charazani, 3230 m alt., 4 Aug 1985, *S.G. Beck 11368*, fl., fr. (LPB, NY). Eliodoro Camacho, Cantón Ambana, Ambana, 3500 m alt., 20 Dec 1980, *S.G. Beck 4228*, fl. (LPB, NY); Combaya, rio Khala Paya [-15.783°, -68.75°], 2742 m alt., 12 Jun 2007, *T. Ortuño 611*, fl., fr. (CTES, LPB). Larecaja, vicinius Sorata, 2650–2800 m alt., Aug-Jan 1858, *G. Mandon 768*, fl. (holotype: G, isotypes: BM, GH, K, NY, P, S, US); Sorata, 2800 m alt. 4 Dec 1983, *S.G. Beck 8652*, fl., fr. (LPB, NY, SI); La Paz, Cota Cota, avenida principal, 3400 m alt., 26 Mar 1983, *E. García 403*, fl. (LPB); suburb of Achumani on southesternmost side of La Paz, [-16.533°, -68.066°], 3400 m alt., 4 Dec 1984, *M.H. Nee 30518*, fl. (LPB, MO, NY); La Paz, subida al cerro Muela del Diablo, 3650 m alt., 4 Mar 1979, *S.G. Beck 1370*, fl. (LPB, NY); Cota Cota, terreno de la UMSA, 3400 m alt., 15 Aug 1979, *S.G. Beck 2335*, fl. (LPB, NY, MO); Calacoto, al sud del rio Huañajahuira, 3600 m alt., 4 Nov 1979, *S.G. Beck 2363*, fl. (LPB, NY); La Paz, Universidad Mayor de San Andrés, jardim botânico do campus da faculdade de Ciencias Puras, 15 Jan 2014,*C.L. Silva-Luz and L.F. Luz 255*, fl. (NY, RB, SPF); near La Paz, 10,000 ft., Apr 1885, *H.H. Rusby 1446*, fl. (GH, NY, US); SE de La Paz, entre Ventilla y Palca, 3400 m alt., 13 Oct 1985, *S.G. Beck 11658*, fl. (HBG, F, LPB, NY, USZ); Hills on South side at Calacoto, [-13.533°, -68.083°], 3300–3600 m alt., 20 Jan 1982, *J.C. Solomon 6747*, fl. (MO, NY); ca. 80 km NNE de La Paz, via camino directo a Sapahaqui, 3500 m alt., 27 Jun 1983, *S.G. Beck 8462*, fr. (LPB, MO, NY, SI); Alto Irpavi, 3605 m alt., 6 Jan 1986, *M. Moraes 690*, fl. (LPB, NY); Sud Yungas, La Paz - Calacoto, 68 km hacia el Este, passando el Nevado Illimani, camino bajando por la estación generadora Ikiko, 3100–3500 m alt., 31 Dec 1980, *S.G. Beck 3922*, fr. (LPB, NY, SI); Calacoto, 3300 m alt., hillsides on the north side, below Alto Irpavi, [-16.533°, -68.083°], 16 Oct 1985, *J.C. Solomon 14349*, fl. (LPB, MO, NY, SI). Songo, Nov 1890, *A.M. Bang* 895, fl. (NY, MO, US). Loayza, município de Cairoma, Asiento Araca, Cerro Rosario, [-16.816°, -67.550°], 3820 m alt., 10 Apr 2004, *S.G. Beck et al. 29317*, fr. (LPB, NY); arriba de los baños termales de Urmiri, 3500 m alt., 16 Dec 1989, *S.G. Beck 17233*, fl. (LPB, NY). Pedro Domingo Murillo, ca. 15 km al este de La Paz, de Palca subiendo el río Choquekkota via Taquesi, 3650 arriba de Huancapampa, 22 Nov 1987, *S.G. Beck 14337*, fl., fr. (CUZ, K, LPB, NY, SI); 2 km SE of Mecapaca, [-16.666°, -68.016°], ca. 3000 m alt., 17 Jul 1981, *J.C. Solomon 5849*, fl., fr. (MO); La Paz, subida al cerro: Muela del Diablo, 3650, 4 Mar 1979, *S.G. Beck 1370*, fl., fr. (LPB, NY); La Paz-Calacoto, 29 km hacia el SE por Collana, 3750 m alt., 11 Jan 1981, *S.G. Beck 4260*, fl., fr. (LPB). **Peru. —**Apurímac: above Argama, on trail to Andahuylas 3800 m alt., 5 Dec 1935, *J. West 3747*, fl. (holotype: GH, isotype: UC); 2500–2600, 1909–1914, *A. Weberbauer 5839*, fl. (F, G, GH). Cusco: Huayllabamba, trilha em direção à laguna Yanacocha, [-13.304°, -72.048°], 3284 m alt., 12 Jan 2015, *C.L. Silva-Luz and L.F. Luz 334, 337*, fl. (NY, RB, SPF); Ollantaytambo, quebrada Rumira, [-13.233°, -72.266°], 3060 m alt., 17 Jul 2003, *I. Huamantupa et al. 3571*, fl. (MO, NY); Ollantaytambo, Valle de Patacancha, 2900 m alt., May-Oct 1987, *Steiphen and J. Tait 32*, fl. (USM); Calca, Parcco, 3230 m alt., 7 Jun 1987, *K. van Eynde s.n.*, sterile (MOL); Huaytampo, [-13.200°, -72.361°], 3336 m alt., 10 Sep 2002, *J. Farfán et al. 367*, fl. (MO, NY); Huayoccari to Yanacoya, Urubamba, NW from Cusco, [-13.266°, -72.066°], 14 Feb 1987, *P. Nuñez et al. 7007* sterile, *7011*, fr. (MO); Tambo, 3100–3200 m alt., May 1910, *A. Weberbauer 5552*, fr. (G, GH, S); Lucanas, Aucará, 3500 m alt., May 2004, *L. Vargas and G. Moura 205*, sterile (USM).

5. ***Schinus minutiflora*** Silva-Luz & Pirani, nom. & stat. nov. *Schinus dependens* var. *andina* Engl. forma *grandifolia* Loes., syn. nov. Meded. Rijks-Herb. 27: 84. 1915. Type: Bolivia. Subalpinen Gebüshes bei Samaipata, ca. 2000 m, March 1911, *T.C.J. Herzog 1714* (lectotype designated here: L0726134 [photo]!, isolectotype: S [photo]!).

Unarmed shrubs, sometimes tree(lets), 1–4 m tall. **Branches** erect, puberulous or pilose, sometimes tomentose. **Trichomes** simple or barbellate and transparent or clavate-glandular and transparent, orangish-red or brown; erect, straight, arcuate, nutant or slightly sigmoid, 0.03–0.1 mm long on branches, leaves and inflorescences. **Leaves** sparse throughout the stem; petiole 2–5 mm long, canaliculate or semi-terete, on

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

both surfaces densely pilose, puberulous or clavate-glandular; blade (1.5–)1.9–3 × 1–3.3 cm, often (broadly) ovate, sometimes elliptic or obovate; apex obtuse, rounded, sometimes retuse; medially asymmetrical, basal insertion (sub)-symmetrical, basal width usually asymmetrical, base obtuse or acute, rounded or decurrent; margin entire on proximal portion, crenate, serrate or serrate-crenate on distal portion, slightly revolute on proximal portion, sometimes pilose; texture membranaceous or chartaceous; costal secondaries in (5–)6–10 pairs, spacing irregular, course sinuous or straight, angle uniform or smoothly increasing toward base, rarely inconsistent; marginal secondary vein 0.03–0.09 mm in width, inconspicuous; tertiary veins visible; on abaxial side the midvein prominent or flat proximally and prominulous or flat distally, secondary veins flat, tertiary veins flat, glabrous or sparsely clavate-glandular; on adaxial side the midvein prominent or flat proximally and prominulous distally, secondary veins flat or impressed, rarely prominulous, tertiary veins flat, sometimes pilose on midvein, rest of surface puberulous or sparsely clavate-glandular; dull, sometimes glossy on both surfaces. **Inflorescences** axillary or terminal, clavate-glandular or puberulous; bracts monomorphic, 0.3–0.6 × 0.3–0.8 mm, (broadly) deltate; bracteoles 0.1–0.2 × 0.1 mm, ovate or lanceolate; bracts and bracteoles densely pilose or clavate-glandular on both surfaces. **Staminate inflorescences** 6–8 mm long, flowers in congested pseudoracemes, often branched at base, median internodes 1–1.4 mm long. **Staminate flowers** with pedicel (0.5–)0.9–1.5 mm long, portion distal to articulation 0.5 mm long or the articulation not visible, puberulous or clavate-glandular, bracteoles subtending pedicel; sepals 0.3–0.6 × 0.5–0.7 mm, (broadly) ovate or obovate, puberulous or clavate-glandular on both surfaces; petals 1–1.5 × 0.8–1.2 mm, ovate, convex, midvein sometimes branching at apex, glabrous; antesepalous and antepetalous stamens 0.6–1 and 0.6 mm long, respectively; anthers 0.2–0.3 mm long, (broadly) oblong in dorsiventral and lateral views; disk 0.1–0.3 mm tall and ca. 0.08 mm thick, glabrous; pistillode 0.2–0.3 mm long. **Pistillate inflorescences** 5–9 mm long, flowers in lax pseudoracemes or solitary, median internodes 0.8–0.9 mm long. **Pistillate flowers** with pedicel 1–2 mm long, portion distal to articulation 0.5–0.8 mm long, puberulous or clavate-glandular, bracteoles subtending pedicel; sepals 0.4–0.6 × 0.4–0.6 mm, ovate, puberulous or clavate-glandular on both surfaces; petals 0.8–1.4 × 0.6–1 mm, ovate or oblong, concave, midvein sometimes branching at apex, glabrous; pistil 0.9–1.1 mm long, glabrous; ovary globose, style 0.1 mm long; antesepalous and antepetalous staminodes all 0.3–0.5 mm long, antherodes 0.1–0.3 mm long; disk 0.1–0.3 mm tall and ca. 0.08 mm thick, glabrous. Fruiting pedicel 2–4 mm long, portion distal to articulation 0.6–0.8 mm long, puberulous or clavate-glandular, sometimes pilose. **Drupes** 4–5 × 4.8–6 mm, obliquely globose or ovoid, exocarp pinkish-red, glabrous. Figures 3A, 8H–P.

Vernacular Names—Wizluru (*S.G. Beck 9348*).

Phenology—There are flowering records from February–May and July–December, and fruiting records from November–April and July.

Distribution and Habitat—*Schinus minutiflora* is a Bolivian endemic species occurring mostly in Chuquisaca and Santa Cruz departments, and scattered populations in Cochabamba and La Paz departments. Plants of this shrubby species are often leaning on other plants, inhabiting moist shrubby areas, on rocky slopes of Bolivian Yungas and Southern Andean Yungas, as well as in ecotonal areas between these Andean cloud forests and Bolivian Montane Dry forest (Fig. 3A), associated with *Prumnopitys*, *Podocarpus*, *Alnus*, and *Polylepis* forests, between 1825–3420 m. It is often found in areas disturbed by cattle grazing.

Preliminary Conservation Status—The IUCN threat status of *Schinus minutiflora* was evaluated as Least Concern (LC) based on the extent of occurrence (EOO = 53,646.20 km^2) and as Endangered (EN) according to area of occupancy (AOO = 116.00 km^2). We assign a preliminary IUCN threat status of Endangered EN B2ab(iii) based on the area of occupancy rather than the extent of occurrence because the latter parameter likely encompasses less unsuitable habitats, such as Bolivian Montane Dry Forest. Also, no populations are known within protected areas network in Bolivia and they may be under threat by cattle grazing. However, some populations occur near Carrasco and Amboró National Parks.

Taxonomic Notes—*Schinus minutiflora* was based on the same type material of *Schinus dependens* var. *andina* forma *grandifolia* Loes. We did not keep the epithet "*grandifolia*," because other *Schinus* species have substantially larger leaves (e.g. *S. meyeri*), and instead we propose the epithet "*minutiflora*" referring to the small inflorescences.

Barkley (1957) considered *Schinus dependens* var. *andina* forma *grandifolia* (here considered as *S. minutiflora*) to be synonymous with *S. myrtifolia*. *Schinus minutiflora* has leaves that are essentially broadly ovate (Fig. 8H–I) but, like *S. myrtifolia*, rarely its leaves are elliptic or obovate (Fig. 8L–M). However, *Schinus minutiflora* is easily distinguished because it has branched staminate pseudoracemes 6–8 mm long (vs. unbranched staminate pseudoracemes 15–30 mm long, see Fig. 5F), and the pistillate inflorescences 5–9 mm long with the median internodes 0.8–0.9 mm long (vs. pistillate inflorescences 9–23 mm long with the median internodes 2–3.5 mm long).

Overlap in pistillate inflorescence length may complicate identification of *Schinus minutiflora* (5–9 mm long) and *S. congestiflora* (3–14 mm long), especially when populations occur in sympatry. Pistillate individuals can be distinguished by their pistil length of 0.9–1.1 mm (vs. 0.7–0.8 mm in *S. congestiflora*) as well as pedicel articulation visible (vs. not visible in *S. congestiflora*).

Schinus minutiflora may also co-occur with *S. subtridentata* and *S. microphylla* in Chuquisaca and La Paz departments (Bolivia), but it is readily distinguished by its unarmed plants (Fig. 8H, N), whereas *S. microphylla* are thorny plants (Figs. 5A, C, 6A), and individuals in *S. subridentata* are inconspicuous thorny or unarmed (Fig. 10N), and pistillate inflorescences with median internodes 0.8–0.9 mm long (vs. 1–1.5 mm long and 1.7–2 mm long, in *S. subtridentata* and *S. microphylla*, respectively). In addition, *Schinus minutiflora* has fruiting pedicels of 2–4 mm long vs. 1.5–1.8 mm in *S. microphylla*.

Representative Specimens—**Bolivia.** —Cochabamba: Siberia, [-17.803°, -64.770°], 2900 m alt., 16 Apr 2005, *E. Fernández et al. 3553*, fr. (BOLV, LPB, MO); Ayopaya, ca. 10 km al NW de Independencia, alrededor de la Cima de la Loma, 3250 m alt., 10 May 1988, *S.G. Beck and R. Seidel 14550*, fl. (K, LPB, NY, SI, US); 5 km al este del puente sobre el río Lopez Mendoza por el camino entre Cochabamba y Santa Cruz (19 km al oeste de Epizana), [-17.533°, -65.366°], 2900 m alt., 11 Feb 1987, *J.C. Solomon and M.H. Nee 16035*, 16041, fr. (LPB, MO, NY); Sehuencas, proximo al pueblo de Montepunku, [-17.750°, -65.028°], 2610 m alt., 26 Sep 2007, *J.Teran et al. 1303*, fl. (BOLV, MO); Quillacollo, cerca La Pía, Thola Pojru, 3420 m alt., 15 Apr 1995, *E. Fernández et al. 447*, fl. (LPB). —Chuquisaca: Hernando Siles, Huacareta, serrania Los Milagros, subiendo el sendero al pastizal, [-64.042°, -20.329°], 1854 m alt., 26 Dec 2005, *M. Serrano et al. 6985*, fr.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

(HSB, MO, NY); primera sección Monteagudo, canton Fernandez, comunidad Vallecito, Canon El Guayavillar, [-20.201°, -64.298°], 2438 m alt., 9 Nov 2007, *O. Apaza et al. 32*, fr. (HSB, MO). Juana Azurduy de Padilla, primera sección Villa Azurduy, [-20.102°, -64.418°], 2507 m alt., 13 Nov 2007, *M. Jimenez et al. 678*, fl., fr. (HSB, MO, NY); 2 km SW Tarvita on Tarabuco -Azurduy road, [-19.950°, -64.516°], 2750 m alt., 25 Sep 1991, *M. Kessler 3243*, fl. (NY). Tomina, trayecto Lampacillos-El Rosal, [-19.422°, -64.193°], 2398 m alt., 21 Dec 2005, *M. Serrano et al. 6805*, fl., fr. (HSB, MO, NY); ca. 10 km saliendo del El Villar hacia Alcala, [-19.566°, -64.332°], 2552 m alt., 8 Jan 2004, *A. Carretero et al.* 1197, fr. (HSB, NY); Padilla, 25 km hacia Monteagudo, 2400 m alt., 1 Oct 1983, *S.G. Beck* and *M. Liberman 9348*, fl. (CTES, LPB, NY). Padilla, 21 km hacia Monteagudo, 2370 m alt., 8 Mar 1981, *S.G. Beck 6296*, fl. (LPB, NY); a 6 km en el camino saliendo del Villar hacia Alcalá, [-19.583°, -64.316°], 2309 m alt., 2 Apr 2003, *J.R.I. Wood et al. 19554*, fr. (HSB, LPB). —La Paz: Inquivisi, 5 km arriba de Quime hacia La Paz [-16.966°, -67.250°], 3350 m alt., 23 Aug 1997, *S.G. Beck 22894*, fr. (LPB, NY). —Santa Cruz: Florida, Strauch des subalpinen Gebüshes bei Samaipata, ca. 2000 m, Mar 1911, *T.C.J. Herzog 1714*, fl. (lectotype: L, isolectotype: S). Vallegrande, El Palmar, camino entre Vallegrande - Postrer Grande, 26 km de Vallegrande, [-18.466°, -63.883°], 2400 m alt., 22 Aug 1994, *M. Moraes and I. Vargas 1809*, fl. (LPB, NY); Quebrada Honda, ca. 10–15 km sobre el camino hacia La Higuera, 1 km de la carretera, siguiendo el curso del rio [-18.566°, -64,100°], 2409 m alt., 14 Mar 2003, *M. Mendoza and R. Ledezma 499*, fr. (LPB, USZ); aproximadamente 2 km del centro de Vallegrande camino hacia Kjallana, subiendo por el mirador [-18.504°, -64.123°], 2360 m alt., 10 Jul 2010, *L. Arroyo et al. 4795*, fl., fr. (MO); juntas de Waricongas, 14 km SE de Vallegrande, [-18.566°, -64.016°], 1825 m alt., 30 Dec 1988, *M. Saldías 546*, fr. (NY); Guapural, ca. 41 km sur de Vallegrande, camino a Gualasi, [-18.666°, -64.016°] 27 Feb 2002, *L. Arroyo et al. 1883*, fl. (NY, USZ); camino principal de Vallegrande a Masicurí, 1–2 km antes de Loma Larga, [-18.246°, -63.901°], 1995 m alt., 23 Aug 2008, *L. Arroyo et al. 3875*, fl. (MO, NY, USZ); 3 km (by air), S of Khasa Monte on road to Los Sitanos, ca. 2 km N of Los Hornos, [-18.716°, -64.033°], 2400 m alt., 26 Dec 1989, *M.H. Nee 38420*, fl., fr. (NY); ca. 6 km S of Abra Tablas on road to Los Sitanos, ca. 1 km N of Lagunillas and 5 km of Khasa Monte, [-18.650°, -64.033°], 2425 m alt., 26 Dec 1989, *M.H. Nee 38397*, fr. (NY); Aguadita, 8 km (by air) S of Khasa Monte on road to Los Sitanos, [-18.783°, -64.033°], 2350 m alt., 26 Dec 1989, *M.H. Nee 38440*, fr. (NY).

6. Schinus myrtifolia (Griseb.) Cabrera in Frenguelli, Invest. Geol. Zona Salt. Valle S. Maria (Inst. Mus. Univ. Nac. La Plata, Obra Cincuent. ii.) 2: 269. 1937, as "*myrtifolius*". *Cybianthus myrtifolius* Griseb., Abh. Königl. Ges. Wiss. Göttingen [Symb. Fl. Argent.] 24: 222. 1879. Type: Argentina. Salta, Yacone cerca de Salta, Mar 1873, *P.G. Lorentz and G.H.E.W. Hieronymus 317* (lectotype designated here: GOET [photo]!); isolectotypes: CORD, LP [photo]!).

Unarmed tree(lets) or shrubs, 2–7 m tall. **Branches** prostrate, often glabrous, sometimes puberulous or clavate-glandular. **Trichomes** simple and transparent or clavate-glandular and transparent or orangish-yellow; erect or appressed, straight, slightly sigmoid or arcuate, 0.06–0.1 mm long on branches, 0.01–0.03 mm long on leaves, and 0.03–0.04 mm long on inflorescences. **Leaves** sparse throughout the stem; petiole 2–8(–11) mm long, canaliculate, puberulous or sparsely clavate-glandular; blade 2–6 × 1.2–3 cm, (broadly) elliptic or oblong, rarely ovate; apex usually obtuse, sometimes acute, rounded or straight; medially (sub)symmetrical, basal insertion (sub)symmetrical, basal width asymmetrical, base acute, rarely obtuse, decurrent; margin often entire, sometimes entire on proximal portion and (slightly) crenate on distal portion, slightly revolute, sparsely strigose; membranaceous or chartaceous; costal secondaries in 8–16 pairs, spacing often irregular, course arcuate, angle uniform or inconsistent; marginal secondary vein 0.03–0.1 mm in width, inconspicuous; tertiary veins visible; on abaxial side the midvein prominent or prominulous proximally and flat distally, secondary veins flat or prominulous, tertiary veins flat, glabrous; on adaxial side the midvein prominulous or flat, secondary veins impressed or flat medially and impressed toward margin, tertiary veins impressed, sparsely clavate-glandular, puberulous or pilose on midvein; glossy on both surfaces. **Inflorescences** axillary or terminal, puberulous or sparsely clavate-glandular; bracts monomorphic, 0.5–0.8 × 0.3–0.6 mm, ovate or deltate; bracteoles 0.2–0.3 × 0.1–0.3 mm, ovate or oblong; bracts and bracteoles pilose or clavate-glandular on abaxial surface and margin, glabrous or clavate-glandular on adaxial surface. **Staminate inflorescences** 15–30 mm long, flowers in unbranched pseudoracemes, median internodes 0.8–1.8 mm long. **Staminate flowers** with pedicel 1.5–5 mm long, portion distal to articulation 0.4–0.7 mm long or the articulation not visible, sparsely pilose, puberulous or clavate-glandular, bracteoles subtending pedicel; sepals 0.6–1 × 0.5–0.9 mm, oblong or ovate, puberulous or sparsely clavate-glandular on both surfaces, conspicuous on margin; petals 1.2–1.9 × 1–1.4 mm, ovate, obovate or oblong, convex, midvein sometimes branching at apex, essentially glabrous, rarely puberulous or clavate-glandular on both surfaces; antesepalous and antepetalous stamens 0.9–1.1 and 0.8–1 mm long, respectively; anthers 0.3–0.4 mm long, (broadly) oblong in dorsiventral view, ovate or (broadly) oblong in lateral view; disk 0.5–0.7 mm tall, 0.1–0.2 mm thick, glabrous; pistillode 0.3–0.4 mm long. **Pistillate inflorescences** 9–23 mm long, flowers in unbranched pseudoracemes, rarely solitary, median internodes 2–3.5 mm long. **Pistillate flowers** with pedicel 2–3.3 mm long, portion distal to articulation 0.1 mm or the articulation not visible, sparsely pilose, puberulous or clavate-glandular, bracteoles subtending pedicel; sepals 0.6–0.7 × 0.6–0.7 mm, ovate or oblong, puberulous or sparsely clavate-glandular on both surfaces, conspicuous on margin; petals 1.2–1.4 × 0.8–0.9 mm, ovate or oblong, slightly convex, midvein sometimes branching at apex, essentially glabrous, rarely puberulous or clavate-glandular on both surfaces; pistil 0.8 mm long, glabrous; ovary globose, style 0.1 mm long; antesepalous and antepetalous staminodes 0.4 mm long and 0.3 mm long, respectively, antherodes 0.2 mm long; disk 0.5–0.7 mm tall, 0.1–0.2 mm thick, glabrous. Fruiting pedicel 2.4–7 mm long, articulation 0.4–2 mm long or the articulation not visible, puberulous. **Drupes** 5.5–7.3 × 5.8–8 mm, obliquely obovoid, laterally compressed, exocarp pink or red, glabrous or sparsely clavate-glandular. Figures 2A, 5F–L, 6C–F.

Vernacular Names—Blanquillo (*C.L. Spegazzini* 1357), molle (*P.R. Legname and A.R. Cuezzo 5085c*; *L.J. Novara 4268*, *8164*), molle trepador (*L. Marmol 152*).

Phenology—Flowers in August–May, and fruits in October–March.

Distribution and Habitat—*Schinus myrtifolia* is relatively widely distributed in northwestern Argentina, in Jujuy and Salta provinces, with scattered populations in southern Bolivia, in Tarija and Chuquisaca departments. It is a common species of Southern Andean Yungas in Argentina, often growing in association with *Alnus*, *Juglans* L., and *Podocarpus* forests, between 900–2600 m. This species also can be distributed in ecotones between Southern Andean Yungas and dry areas of Bolivian Montane Dry Forest, Central Andean Puna, or Dry Chaco (Fig. 2A), where it may be associated with *horco quebracho* (*Schinopsis marginata* Engl.; Muñoz 2000). This species can be also found in areas disturbed by grazing.

Preliminary Conservation Status—We evaluated this taxon with a narrower delimitation of the species and

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

preliminarily found it to be of Least Concern (LC) based on the extent of occurrence (EOO = 80,160.28 km^2) and as Endangered (EN) according to the area of occupancy known at this time (AOO = 196.00 km^2). There are numerous collections of *Schinus myrtifolia,* but they are mainly collected near sparse road networks in Bolivia and Argentina. Low collection densities in other areas within the range are probably due either to access issues, or to gaps in fieldwork, especially in the border region between Argentina and southern Bolivia where collections are very limited. Populations of this species are known within Calilegua National Park (Argentina) and in the vicinity of Tariquía Flora and Fauna National Reserve (Bolivia). Hence, we concur with the IUCN threat status of Least Concern (LC), see BGCI and IUCN SSC Global Tree Specialist Group (2019b).

Taxonomic Notes—When Grisebach (1879) described *Cybianthus myrtifolius* Griseb. (the basionym of *Schinus myrtifolia*), he cited two syntypes: one collected in Yacone, Argentina, and *Balansa 2381* collected in Paraguay. The "Yacone" collection was listed without a collector or collection number. According to Varela and Novara (2007), Yacone is a locality in Salta province (Argentina) with dense populations of *Schinus myrtifolia.* There is a collection of *Lorentz and Hieronymus 317*, housed at GOET, which was collected in Yacone in 1873 and determined as *Cybianthus myrtifolius.* As the GOET herbarium contains most of the type materials of Grisebach (Stafleu and Cowan 1976), and as the collections of *Lorentz and Hieronymus* were used to produce the treatment of the *Symbolae ad floram Argentinam*, this specimen has been assigned to that cited by Grisebach. The *Balansa 2381* collection from Paraguay is outside of the range of this species. Examination of these specimens shows that *Lorentz and Hieronymus 317* is *Schinus myrtifolia*, while *Balansa 2381* is a species of *Prunus* L. (Rosaceae).

When Cabrera (1937) transferred *Cybianthus myrtifolius* to *Schinus*, he did not mention the type material. He subsequently (1938) cited *Lorentz and Hieronymus 317* as the type but did not mention *Balansa 2381*, nor did Barkley (1957). We agree with Cabrera and Barkley about the choice of the type material and have here lectotypified it as *Lorentz and Hieronymus 317* housed at GOET.

Cabrera (1938) treated *Schinus bumelioides* (species not treated in this taxonomic revision) as a synonym of *S. myrtifolia*. However, we agree with Barkley (1957) and Muñoz (2000) that these are two distinct species. *Schinus myrtifolia* are unarmed plants (Fig. 5F, L) with tetramerous flowers (Fig. 5K), whereas *S. bumelioides* are thorny plants with pentamerous flowers.

Schinus myrtifolia has leaves that are broadly elliptic or oblong, rarely ovate; margins that are often entire or sometimes entire on the proximal portion and crenate on the distal portion; and bases that are acute, rarely obtuse (Fig. 5F, I, J, L). It can be confused with *Schinus gracilipes* where their distributions overlap in northwestern Argentina because sometimes *S. myrtifolia* has ovate leaves with the margin slightly crenate distally (Fig. 6E), similar to *S. gracilipes*. However, *Schinus gracilipes* has leaves that are ovate or ovate-lanceolate and crenate, crenate-serrate, doubly-serrate or erose throughout the margins (Fig. 4A–B).

Schinus myrtifolia may also co-occur with *S. obliqua*, *S. meyeri*, and *S. venturii*, but these three latter species clearly differ by having staminate pseudoracemes that are often branched at the base, sometimes as thyrsoids, cymes or solitary flowers (Figs. 4I, N, 9A, E) and pistillate flowers with larger pistils (1.2–1.5 mm, 1.4 mm and 1–1.4 mm long, respectively). In contrast, *Schinus myrtifolia* has unbranched staminate pseudoracemes (Fig. 6D) and pistillate flowers with pistils of 0.8 mm long.

Schinus myrtifolia can be also found in the same area as *S. tarijensis*, but the former differs by having leaves that are sparse throughout the stem, staminate inflorescences with median internodes 0.8–1.8 mm long, and pistillate flowers with glabrous pistil of 0.8 mm long (vs. congested leaves, staminate inflorescences with median internodes 1.1–1.4 mm long, and pistillate flowers with densely hirsute or clavate-glandular pistil of 1.4–1.5 mm long).

***Representative Specimens*—Argentina.** —Jujuy: Ledesma, Abra de Cañas, ruta provincial 3, camino a Valle Grande, 1720 m alt., 28 Oct 1970, *F. Vervoorst and A.R. Cuezzo 7625C*, fl. (LIL, NY); Ledesma, camino a Valle Grande, Abra de Cañas, 21 Oct 1979, *A.L. Cabrera et al. 30922*, fl., fr. (SI); rota provincial 4 em direção a termas de Reyes, [-24.178°, -65.453°], 1659 m alt., 18 Dec 2014, *C.L. Silva-Luz and L.F. Luz 325*, fl., fr. (NY, RB, SPF); Oct 1892, *O. Kuntze s.n.*, fl. (NY); depto Tumbaya, Volcan, cerca cementerio y cantera, 2100 m alt., 30 Jan 1999, *S.G. Beck and N. Paniagua 26780*, fr. (CTES, LPB, M, NY); 11 km del desvio de la ruta nacional 9, camino a Tiraxi, 10 Dec 1998, *O. Morrone et al. 3247*, fr. (MBM, MO, SI); Zapla, 9 Nov 1974, *A. Burkart et al. 30523*, fl., fr. (CTES, LP, SI); Parque Nacional Calilegua, rota provincial 83 em direção a Valle Grande, em estrada de terra não pavimentada, lado esquerdo, [-23.690°, -64.878°], 1440 m alt., 17 Dec 2014, *C.L. Silva-Luz and L.F. Luz 322*, fl. (NY, RB, SPF); rota provincial 4 em direção a termas de Reyes, [-24.183°, -65.450°], 1614 m alt., 18 Dec 2014, *C.L. Silva-Luz and L.F. Luz 324*, fl. (NY, RB, SPF); termas de Reyes, 17 Feb 1940, *A. Burkart and N.S. Troncoso 23*, fl. (CTES, SI); Yala, 2 Nov 1974, *A. Schinini et al. 10066*, fl. (CTES, LP, MBM); Yala, side valley from main Humahuaca valley, 1400 m alt., 13 Nov 1978, *S.A. Renvoize et al. 3458*, fl. (K, MO, NY, SI, US); quebrada de Yala, 17 Apr 1969, *A.L. Cabrera and H.A. Fabris 19970*, fl. (CTES, LP); Valle Grande, 2 Mar 1969, *P.R. Legname and A.R. Cuezzo 7274C*, fl. (LIL, NY); Tilquiza, 24 Sep 1981, *A. Rotman and O. Ahumada 564*, fl. (CTES, SI). Salta: Yacone cerca de Salta, Mar 1873, *P.G. Lorentz and G.H.E.W. Hieronymus 317*, fr. (lectotype: GOET, isolectotypes: CORD, LP); La Caldera, Lessen, 1850 m alt., 16 Nov 1980, *S.R. Zapata 43*, fl., fr. (MCNS, NY); La Caldera, entre Yacones y Potrero del Castillo, 1700–2200 m alt., 12 Mar 1952, *H. Sleumer and F. Vervoorst 2787*, fr. (LIL, NY, US); La Caldera, rota 9 em direção a Salta, [-24.523°, -65.354°], 1561 m alt., 19 Dec 2014, *C.L. Silva-Luz and L.F. Luz 327*, fl. fr. (NY, RB, SPF); sierras entre La Viña y Amblair, 15 Feb 1943, *Castellanos s.n.*, fr. (BA 46827); San Lorenzo, rota 115 em estrada de terra, [-24.654°, -65.483°], 1528 m alt., 26. Mar 2014, *C.L. Silva-Luz and L.F. Luz 288*, fr. (NY, RB, SPF); quebrada San Lorenzo, 1600 m alt., 14 Aug 1971, *F.B. Vervoorst and P.R. Legname 4561*, fl. (CTES); San Lorenzo, 460 m alt., s.d., *J.S. Biloni 6023*, fl. (SI); rota nacional 9, de El Carmén a Salta, próximo ao dique, [-24.531°, -65.367°], 1519 m alt., 28 Mar 2014, *C.L. Silva-Luz and L.F. Luz 292*, fr. (NY, RB, SPF); rota nacional 9, de El Carmén a Salta, próximo ao dique, [-24.542°, -65.363°], 1643 m alt., 28 Mar 2014, *C.L. Silva-Luz and L.F. Luz 293*, fr. (NY, RB, SPF); La Caldera, rota 9 em direção a Salta, [-24.523°, -65.354°], 1561 m alt., 19 Dec 2014, *C.L. Silva-Luz and L.F. Luz 326*, fl. (NY, RB, SPF); Salta, lagunas de Yala, 4 Jan 1971, *A. Krapovickas and C.L. Cristóbal 17489*, fr. (CTES, MBM). **Bolivia.** —Chuquisaca: Sud Cinti, Puca Pampa, aproximadamente a 5 km de puesto ganadero, en la parte NW del río Alborniyoj., [-20.733°, -64.500°], 2100 alt., 8 Feb 2004, *J. Gutiérrez et al. 500*, fr. (HSB, MO, NY). —Tarija: Aniceto Arce, El Carmen [-22.029°, -64.841°], 2600 m alt., 12 Feb 2006, *F. Zenteno et al. 3690*, fr. (LPB, NY). Burnet O'Connor, rota 11, de Entre Ríos a Tarija, a cerca de 184 km de Villamontes, [-21.406°, -64.293°], 1976 m alt., 9 Jan 2014, *C.L. Silva-Luz and L.F. Luz 243*, fl. (NY, RB, SPF); rota 11, de Entre Ríos a Tarija, a cerca de 184 km de Villamontes, [-21.412°, -74.288°], 1907 m alt., 9 Jan 2014, *C.L. Silva-Luz and L.F. Luz 241*, fr. (NY, RB, SPF); rota 11, de Entre Ríos a Tarija, a cerca de 184 km de Villamontes, [-21.409°, -74.293°], 1976 m alt., 9 Jan 2014, *C.L. Silva-Luz and L.F. Luz 242*, fr. (NY, RB, SPF). Eustaquio Méndez, 10.4 km SW Tomatas (5 km N of Tarija), rincon de La Victoria, [-21.533°, -64.833°], 2200–2300 m alt., 10 May 1983, *J.C Solomon 10610*, fl. (LPB, MO, NY).

7. ***Schinus obliqua*** Silva-Luz & J.D.Mitch., sp. nov. Type: Bolivia. Tarija, prov. Burnet O'Connor, area de Los Canalitos, 55–60 km de Tarija hacia Entre Rios, 2050 m alt., 23 Nov 1996, *J.R.I. Wood 11623* (holotype: LPB!).

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

Shrubs or trees 1.8–4 m tall, *Schinus obliqua* differs from all other species in *S.* section *Myrtifolia* by its distinct blade with basal width asymmetrical and its indumentum being densely clavate-glandular, hirsute, or villous on the veins of both surfaces. *Schinus obliqua* is similar to *S. villosa* because of its villous branches and hirsute or villous leaves, but it differs by the median internodes of its staminate inflorescences being 2.7–5 mm long (vs. 0.5–1.4 mm long in the latter) and pistillate inflorescences being 10–30 mm long (vs. 5–7 mm long).

Unarmed shrubs or trees, 1.8–4 m tall. **Branches** erect, sparsely villous or clavate-glandular. **Trichomes** simple, barbellate or barbed and transparent or cream-colored, clavate-glandular and transparent or orange; erect, (slightly) sigmoid or straight, sometimes nutant or arcuate, 0.2–0.6 mm long on branches and leaves, and 0.1–0.3 mm long on inflorescences. **Leaves** sparse throughout the stem; petiole 4–10 mm long, canaliculate, densely villous or clavate-glandular on both surfaces; blade 3.5–9.3 × 2.1–4.9 cm, often ovate, sometimes lanceolate; apex obtuse, rounded; medially asymmetrical, basal insertion asymmetrical, basal width markedly asymmetrical, base obtuse, rounded or truncate; margin entire or entire on proximal portion and crenate-serrate or twice-crenate on distal portion, slightly revolute on proximal portion; texture chartaceous, sometimes coriaceous; costal secondaries in 8–16 pairs, spacing irregular, course arcuate, angle smoothly increasing toward base; marginal secondary vein 0.08–0.09 mm in width, inconspicuous; tertiary veins visible; on abaxial side the midvein prominent proximally and prominulous distally, secondary veins prominulous or flat, tertiary veins flat, clavate-glandular, hirsute or villous, densely so on veins; on adaxial side the midvein prominent proximally and prominulous distally, secondary veins flat medially and impressed toward margin, tertiary veins impressed, clavate-glandular, hirsute or villous, densely on veins; dull on both surfaces. **Inflorescences** axillary or terminal, villous or clavate-glandular; bracts dimorphic, smaller ones 0.4–0.8 × 0.4–0.5 mm, deltate, larger ones 2.5–6.5 × 1 mm, obovate or oblanceolate; bracteoles 0.2–0.4 × 0.08–0.2 mm, lanceolate or ovate; bracts and bracteoles densely villous or hirsute on both surfaces. **Staminate inflorescences** 14–48 mm long, flowers in pseudoracemes, often branched at base, sometimes thyrsoids, cymes or solitary, median internodes 2.7–5 mm long. **Staminate flowers** with pedicel 3–8.1 mm long, the articulation not visible, hirsute, villous or clavate-glandular, often bracteoles present on the pedicel; sepals 0.8–1.3 × 0.9–1.4 mm, (broadly) oblong or ovate, pilose, densely hirsute or clavate-glandular on both surfaces; petals (1.6–)1.9–2.5 × (1–)1.2–1.8 mm, (broadly) ovate or obovate, convex or concave, midvein branching at apex, glabrous; antesepalous and antepetalous stamens (1–)1.4–1.5 and 0.8–1.2 mm long, respectively; anthers 0.4–0.6 mm long, ovate, oblong or lanceolate in dorsiventral view, (broadly) oblong in lateral view; disk 0.4–0.7 mm tall and ca. 0.08–0.2 mm thick, sparsely hirsute; pistillode 0.3–0.6 mm long. **Pistillate inflorescences** 10–30 mm long, flowers in pseudoracemes, median internodes 1–2.9 mm long. **Pistillate flowers** with pedicel 2.7–6 mm long, the articulation not visible, hirsute, villous or clavate-glandular, often bracteoles present on the pedicel; sepals 0.7–0.9 × 0.8–1 mm, (broadly) ovate, pilose, densely hirsute or clavate-glandular on both surfaces; petals 1.4–1.6 × 0.7–1.1 mm, oblong or ovate, concave, midvein branching at apex, glabrous; pistil 1.2–1.5 mm long, glabrous; ovary globose, laterally compressed, style 0.08–0.2 mm long; antesepalous and antepetalous staminodes 0.5–0.6 mm long and 0.3–0.5 mm long, respectively, antherodes 0.3–0.5 mm long; disk 0.4–0.7 mm tall and ca. 0.08–0.2 mm thick, glabrous. Fruiting pedicel (1.5–)2.5–5.2 mm long, the articulation not visible, villous or hirsute. **Drupes** 5.4–7 × 6.1–6.7 mm, globose, laterally compressed, exocarp red, sparsely hirsute or glabrescent. Figures 3A, 9A–G.

Vernacular Names—None reported.

Phenology—There is a limited number of specimens that document that this species flowers in May and September-November, and fruits in September.

Distribution and Habitat—*Schinus obliqua* is endemic to the Tarija department in southern Bolivia. It occurs on steep slopes in Southern Andean Yungas, as well as in ecotonal areas between these Andean cloud forests and Central Andean Puna (Fig. 3A), in association with *Polylepis*, *Podocarpus*, and *Alnus* forests, between from 2050–2300 m. It is also found in moist shrubby vegetation, sometimes heavily disturbed.

Preliminary Conservation Status—We used IUCN threat assessment criteria to evaluate this news species and determined its status to be Critically Endangered (CR) based on the extent of occurrence (EOO = 38.27 km^2) and as Endangered (EN) according to area of occupancy (AOO = 20.00 km^2). We assign a preliminary IUCN threat status of Critically Endangered CR B1ab(iii,iv) because this species has only been collected near roads in southern Bolivia, and the vegetation near these roads is disturbed by agriculture and cattle grazing.

Taxonomic Notes—*Schinus obliqua* is a new taxon that is often misidentified as other previously described species that occur in sympatry such as *S. meyeri*, *S. myrtifolia*, and *S. venturii*. *Schinus obliqua* is readily separated from those species because of its leaf characteristics including blades medially asymmetrical with basal width also asymmetrical, base rounded or truncate, and indumentum hirsute or villous on both surfaces (Fig. 9A, D, E). Specimens from Cercado province have staminate flowers with smaller petals and sepals (1.6 × 1 and 0.5 × 0.6 mm, respectively).

Representative Specimens—**Bolivia.** —TARIJA: Burnet O'Connor, Area de Los Canalitos, 55–60 km de Tarija, hacia Entre Ríos, 2050 m alt., 23 Nov 1996, *J.R.I. Wood 11623*, fl. (holotype: LPB); [-21.455°, -64.342°], 2100 m alt., 12 Oct 2005, *S.G. Beck and D. Barrientos 31464*, fl. (LPB, NY); ca. 70 km on road from Tarija to Entre Ríos, [-21.433°, -64.316°], 2200 m alt., 20 Sep 1991, *M. Kessler 3133, 3139*, fl., fr. (LPB); ca. 6 km E of pass on Tarija-Entre Ríos road, [-21.450°, -64.433°], 2300 m alt., 20 Sep 1991, *M. Kessler 3163*, fl. (LPB). Cercado, 54.9 km E of Tarija-Padcaya road, on road to Entre Ríos, [-21.483°, -64.333°], 2050 m alt., 1 May 1983, *J.C. Solomon 10327*, fl. (LPB, MO).

8. ***Schinus subtridentata*** (Kuntze) Silva-Luz, stat. nov. *Schinus huyngan* var. *subtridentata* Kuntze, Revis. Gen. Pl. 3(3): 46. 1898, as "*subtridentatus*". *Schinus andina* var. *subtridentata* (Kuntze) F.A.Barkley, Brittonia 5(2): 179, as "*andinus* var. *subtridentatus*". 1944. TYPE: BOLIVIA. Cochabamba, 26 March 1892, *O. Kuntze* s.n. (lectotype designated here: NY 00050894!, isolectotype: B [presumed destroyed]).

Unarmed or inconspicuous thorny shrubs, sometimes tree(lets), 0.3–4 m tall. **Branches** erect, sparsely hirsute or clavate-glandular. **Trichomes** simple and transparent or clavate-glandular and transparent or orange; erect, straight, 0.04–0.1 mm long on branches, leaves and inflorescences. **Leaves** sparse throughout the stem; petiole 1–5 mm long, semi-terete or slightly canaliculate, hirsute or clavate-glandular, sometimes pilose on both surfaces; blade 0.7–2.4 × 0.7–1.4 cm, (broadly) ovate, oblong or obovate, sometimes orbicular; apex obtuse, rounded or truncate; medially

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

subsymmetrical, basal insertion (sub)symmetrical, basal width (sub)symmetrical, base obtuse, sometimes acute, rounded or decurrent, rarely cordate; margin entire on proximal portion and (slightly) crenate on distal portion, flat or revolute, sparsely strigose or hirsute; coriaceous; costal secondaries in 5–7 pairs, spacing often regular, course straight or arcuate, angle uniform, inconsistent or smoothly increasing toward base; marginal secondary vein 0.1–0.2 mm in width, conspicuous; tertiary veins not visible; on abaxial side the midvein prominent, secondary veins flat, rarely prominulous or impressed, (densely) hirsute or densely clavate-glandular; on adaxial side the midvein flat or prominulous proximally and impressed distally, secondary veins impressed, hirsute or clavate-glandular, often conspicuous on midvein; dull, sometimes glossy on both surfaces. **Inflorescences** axillary or terminal, clavate-glandular or puberulous; bracts dimorphic, smaller ones 0.3–0.8 × 0.5–1 mm, (broadly) deltate, larger ones 6 × 5.5 mm, deltate or ovate; bracteoles 0.2–0.4 × 0.1–0.5 mm, ovate or deltate; bracts and bracteoles sparsely pilose, puberulous or clavate-glandular on both surfaces. **Staminate inflorescences** 8–15 mm long, flowers in pseudoracemes, branched at base, sometimes densely branched distally, median internodes 1–2 mm long. **Staminate flowers** with pedicel 1.4–1.6 mm long, portion distal to articulation 0.5–0.6 mm long, hirsute or clavate-glandular, bracteoles subtending pedicel; sepals 0.3–0.7 × 0.5–0.7 mm, ovate or deltate, puberulous or clavate-glandular on both surfaces, conspicuous on margin; petals 1–1.7 × 0.8–1.3 mm, ovate or oblong, concave, midvein branching at apex, essentially glabrous on both surfaces, rarely puberulous on margin; antesepalous and antepetalous stamens 0.8–1.1 and 0.6–1 mm long, respectively; anthers 0.3 mm long, (broadly) oblong or ovate in dorsiventral view, oblong in lateral view; disk 0.3–0.4 mm tall and ca. 0.1 mm thick, glabrous; pistillode 0.3–0.5 mm long. **Pistillate inflorescences** 6–16 mm long, flowers in lax pseudoracemes, median internodes 1–1.5 mm long. **Pistillate flowers** with pedicel 1–2 mm long, portion distal to articulation 0.5 mm long or the articulation not visible, hirsute or clavate-glandular, bracteoles subtending pedicel; sepals 0.4–0.6 × 0.6–0.7 mm, ovate, puberulous or clavate-glandular on both surfaces, conspicuous on margin; petals 1.1–1.4 × 0.8–1 mm, ovate, concave, midvein branching at apex, essentially glabrous on both surfaces, rarely puberulous on margin; pistil 0.7–1.1 mm long, glabrous; ovary globose, laterally compressed, style 0.08 mm long; antesepalous and antepetalous staminodes 0.4 mm long and 0.3–0.4 mm long, respectively, antherodes 0.1–0.2 mm long; disk 0.3–0.4 mm tall and ca. 0.1 mm thick, glabrous. Fruiting pedicel 2.3–2.5 mm long, the articulation not visible, puberulous or clavate-glandular. **Drupes** 5–5.2 × 5–6.3 mm, globose or obliquely ovoid, laterally compressed, exocarp red or pink, glabrous. Figures 3B, 10I–P.

Vernacular Names—Huayruro (*O. Murguia* 1), huislulu (*E. Morales* 237; O. *Murguia 370*), luyo-luyo (*V. Arrázola 193.3*), luyu-luyu (*M. Cárdenas 2268*; *I. Hensen 1268*), suilulu (*S.G. Beck* 2), wizlulu (*S.G. Beck and M. Liberman 9548*; *G. Torrico and C. Peca 120*).

Phenology—Even though there are flowering records from January–December, it seems that there is a lack of data for fruiting collections, with only records from February–April, June, August, and December.

Distribution and Habitat—*Schinus subtridentata* is endemic to Bolivia and a relatively widespread distributed and common species in that country, occurring from La Paz and Cochabamba departments toward the south central part of the country in Chuquisaca and Potosí departments. It is distributed in dry areas of Bolivian Montane Dry Forest, Central Andean Puna, and Central Andean Wet Puna (Fig. 3B), however it shows a preference to grow on dry or semi-humid rocky slopes where patches of Bolivian Yungas and Southern Andean Yungas develop, often in association with open forests of *Polylepis*, between 2400–3900 m.

Preliminary Conservation Status—We evaluated the IUCN threat status of *Schinus subtridentata* to be as Least Concern (LC) based on the extent of occurrence (EOO = 64,519.99 km^2) and as Endangered (EN) according to area of occupancy (AOO = 148.00 km^2). Although some collections are from Cochabamba, an area under threat from development, populations are also found in less populated areas of south Bolivia and probably under less human pressure. The numerous available collections suggest that *Schinus subtridentata* is a common species, and since it occurs on steep slopes, in areas where access can be difficult, the collection density may be underestimated. The extent of occurrence likely encompasses suitable habitat for this species, thus we assign the preliminary IUCN threat status of Least Concern (LC).

Taxonomic Notes—According to the morphological analysis, most specimens previously identified as *Schinus andina* (here considered as illegimate name and synonym of *S. microphylla*) match the type material of *S. andina* var. *subtridentata* (Kuntze) F.A.Barkley (here considered as *S. subtridentata*). The combination made by Barkley (1944) was based on *Schinus huyngan* Kuntze var. *subtridentata* Kuntze. For the latter variety, Kuntze (1898) cited two collections, a specimen collected by Hieronymus in Sierra Achala, Argentina, and a specimen collected by Kuntze in Cochabamba, Bolivia, both specimens without collection numbers. There are two Kuntze annotated specimens at the NY herbarium that might be these collections he cited. The Kuntze specimen from Bolivia corresponds to *Schinus subtridentata*. The Hieronymus specimen from Sierra Achala, in Cordoba, Argentina, could possibly be assigned to *S. praecox* (Griseb.) Speg. or *S. pilifera* (neither species is treated in this taxonomic revision), because of the conspicuous thorns, but the specimen is in poor condition. Thus, we chose the Kuntze specimen as the lectotype for *Schinus huyngan* var. *subtridentata*.

Schinus subtridentata can be found in sympatry with *S. congestiflora*. Although both species have similar inflorescence lengths, the former species usually has staminate flowers with shorter pedicels (1.4–1.6 mm long vs. 1.3–2.5 mm long in *S. congestiflora*) and pistillate inflorescences with longer median internodes (1–1.5 mm long vs. 0.5–1 mm long in *S. congestiflora*). Moreover, *Schinus subtridentata* has coriaceous leaves (vs. chartaceous), costal secondary veins with spacing usually regular (vs. usually irregular), and tertiary veins not visible (vs. barely visible).

Populations of *Schinus subtridentata* and *S. minutiflora* may also co-occur, but the former species has staminate inflorescences 8–15 mm long and dimorphic bracts, whereas the latter species has staminate inflorescences 6–8 mm long and monomorphic bracts.

Specimens of *Schinus subtridentata* distributed in Chuquisaca (Bolivia) have distinct (broadly) ovate leaves, which are densely hirsute abaxially (Fig. 10M).

Schinus subtridentata and *S. microphylla* occur in sympatry, but the former species has leaves with secondary vein angle uniform, inconsistent or smoothly increasing toward base, as in Fig. 10L–M (vs. smoothly decreasing toward base, see

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

Fig. 6B), and staminate and pistillate inflorescences with the median internodes 1–2 mm long and 1–1.5 mm, respectively (vs. 1.7–3.5 mm and 1.7–2 mm, respectively).

***Representative Specimens*—Bolivia. —**CHUQUISACA: Maragua, cercanias de Sucre, [-18.995°, -65.419°], 3062 m alt., 4 Aug 2007, *M. Velayos et al. 11118*, fl., fr. (LPB, MA); Maragua, 3320 m alt., 23 Aug 1980, *S.G. Beck 2*, fl. (LPB, NY); Capilla de Chataquilla, camino hacia Chaunaca, [-18.991°, -65.400°], 3496 m alt., 25 May 2006, *E. Cervantes et al. 13*, fl. (HSB, MO); Sucre, sobre el camino 1 km antes de la división departamental entre Potosí y Sucre, 3100 m alt., 19 Sep 2006, *I. Linneo et al. 774*, fl. (MO, USZ); summit of Cerro Obispo, 3500 m alt., 30 Dec 1993, *J.R.I. Wood 7794*, fl. (LPB). —COCHABAMBA: Arani, 49.3 km E of the bridge over the río Pucará (at Punata), on the road to Santa Cruz, [-17.433°, -65.483°], 3100–3300 m alt., 20 Oct 1985, *J.C. Solomon 14444*, fl. (LPB, MBM, MO, SI); cerca de Tiraque, camino de Cochabamba - Santa Cruz, 3400 m alt., 4 Nov 1988, *I. Hensen 223*, fl. (LPB). Carrasco, Incallajta ruins, 15 km S Monte Punco, [-17.616°, -65.416°], 3000 m alt., 15 Aug 1991, *M. Kessler 2977*, fl., fr. (LPB). Quillacollo, 60 km de Cochabamba, en dirección a Camino Cantón Sipe Sipe, comunidad de Choroko Exp. E-NE, 3900 m alt., 15 Dec 1988, *M. Liberman 2300*, fl. (LPB, MO, NY); Siberia-Copachuncho, a unos 155 km de la ciudad de Cochabamba, próximos al pueblito de Copachuncho, [-17.772°, -65.039°], 2847 m alt., 22 Sep 2007, *J. Teran et al. 1125*, fl. (LPB, MO, NY); the road between Cochabamba and Santa Cruz, 107 km from Cochabamba, Geviñapamba, [-17.566°, -65.300°], 3100 m alt., 21 Apr 1987, *J. Brandbyge 712*, fl., fr. (LPB, MO); a 40 km de Epizana por la carretera que conduce a Santa Cruz, 3100 m alt., 26 Dec 1982, *J.F. Casas 7790*, fl., fr. (NY, MO); quebrada de Zapata Rancho, camino viejo Cbba, 3200 m alt., 20 Mar 1991, *I. Hensen 1906*, fl. (LPB); Cercado, Pajcha, [-17.320°, -66.136°], 3340 m alt., 10 Mar 2004, *E. Gutierrez et al. 696*, sterile (BOLV, MO); 26 Mar 1892, *O. Kuntze*, s.n., fl. (lectotype: NY, isolectotype: B [presumed destroyed]). Arque, com. Huancani, 3600 m alt., 9 Jul 1991, *P. Ibisch 112*, fl. (LPB). LA PAZ: 10.000 ped., 1890, *A.M. Bang 160*, fl. (GH, MO, US); along the río Khatu from the footbridge of the Cambillaya-Cochabambita trail to the mouth of the río Jokho Pampa, ca. 4 km W of Inquisivi, [-16.916°, -67.166°], 2450 m alt., 18 Jan 1989, *M. Lewis 35118*, sterile (LPB, MO, NY). Charazani-Tal, 3150 m alt., 30 Mar 1980, *T. Feuerer 4019*, fr. (NY); along the road ca. 1–2 km W of Inquivisi, [-16.900°, -67.150°], 2900 m alt., 13 Mar 1989, *M. Lewis 35361*, fl. (LPB, MO, NY); Inquivisi, along the Río Khatu from the footbridge of the Cambillaya-Cochabambita trail to the mouth of the Río Jokho Pampa, ca. 4 km W of Inquivisi [-16.916°, -67.166°], 2450 m alt., 18 Jan 1989, *M. Lewis 35118*, fl. (LPB, MO). Quime, 7 km, hacia Caxata, 3420 m alt., 19 Feb 1981, *S.G. Beck 4376*, fl., fr. (LPB, NY, SI). POTOSÍ: Charcas, 20 Jun 1993, *G. Torrico and C. Peca 533*, fl., fr. (LPB, NY). Chayanta, comunidad de Pajri Cuchu, próximo a Ranchos, 3780 m alt., 12 March 1993, *G.Torrico and C. Peca 120*, fl., fr. (LPB, NY).

9. ***Schinus tarijensis*** Silva-Luz and J.D.Mitch., sp. nov. TYPE: BOLIVIA. Tarija, cuenca del río Camacho, río Lanurejoy, 2540 m alt., Exp. N., Incl. 35-40°, frente al la comunidad de Camacho, 20 Dec 1987, *M. Liberman and S.G. Beck 1563* (holotype: LPB!).

Shrubs, sometimes tree(lets) 1–4 m tall, similar to *Schinus congestiflora* because both have chartaceous obovate leaves with overlapping dimensions of 1.4–3 × 0.9–1.2 cm and 1.5–3 (–3.5) × 1–1.6(–1.9–2.2) cm, respectively. *Schinus tarijensis* differs from *S. congestiflora* by its pistil and fruit being densely hirsute or clavate-glandular, fruit sometimes glabrescent and 6–7 × 6.2–8 mm (vs. *S. congestiflora* with pistil and fruit glabrous, fruits 4–5.5 × 4.5–6.4 mm). *Schinus tarijensis* is similar to *S. microphylla* because of its congested leaves; however, *S. tarijensis* differs from the latter by its larger leaves, while *S. microphylla* has leaves of 0.9–1.2 × 0.6–1 cm.

Unarmed shrubs, sometimes tree(lets), 1–4 m tall. **Branches** erect, hirsute, tomentose or clavate-glandular. **Trichomes** simple, barbellate and transparent or clavate-glandular and transparent or orangish; erect or appressed, straight or arcuate, sometimes nutant, 0.2 mm long on branches, 0.03 mm on leaves, 0.08 mm on inflorescences and 0.08–0.2 mm on fruits. **Leaves** clustered at stem apex; petiole 1–5 mm long, canaliculate, on abaxial surface puberulous, on adaxial surface densely pilose, puberulous or clavate-glandular; blade 1.4–3 × 0.9–1.2 cm, obovate or oblong; apex obtuse, rounded; medially (sub)symmetrical, basal insertion symmetrical, basal width (sub)symmetrical, base acute, cuneate; margin often entire on proximal portion and crenate on distal portion, slightly revolute, strigose or pilose; texture chartaceous; costal secondaries in 8–9 pairs, spacing often irregular, course straight or arcuate, angle uniform or smoothly decreasing toward base; marginal secondary vein 0.04–0.1 mm in width, inconspicuous; tertiary veins sometimes visible; on abaxial side the midvein flat or flat proximally and slightly impressed distally, secondary veins flat or slightly impressed, tertiary veins flat, strigose or pilose on midvein, especially on proximal portion, rest of surface clavate-glandular; on adaxial side the midvein prominulous on proximal portion and flat toward apex, secondary veins impressed, tertiary veins flat, strigose or pilose on midvein, especially on proximal portion, rest of surface clavate-glandular; dull on both surfaces. **Inflorescences** axillary, clavate-glandular or pilose; bracts monomorphic, 0.6–0.8 × 0.3–0.5 mm, (broadly) deltate; bracteoles 0.3–0.4 × 0.2–0.3 mm, usually oblong, sometimes ovate; bracts and bracteoles clavate-glandular or pilose on both surfaces, conspicuous on margin. **Staminate inflorescences** 4–7 mm long, flowers in lax pseudoracemes, median internodes 1.1–1.4 mm long. **Staminate flowers** with pedicel 3 mm long, portion distal to articulation 1.2 mm long, densely pilose, hirsute or clavate-glandular, bracteoles subtending pedicel; sepals 0.9–1 × 0.8–0.9 mm, (broadly) ovate, hirsute, pilose or sparsely clavate-glandular on abaxial surface and margin, glabrous on adaxial surface; petals 1.7 × 1.5 mm, (broadly) oblong, convex, midvein branching at apex, essentially glabrous; antesepalous and antepetalous stamens 1.3 and 0.8 mm long, respectively; anthers 0.4–0.5 mm long, (broadly) oblong in dorsiventral and lateral views; disk 0.3–0.5 mm tall and ca. 0.08–0.2 mm thick, glabrous; pistillode 0.8 mm long. **Pistillate inflorescences** 6–8 mm long, flowers in lax pseudoracemes, median internodes 1–1.1 mm long. **Pistillate flowers** with pedicel 1.6–2.7 mm long, portion distal to articulation 0.4–1 mm long, densely pilose, hirsute or clavate-glandular, bracteoles subtending pedicel; sepals 0.4–0.8 × 0.5–0.8 mm, ovate, hirsute, pilose or sparsely clavate-glandular on abaxial surface and margin, glabrous on adaxial surface; petals 1.4–1.6 × 0.8–1.1 mm, oblong or ovate, concave, midvein branching at apex, essentially glabrous; pistil 1.4–1.5 mm long, densely hirsute or clavate-glandular; ovary globose, style 0.1 mm long; antesepalous and antepetalous staminodes 0.4–1 mm long and 0.3–0.5 mm long, respectively, antherodes 0.3 mm long; disk 0.3–0.5 mm tall and ca. 0.08–0.2 mm thick, glabrous. Fruiting pedicel 2–3 mm long, portion distal to articulation 1.2 mm long, pilose, puberulous or clavate-glandular. **Drupes** 6–7 × 6.2–8 mm, obliquely globose or ovoid, laterally compressed, exocarp red or pink, conspicuous hirsute or clavate-glandular, sometimes glabrescent. Figures 3B, 10A–H.

***Vernacular Names*—**None reported.

***Phenology*—**There are a limited number of specimens that document that this species flowers in Nov–Jan, and fruits in Nov–Dec and Feb.

Distribution and Habitat*—Schinus tarijensis* is endemic to south Bolivia, in Tarija department. It occurs in area of Central Andean Puna, however it shows a preference to grow in humid shrubby slopes where patches of Southern Andean Yungas develop (Fig. 3B), often in association with *Alnus* and *Polylepis* forests, between 2200–3300 m.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

***Preliminary Conservation Status*—**We preliminarily evaluated the IUCN threat status as Endangered (EN) B1ab(iii,iv) +2ab(iii,iv) based both on extent of occurrence (EOO = 194.08 km^2) and area of occupancy (AOO = 16.00 km^2). *Schinus tarijensis* is known from a few records, most of them from Tariquía Flora and Fauna National Reserve. Since its area of occurrence comprises a relatively large protected area in Bolivia, low collection densities may be related to fieldwork gaps.

Taxonomic Notes*—Schinus tarijensis* is very distinct from other species of *S.* sect. *Myrtifolia* because of its leaves usually clustered at stem apex (Fig. 10D), flowers with pistil densely hirsute or clavate-glandular (Fig. 10E–F), the fruits that are relatively large (6–7 × 6.2–8 mm) and conspicuously hirsute (Fig. 10H) or clavate-glandular, sometimes glabrescent.

Schinus tarijensis may co-occur with *S. meyeri* and *S. venturii*, but *S. tarijensis* differs from *S. meyeri* and *S. venturii* by having obovate leaves and inflorescences with monomorphic bracts (Fig. 10A–B), while *S. meyeri* and *S. venturii* have ovate or ovate-lanceolate leaves (Fig. 4H, N) and inflorescences with dimorphic bracts (Fig. 4O).

This species may also co-occur with *Schinus myrtifolia* but differs from it by having shorter staminate and pistillate inflorescences (4–7 mm and 6–8 mm long, respectively vs. 15–30 mm and 9–23 mm long, respectively).

***Representative Specimens*—Bolivia.** —Tarija: Aniceto Arce, Padcaya, reserva Nacional de Flora y Fauna Tariquía, bajando el cerro Alisos, 2550 m alt., 11 Nov 2004, *M. Serrano et al. 5050*, fl., fr. (HSB, MO, NY); El Carmen [-22.027°, -64.837°], 2650 m alt., 11 Feb 2006, *F. Zenteno et al. 3649*, fl. (CTES, LPB); cerro Pabellón, arriba de la población de Cañas [-21.900°, -64.900°], 2600 m alt., 15 Mar 1998, *S.G. Beck et al. 26058*, fl. (LPB, M, NY); cuenca del río Camacho, río Lanurejoy, frente al la comunidad de Camacho, 2540 m alt., 20 Dec 1987, *M. Liberman and G. Beck 1563*, fl., fr. (holotype: LPB, isolectotypes: M, NY); Padcaya, reserva Nacional de Flora y Fauna Tariquía, bajando el cerro Alisos, 2550 m alt., 11 Nov 2004, *M. Serrano et al. 5055*, fl. (HSB, MO, NY); El Carmen, [-22.027°, -64.837°], 2650 m alt., 11 Feb 2006, *F. Zenteno et al. 3657*, fr. (LPB, NY, TA). José María Avilés, El Carmen, Huayco Hondo, [-22.024°, -64.835°], 2550 m alt., 11 Feb 2006, *S. Gallegos et al. 354*, fr. (LPB, NY); El Carmen, Huayco Hondo, [-22.027°, -64.835°], 2550 m alt., 11 Feb 2006, *S. Gallegos et al. 346*, fr. (LPB, NY); El Carmen, Huayco Hondo, [-22.027°, -64.835°], 2550 m alt., 11 Feb 2006, *S. Gallegos et al. 367*, sterile (LPB, NY); Calderillo, 3300 m alt., 7 Jan 1904, *K. Fiebrig 2477*, fl. (GH, LP, MO, US).

10. Schinus venturii F.A.Barkley, Brittonia 5(2): 179. 1944. Type: Bolivia. Bermejo, 1000 m alt., 27 Nov 1903, *K. Fiebrig 2291* (holotype: MO–160106!; isotypes: F V0047692F [photo]!, GH 00049192, LIL [photo]!, NY 01043207!, US 00930529!).

Unarmed tree(lets) or shrubs, 2.5–5 m tall. **Branches** prostrate, puberulous, sparsely clavate-glandular or glabrous. **Trichomes** simple and transparent or clavate-glandular and transparent or orangish-red; erect or appressed, straight, 0.03–0.06 mm long on branches, 0.1 mm long on leaves and 0.03–0.06 mm long on inflorescences. **Leaves** sparse throughout the stem; petiole 3–15 mm long, (slightly) canaliculate or semi-terete, puberulous or clavate-glandular on both surfaces; blade 3.5–5.7 × 1.7–2.5 cm, ovate or ovate-lanceolate; apex obtuse, rarely acute, rounded, sometimes straight; medially (sub)symmetrical, basal insertion (sub)symmetrical, basal width symmetrical or asymmetrical, base obtuse, decurrent, sometimes rounded; margin entire or entire on proximal portion and crenate, crenate-serrate, or erose on distal portion, slightly revolute, puberulous on proximal portion; texture often chartaceous; costal secondaries in 11–14 pairs, spacing irregular, course arcuate, angle inconsistent; marginal secondary vein 0.04–0.1 mm in width, inconspicuous, tertiary veins barely visible; on abaxial side the midvein prominent proximally and prominulous distally, secondary veins flat or prominulous, tertiary veins flat, clavate-glandular; on adaxial side the midvein prominent or prominulous on proximal portion and flat toward apex, secondary veins flat medially and conspicuous impressed toward margin, tertiary veins impressed; puberulous on midvein, rest of surface clavate-glandular; dull on both surfaces. **Inflorescences** axillary or terminal, puberulous or sparsely clavate-glandular; bracts dimorphic, smaller ones 0.3–1.3(–2) × 0.6–0.9 mm, (broadly) deltate or ovate, larger ones 1.5–3.6 × 2–2.8 mm, ovate; bracteoles 0.2–0.6 × 0.2–0.3 mm, ovate; bracts and bracteoles pilose, puberulous or sparsely clavate-glandular on both surfaces, sometimes only on margin; pedicel puberulous or clavate-glandular, sometimes bracteoles present on the pedicel. **Staminate inflorescences** 8–30 mm long, flowers in congested pseudoracemes, often branched at base, rarely solitary, median internodes 1.3–2.7 mm long. **Staminate flowers** with pedicel 1.7–3.5 mm long, the articulation not visible, puberulous or clavate-glandular, sometimes bracteoles present on the pedicel; sepals 0.7–1.1 × 0.6–1.1 mm, (broadly) ovate, puberulous or clavate-glandular, sometimes glabrous on both surfaces, puberulous on margin; petals 1.7–2.3 × 1.3–1.5 mm, ovate, obovate or oblong, concave, midvein sometimes branching at apex, glabrous; antesepalous and antepetalous stamens 1.2–1.5 and 1–1.2 mm long, respectively; anthers 0.4–0.6 mm long, ovate or (broadly) oblong in dorsiventral view, oblong in lateral view; disk 0.3–0.6 mm tall and ca. 0.1 mm thick, glabrous; pistillode 0.3–0.5 mm long. **Pistillate inflorescences** 12–35 mm long, flowers in lax pseudoracemes, median internodes 1.4–3.2 mm long. **Pistillate flowers** with pedicel 2.6–5.7 mm long, the articulation not visible, puberulous or clavate-glandular, sometimes bracteoles present on the pedicel; sepals 0.6–1 × 0.8–1 mm, (broadly) ovate or deltate, conspicuous concave, puberulous or clavate-glandular, sometimes glabrous on both surfaces, puberulous on margin; petals 1.4–2 × 0.6–1.2 mm, ovate, obovate or oblong, concave, midvein sometimes branching at apex, glabrous; pistil 1–1.4 mm long, glabrous; ovary globose, laterally compressed, style 0.2 mm long; antesepalous and antepetalous staminodes 0.5–0.8 mm long and 0.4–0.6 mm long, respectively, antherodes 0.2–0.4 mm long; disk 0.3–0.6 mm tall and ca. 0.1 mm thick, glabrous. Fruiting pedicel 3–5 mm long, the articulation not visible, puberulous or clavate-glandular. **Drupes** 5.2–6.5 × 6.1–6.5 mm, obliquely ovoid, laterally compressed, exocarp pink or red, sparsely hirsute or glabrescent. Figures 2B, 4M–R.

***Vernacular Names*—**Not reported.

***Phenology*—**Flowers March–May and August–November, and fruits in March, August, and November–December.

Distribution and Habitat*—Schinus venturii* is restricted to Tarija department in southern Bolivia, and in scattered populations in Salta and Jujuy provinces in northwestern Argentina. It occurs in Southern Andean Yungas, in association with *Podocarpus*, *Polylepis*, and *Alnus* forests. It also occurs in ecotones between Southern Andean Yungas and arid areas of Central Andean Puna or Dry Chaco (Fig. 2B), between 1200–2677 m.

***Preliminary Conservation Status*—**We evaluated the IUCN threat status of *Schinus venturii* as Vulnerable (VU) based on the extent of occurrence (EOO = 12,965.57 km^2) and as Endangered (EN) according to area of occupancy (AOO = 64.00 km^2). Most of the *Schinus venturii* collections are from the Tariquía Flora and Fauna National Reserve, along roads,

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

and also near Calilegua National Park. This species occurs within a large protected area in Bolivia, and low collection densities are probably due to access constraints or to fieldwork gaps. Given that there is a good amount of protected and otherwise undisturbed habitat within the species distribution, we assign an IUCN threat status of Vulnerable VU B1ab(iii,iv) as also assigned by IUCN red list (Prado 1998). Threats to this species are related to annual and perennial non-timber crops, as well as livestock farming and ranching (Prado 1998).

Taxonomic Notes*—Schinus venturii* can be found in the same area with *S. gracilipes*, *S. meyeri*, *S. myrtifolia*, *S. obliqua*, and *S. tarijensis*.

Schinus venturii differs from *S. gracilipes* by the margin completely entire or entire on the proximal portion and crenate, crenate-serrate, or erose on the distal portion (Fig. 4M–N), and the flower pedicel with articulation not visible, as seen in Fig. 4O (vs. completely crenate, crenate-serrate, twice-serrate or erose, as in Fig. 4A, and the flower pedicel articulated).

Schinus venturii differs from *S. meyeri* because its leaves are often chartaceous and the tertiary veins are barely visible (vs. membranaceous, sometimes chartaceous, and tertiary veins visible, as in Fig. 4H). Additionally, *Schinus venturii* has the petiole (slightly) canaliculate or semi-terete (vs. deeply canaliculate), staminate inflorescences that are congested, as seen in Fig. 4N (vs. inflorescences lax, see Fig. 4I) with median internodes 1.3–2.7 mm long (vs. 2.1–5 mm long), and petals with the midvein sometimes branching at apex (vs. midvein branching from the median portion toward apex).

Schinus venturii can be distinguished from *S. myrtifolia* because of its ovate or ovate-lanceolate leaves (vs. broadly elliptic or oblong, rarely ovate, see Fig. 5F, I, J, L).

Schinus venturii has leaves medially (sub)symmetrical, the basal width symmetrical or asymmetrical, and the secondary vein angle inconsistent; whereas, *S. obliqua* has leaves medially asymmetrical, basal width asymmetrical, and the secondary veins smoothly increasing toward base (Fig. 9D).

Schinus venturii can be differentiated from *S. tarijensis* because the former species has ovate or ovate-lanceolate leaves, and pistils that are glabrous (Fig. 4R), whereas the latter species has obovate leaves (Fig. 10A, D), and pistils that are densely hirsute or clavate glandular (Fig. 10E–F).

***Representative Specimens*—Argentina.** —Jujuy: Ledesma, Abra de Las Cañas, 9 Apr 1971, *P.R. Legname and A.R. Cuezzo 7944C*, fl. (LIL, US). Valle Grande, 2 Dec 1969, *P.R. Legname and A.R. Cuezzo 7275C*, fr. (LIL, LP). —Salta: Orán, cordillera oriental, sierra de Zenta, entre Trancas y San Andrés, [-23.083°, -64.866°], 2200 m alt., 21 Apr 1998, *A. Schinini et al. 34717*, fl. (CTES, GH, LPB, NY). Santa Victoria, Los Toldos, Guaico Grande, 1850 m alt., 19 Aug 1971, *F. Vervoost and P.R. Legname 4492*, fl. (LIL, NY, US); Toldos, Guaico Grande, 1750 m alt., 19 Aug 1971, *F.B. Vervoorst and P.R. Legname 4493*, fl., fr. (BAA, LIL). **Bolivia.** —Tarija: Aniceto Arce, Padcaya, Cantón Emborozú, Reserva Natural Alarachi, Pendiente Superior, Cerro Los Tejerinas, [-22.198°, -64.607°], 1960 m alt., 17 Sep 2004, *M. Serrano et al. 4865*, fl. (MO, USZ); comunidad Guayavillas, 23.8 km S of Padcaya on road to Bermejo, [-21.983°, -64.666°], 2100 m alt., 5 May 1983, *J.C. Solomon 10481*, fl. (LPB, MO); Padcaya, Reserva Nacional de Flora y Fauna Tariquía, subiendo la Escalera, vertiente W, cerro Alisos, 2494 m alt., 27 Nov 2004, *M. Serrano and J. Villalobos 5347*, fl., fr. (HSB, MO, NY); Bermejo, 27 Nov 1903, *K. Fiebrig 2291*, fl, fr. (holotype: MO, isotypes: GH, LIL, NY, SI, US). Burnet O'Connor, 21.1 km on road to Entre Ríos, [-21.450°, -64.333°], 1900 m alt., 1 Oct 1983, *J.C. Solomon 10927*, fl. (CTES, LPB, MO, NY); sobre la carretera hacia la comunidad Honduras, [-21.448°, -64.202°], 1620 m alt., 9 Mar 2006, *F. Zenteno et al. 4517*, fl., fr. (LPB, NY); [-21.436°, -64.320°], 2150 m alt., 12 Oct 2005, *S.G. Beck and D. Barrientos 31470*, fl. (LPB, NY); 10.8 km W of Narvaez (Canaletas), [-21.416°, -64.316°], 2200 m alt., 3 May 1983, *J.C. Solomon 10458*, fl. (CTES, LPB, MO, NY). Cercado, Tarija, 25 km NW, Rincon de La Victoria, 2340 m alt., 23 Mar 1979, *S.G. Beck 795*, sterile (MO).

11. ***Schinus villosa*** Silva-Luz and J.D.Mitch., sp. nov. Type: Bolivia. Prov. Belisario Boeto, c. 5 km S of Nuevo Mundo at summit of road to Villa Serrano, 2300 m alt., 18 Oct 1997, *J.R.I. Wood 12708* (holotype: LPB!).

Shrubs or tree(lets), 1.8–6 m tall., *Schinus villosa* is similar to *S. obliqua* because of its villous indumentum and cream-colored trichomes. *Schinus villosa* differs from *S. obliqua* by having pistillate flower pedicels being 1.6–2.1 mm long (vs. pistillate flowers with pedicels 2.7–6 mm long in the latter).

Unarmed shrubs or tree(lets), 1.8–6 m tall. **Branches** erect, villous. **Trichomes** simple, barbellate or bulbous and cream-colored or clavate-glandular and transparent or orange; erect, sigmoid or straight, 0.2–0.8 mm long on branches, (0.1–) 0.2–0.5 mm long on leaves and inflorescences. **Leaves** sparse throughout the stem; petiole 1–5 mm long, canaliculate, villous on both surfaces; blade 2.2–4.5 × 1–2.3 cm, often ovate or ovate-lanceolate, sometimes oblong or elliptic; apex obtuse, rarely acute, rounded, sometimes truncate or straight; medially (sub)symmetrical, basal insertion symmetrical, basal width asymmetrical, base acute or obtuse, cuneate or decurrent; margin often entire on proximal portion and crenate or crenate-serrate on distal portion, sometimes entire or erose, conspicuous revolute; texture chartaceous; costal secondaries in 6–12 pairs, spacing irregular, course arcuate, angle uniform or smoothly increasing toward base, marginal secondary vein 0.06–0.09 mm in width, inconspicuous; tertiary veins visible; on abaxial side the midvein prominent, secondary veins prominulous or flat, tertiary veins flat, villous, hirsute or clavate-glandular; on adaxial side the midvein obscurely prominent proximally and flat or impressed distally, secondary veins conspicuously impressed, tertiary veins flat, villous, hirsute or clavate-glandular, densely or sparsely so on midvein; dull on both surfaces. **Inflorescences** axillary or terminal, sparsely pilose or clavate-glandular; bracts dimorphic, smaller ones 0.3–0.7 × 0.5–0.8 mm, deltate, larger ones 0.8 × 0.6 mm, ovate; bracteoles 0.2–0.4 × 0.1–0.2 mm, lanceolate or (narrowly) ovate; bracts and bracteoles villous abaxially, glabrous adaxially. **Staminate inflorescences** 9–45 mm long, flowers in congested pseudoracemes, often branched at base, median internodes 0.5–1.4 mm long. **Staminate flowers** with pedicel 1.3–3.8 mm long, the articulation not visible, hirsute; sepals 0.5–1 × 0.6–0.8 mm, ovate, tomentose, hirsute, puberulous or clavate-glandular, densely on margin; petals 1.6–2.2 × 1–1.4 mm, ovate or obovate, concave, midvein branching at apex, pilose on midvein and margin, rest of surface sparsely tomentose or glabrous; antesepalous and antepetalous stamens 1–1.6 and (0.7–)1–1.3 mm long, respectively; anthers 0.4–0.5 mm long, ovate in dorsiventral view, (broadly) oblong in lateral view; disk 0.3–0.6 mm tall and ca. 0.08–0.1 mm thick, glabrous or sparsely hirsute; pistillode 0.3–0.5 mm long. **Pistillate inflorescences** 5–7 mm long, flowers in lax pseudoracemes, median internodes 0.6–1 mm long. **Pistillate flowers** with pedicel 1.6–2.1 mm long overall, portion distal to articulation 0.8 mm long, sparsely tomentose, hirsute, puberulous or clavate-glandular; sepals 0.5–0.9 × 0.4–0.9 mm, ovate, tomentose, hirsute, puberulous or clavate-glandular, densely on margin; petals 1.1–1.5 × 0.8–1.2 mm, ovate or obovate, concave, midvein branching at apex, pilose on midvein and

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

margin, rest of surface sparsely tomentose or glabrous; pistil 0.8–1.1 mm long, glabrous; ovary globose, laterally compressed, style 0.08–0.1 mm long; antesepalous and antepetalous staminodes 0.4–0.7 mm long and 0.3–0.6 mm long, respectively, antherodes 0.2–0.3 mm long; disk 0.3–0.6 mm tall and ca. 0.08–0.1 mm thick, glabrous or sparsely hirsute. Fruiting pedicel 1.8–2 mm long, portion distal to articulation 1 mm long or the articulation not visible, sparsely pilose, puberulous or clavate-glandular. **Drupes** 4.2–5.5 × 4.8–6 mm, red, obliquely globose or ovoid, laterally compressed, exocarp pink or light purple, glabrous. Figures 3A, 9H–M.

Vernacular Names—Yulu-yulu (*J.D. Muñoz 1352*).

Phenology—Flowers February–April, July–August, and October–December, and fruits February–May, July–August, October, and December.

Distribution and Habitat—*Schinus villosa* is an endemic species to south central of Bolivia, occurring in Chuquisaca and Santa Cruz departments. It occurs on steep hillsides, often in areas disturbed by agriculture and cattle grazing, in Southern Andean Yungas or in ecotonal areas between these Andean cloud forests and Bolivian Montane Dry Forest (Fig. 3A), in association with *Podocarpus* and *Polylepis* forests, between 1883–2540 m alt.

Preliminary Conservation Status—We assign a preliminary IUCN threat status as Endangered (EN) B1ab(iii,iv)+ 2ab(iii,iv) based both on extent of occurrence (EOO = 2,185.49 km^2) and area of occupancy (AOO = 52.00 km^2). The low collection densities of *Schinus villosa* could be related to fieldwork gaps since roads are limited in this area. Populations are not known to occur within protected areas.

Taxonomic Notes—*Schinus villosa* co-occurs with and resembles *S. minutiflora* individuals that have sparsely villous branches and leaves, and ovate leaves (e.g. *Villalobos et al. 113*, *Teran 540*). They can be distinguished because *Schinus villosa* has petals that are pilose on the midvein and margins, whereas *S. minutiflora* has glabrous petals.

Representative Specimens—**Bolivia.** —Chuquisaca: Belisario Boeto, c. 5 km S of Nuevo Mundo at summit of road to Villa Serrano, 2300 m alt., 18 Oct 1997, *J.R.I. Wood 12708*, fl., fr. (holotype: LPB); El Pity, 20 km al NW de V. Serrano [-19.012°, -64.334°], 2480 m alt., 2 Mar 1995, *J.D. Muñoz 1352*, fl., fr. (NY); comunidad Huerta Mayu, 3 km al SW de la localidad de Villa Serrano, 2200 m alt., 27 Feb 1994, *M. Serrano 656*, fl., fr. (NY); ciudad Muyu Monte, 25 km al NE de Villa Serrano, 2650 m alt., 4 Jul 1993, *J. Teran 540*, fl., fr. (LPB, NY); 22 km en el camino saliendo de Serrano a Nuevo Mundo, 2290 m alt., 3 Apr 2003, *J.R.I. Wood et al. 19576*, fl., fr. (HSB, LPB); 18 km de Villa Serrano hacia Valle Grande, [-18.950°, -64.333°], 2500 m alt., 27 Aug 1994, *M. Moraes and I. Vargas 1834*, fl., fr. (LPB, MO, NY); Villa Serrano, comunidad Potreros, área de influencia del Parque Nacional y área de Manejo Integrado Serranía del Iñao, [-19.081°, -64.085°], 1883 m alt., 20 Aug 2005, *J. Villalobos et al. 113*, fl. (MO); Villa Serrano, comunidad Nuevo Mundo, camino a Phyti, [-19.005°, -64.333°], 2469 m alt. 18 Aug 2005, *J. Villalobos et al. 84*, fl. (HSB, MO); camino de Villa Serrano a 2 km de llegar a las Pampas del Tigre, [-19.116°, -64.366°], 2258 m alt., 14 Dec 2004, *J.R.I. Wood and H. Huaylla 21198*, fl. (LPB); Villa Serrano, comunidad Nuevo Mundo, trayecto del puente Del Diablo a la Pajcha, [-19.020°, -64.281°], 2284 m alt., 28 Nov 2005, *J. Villalobos et al. 401*, fl. (HSB, MO); aprox. 20 minutos de Serrano, trayecto a Pampas del Tigre en el sector el Arrayan, [-19.090°, -64.252°], 2267 m alt., 15 May 2004, *A. Lliully 768*, fr. (MO). Juana Azurduy de Padilla, Tarvita, comunidade Cuñuripampa, [-19.748°, -64.491°], 2092 m alt., 11 Dec 2007, *J. Villalobos 1016*, fr. (HSB, MO, NY). Santa Cruz: Vallegrande, 5 km (by air) NW of Los Sitanos, 1 km N of turnoff to Sitanos Altos on road from Abra Tabla to Los Sitanos, [-18.841°, -64.000°], 2025 m alt., 29 Dec 1989, *M.H. Nee 38351*, fr. (NY).

Acknowledgments

This study is part of a Ph.D. thesis by the first author and was supported by FAPESP awards 2013/04345-2, 2014/18490-7, and by IAPT Research Grant Program 2014 granted to Silva-Luz, and by FAPESP award 2014/18002-2 to Pirani. We thank all herbaria cited for access to material and information; Rosa Isela Meneses for assisting in the acquisition of the collection permit in Bolivia; Barbara Thiers for granting access to the NYBG herbarium. We also thank Marc Appelhans, who helped with the type issues of *Schinus myrtifolia*; Jörn Hentschel, who gave important insight about the type material of *Schinus minutiflora*; members of dissertation committee for their helpful comments; Jefferson Prado for valuable discussions about nomenclature; Daniela Zappi, who provided English revision of the manuscript; Juliana Lovo for helping in the editing of images; Fernanda Alves for preparation of the distribution map; and Luciano Luz, who generously provided support during fieldwork.

Author Contributions

CSL provided morphological data, photographs, distribution maps, conservation status, and was the primary author for all the sections of the manuscript except the palynology section and the primary author of the new species description. JM is the second author of some of the new species descriptions and provided critical review of the manuscript. DD and SP provided critical review of the manuscript. CB provided palynological data. PP provided palynological data and was the primary author for the palynology section. JP is the second author of some of the new species description and provided critical review of the manuscript.

Literature Cited

Antonelli, A., J. A. A. Nylander, C. Persson, and I. Sanmartín. 2009. Tracing the impact of the Andean uplift on Neotropical plant evolution. *Proceedings of the National Academy of Sciences USA* 106: 9749–9754.

Bachman, S., J. Moat, A. W. Hill, J. de la Torre, and B. Scott. 2011. Supporting Red List threat assessments with GeoCAT: Geospatial conservation assessment tool. *ZooKeys* 150: 117–126.

Barkley, F. A. 1944. *Schinus* L. *Brittonia* 5: 160–198.

Barkley, F. A. 1957. A study of *Schinus* L. *Lilloa* 28: 5–110.

Barkley, F. A. 1973. *Schinus meyeri*, una nueva especie de Anacardiaceas. *Lilloa* 23: 293–296.

Barrett, S. C. H. and J. Hough. 2013. Sexual dimorphism in flowering plants. *Journal of Experimental Botany* 64: 67–82.

Barros, M., O. M. Barth, and K. M. R. Costa. 1999. Catálogo sistemático de pólen das plantas arbóreas do Brasil Meridional XXXII: Anacardiaceae. *Leandra* 14: 17–24.

Beentje, H. and J. Williamson. 2010. *The Kew Plant Glossary: An Illustrated Dictionary of Plant Terms*. Surrey, England: Kew Publishing.

Bell, C. D. and M. J. Donoghue. 2005. Phylogeny and biogeography of Valerianaceae (Dipsacales) with special reference to the South America valerians. *Organisms, Diversity & Evolution* 5: 147–159.

Blandin, P. and Y. Gareca. 2011. A new subspecies of *Morpho* (*Grasseia*) *godartii* Guérin-Méneville, [1844], discovered in sub-humid forests from southern Bolivian Andes (Lepidoptera, Nymphalidae). *Bulletin de la Société Entomologique de France* 116: 291–300.

BGCI and IUCN SSC Global Tree Specialist Group. 2019a. *Schinus microphylla*. The IUCN Red List of Threatened Species 2019: e.T146074118A146074120. https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T146074118A146074120.en. (accessed 21 September 2022).

BGCI and IUCN SSC Global Tree Specialist Group. 2019b. *Schinus myrtifolia*. The IUCN Red List of Threatened Species 2019: e.T146076892A146076894. https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T146076892A146076894.en (accessed 21 September 2022).

Cabrera, A. L. 1937. *Schinus polygamus* (Cav.) Cabrera. Pp. 269 in *Obra del Centenario del Museo de La Plata*, vol. 2, ed. J. Frenguelli. La Plata, Argentina: Museo de La Plata.

Cabrera, A. L. 1938. Revisión de las Anacardiáceas Austroamericanas. *Revista del Museo de La Plata. Sección Botánica* 2: 3–64.

Cabrera, A. and A. Willink. 1973. *Biogeografía de América Latina*. Washington, DC: Organization of American States, Regional Program of Scientific and Technological Development.

Chen, Z. and J. Li. 2004. Phylogenetics and biogeography of *Alnus* (Betulaceae) inferred from sequences of nuclear ribosomal DNA ITS region. *International Journal of Plant Sciences* 165: 325–335.

Churchill, S. P. and R. Lozano. 2009. Bryophytes of the Tucuman-Bolivian montane forest, Bolivia. *Tropical Bryology* 30: 19–42.

Cracraft, J. 1985. Historical biogeography and patterns of differentiation within the South American avifauna: Areas of endemism. Pp. 49–84 in *Neotropical Ornithology*, eds. P. A. Buckley, M. S. Foster, E. S. Morton, R. S. Ridgely, and F. G. Buckley. Washington, DC: American Ornithologists' Union.

Cruz-Barros, M. A. V. and C. R. Granito. 1997. Flora polínica da reserva do Parque Estadual das Fontes do Ipiranga (São Paulo, Brasil). Família: 114 –Anacardiaceae. *Hoehnea* 24: 175–178.

Danielson, J. J. and D. B. Gesch. 2011. Global multi-resolution terrain elevation data 2010 (GMTED2010). *US Geological Survey Open-File Report 2011-1073*.

Dinerstein, E., D. Olson, A. Joshi, C. Vynne, N. D. Burgess, E. Wikramanayake, N. Hahn, S. Palminteri, P. Hedao, R. Noss, M. Hansen, H. Locke, E. C. Ellis, B. Jones, C. V. Barber, R. Hayes, C. Kormos, V. Martin, E. Crist, W. Sechrest, L. Price, J. E. M. Baillie, D. Weeden, K. Suckling, C. Davis, N. Sizer, R. Moore, D. Thau, T. Birch, P. Potapov, S. Turubanova, A. Tyukavina, N. de Souza, L. Pintea, J. C. Brito, O. A. Llewellyn, A. G. Miller, A. Patzelt, S. A. Ghazanfar, J. Timberlake, H. Klöser, Y. Shennan-Farpón, R. Kindt, J. Barnekow Lillesø, P. van Breugel, L. Graudal, M. Voge, K. F. Al-Shammari, and M. Saleem. 2017. An ecoregion-based approach to protecting half the terrestrial realm. *Bioscience* 67: 534–545.

Ellis, B., D. C. Daly, L. J. Hickey, K. R. Johnson, J. D. Mitchell, P. Wilf, and S. L. Wing. 2009. *Manual of Leaf Architecture*. Ithaca, New York: Cornell University Press.

Emmons, L. H. 1997. Mammals of the Río Urucuti Basin, south central Chuquisaca, Bolivia. Pp. 30–33 in *A Rapid Assessment of the Humid Forests of South Central Chuquisaca, Bolivia, RAP Working Papers 8*, eds. T. S. Schulenberg and K. Awbrey. Washington, DC: Conservation International.

Erdtman, G. 1952. *Pollen Morphology and Plant Taxonomy: Angiosperms*. Stockholm: Almqvist and Wiksell.

Erdtman, G. 1960. The acetolysis method, a revised description. *Svensk Botanisk Tidskrift* 54: 561–564.

Ferro, L. I., J. J. Martínez, and R. M. Barquez. 2010. A new species of *Phyllotis* (Rodentia, Cricetidae, Sigmodontinae) from Tucumán province, Argentina. *Mammalian Biology* 75: 523–537.

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

Fjeldså, J. and S. Mayer. 1996. *Recent Ornithological Surveys in the Valles Region, Southern Bolivia – and the Possible Role of Valles for the Evolution of the Andean Avifauna.* DIVA Technical Report 1. Kalø, Denmark: Centre for Research on Cultural and Biological Diversity of Andean Rainforests.
Fleig, M. 1989. Anacardiáceas. Pp. 1–64 in *Flora Ilustrada Catarinense*, ed. R. Reitz. Itajaí: Herbário Barbosa Rodrigues.
Gareca, Y. and Y. Blandin. 2011. *Morpho* (*Morpho*) *helenor* (Cramer) (Lepidoptera, Nymphalidae, Morphinae) in Bolivia: Geographical distribution and ecological plasticity, with a description of a new subspecies. *Zootaxa* 3130: 30–56.
Geml, O., N. Pastor, L. Fernandez, S. Pacheco, T. A. Semenova, A. G. Becerra, C. Y. Wicaksono, and E. R. Nouhra. 2014. Large-scale fungal diversity assessment in the Andean Yungas forests reveals strong community turnover among forest types along an altitudinal gradient. *Molecular Ecology* 23: 2452–2472.
Gentry, A. H. 1992. Diversity and floristic composition of Andean forests of Peru and adjacent countries: Implications for their conservation. *Memorias del Museo de Historia Natural. Javier Prado* 21: 11–29.
Grisebach, A. H. R. 1879. Symbolae ad Floram Argentinam. *Abhandlungen der Königlichen Gesellschaft der Wissenschaften zu Göttingen* 24: 222.
Hughes, C. and R. Eastwood. 2006. Island radiation on a continental scale: Exceptional rates of plant diversification after uplift of the Andes. *Proceedings of the National Academy of Sciences USA* 103: 10334–10339.
IUCN. 2022. The IUCN Red List of Threatened Species. Version 2021–3. https://www.iucnredlist.org.
Johnston, I. M. 1938. New or noteworthy plants from temperate South America. *Journal of the Arnold Arboretum* 19: 248–263.
Josse, C., F. Cuesta, G. Navarro, V. Barrena, E. Cabrera, E. Chacón-Moreno, W. Ferreira, M. Peralvo, J. Saito, and A. Tovar. 2009. *Ecosistemas de los Andes del Norte y Centro. Bolivia, Colombia, Ecuador, Perú y Venezuela.* Lima: Secretaría General de la Comunidad Andina, Programa Regional ECOBONA-Intercooperation, CONDESAN Proyecto Páramo Andino, Programa BioAndes, EcoCiencia, NatureServe, IAvH, LTAUNALM, ICAE-ULA, CDC-UNALM, and RUMBOL SRL.
Kessler, M. 1999. Plant species richness and endemism during natural landslide succession in a perhumid montane forest in the Bolivian Andes. *Ecotropica (Bonn)* 5: 123–136.
Kier, G., H. Kreft, T. M. Lee, W. Jetz, P. L. Ibisch, C. Nowicki, J. Mutke, and W. Barthlott. 2009. A global assessment of endemism and species richness across island and mainland regions. *Proceedings of the National Academy of Sciences USA* 106: 9322–9327.
Kuntze, O. 1898. Anacardiaceae. Pp. 44–46 in *Revisio Generum Plantarum*, vol. 3, ed. O. Kuntze. Leipzig: A. Felix.
Lagomarsino, L. P., A. Antonelli, N. Muchhala, A. Timmermann, S. Mathews, and C. C. Davis. 2014. Phylogeny, classification, and fruit evolution of the species-rich Neotropical bellflowers (Campanulaceae: Lobelioideae). *American Journal of Botany* 101: 2097–2112.
Lenzi, M. and A. I. Orth. 2004. Fenologia reprodutiva, morfologia e biologia floral de *Schinus terebinthifolius* Raddi (Anacardiaceae) em restinga da Ilha de Santa Cataria, Brasil. *Biotemas* 17: 67–89.
Lloyd, D. G. and C. J. Webb. 1977. Secondary sex characters in plants. *Botanical Review* 43: 177–216.
Luebert, F. and M. Weigend. 2014. Phylogenetic insights in Andean plant diversification. *Frontiers in Ecology and Evolution* 2: 27.
Macbride, J. F. 1951. Anacardiaceae, Flora of Peru. *Field Museum of Natural History, Botanical series*. 13: 238–258.
Mallet, J. 1995. A species definition for the modern synthesis. *Trends in Ecology & Evolution* 10: 294–299.
Marchand, N. L. 1869. *Révision du Groupe des Anacardiacées.* Paris: Balliere, Sons.
Markgraf, V. and H. L. D'Antoni. 1978. *Pollen Flora of Argentina: Modern Spore and Pollen types of Pteridophyta, Gymnospermae and Angiospermae.* Tucson: The University of Arizona Press.
Moraes, M., A. Araujo-Murakami, A. Fuentes, N. Tejedor Garavito, C. Blundo, L. Malizia, and S. Pacheco. 2019. *Schinus meyeri*. The IUCN Red List of Threatened Species 2019: e.T42532548A42533563. https://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T42532548A42533563.en. (last accessed October 2021).
Muñoz, J. D. 2000. Anacardiaceae. Pp. 1–28 in *Flora Fanerogamica Argentina*, ed. A. T. Hunkizer. Cordoba: Proflora (Conicet).
Mutke, J., R. Jacobs, K. Meyers, T. Henning, and M. Weigend. 2014. Diversity patterns of selected Andean plant groups correspond to topography and habitat dynamics, not orogeny. *Frontiers in Genetics* 5: 351.
Myers, N., R. A. Mittermeier, C. G. Mittermeier, G. A. B. da Fonseca, and J. Kent. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403: 853–858.
Myster, R. W. 2021. *The Andean Cloud Forest*. Cham, Switzerland: Springer.
Ojeda, R. A., R. M. Barquez, J. Stadler, and R. Brandl. 2008. Decline of mammal species diversity along the Yungas Forest of Argentina. *Biotropica* 40: 515–521.
Olson, D. M., E. Dinerstein, E. D. Wikramanayake, N. D. Burgess, G. V. N. Powell, E. C. Underwood, J. A. D'Amico, I. Itoua, H. E. Strand, J. C. Morrison, C. J. Loucks, T. F. Allnutt, T. H. Ricketts, Y. Kura, J. F. Lamoreux, W. W. Wettengel, P. Hedao, and K. R. Kassem. 2001. Terrestrial ecoregions of the world: A new map of life on Earth. *Bioscience* 51: 933–938.
Pennington, R. T. and C. W. Dick. 2010. Diversification of the Amazonian flora and its relation to key geological and environmental events: A molecular perspective. Pp. 373–385 in *Amazonia: Landscape and Species Evolution. A Look into the Past*, eds. C. Hoorn and F. P. Wesselingh. Oxford, UK: Blackwell.
Pérez-Escobar, O. A., A. Zizka, M. A. Bermúdez, A. S. Meseguer, F. L. Condamine, C. Hoorn, H. Hooghiemstra, Y. Pu, D. Bogarín, L. M. Boschman, R. T. Pennington, A. Antonelli, and G. Chomicki. 2022. The Andes through time: Evolution and distribution of Andean floras. *Trends in Plant Science* 27: 364–378.
Perger, R. and F. Guerra. 2012. Two new tiger beetle (Coleoptera, Carabidae, Cicindelitae) species from the Tucuman-Bolivian forest in the National Tariquía Reserve, Bolivia. *Zootaxa* 3434: 49–58.
Perger, R. and F. Guerra. 2013. Longhorn beetles (Coleoptera: Cerambycidae) of the Tucuman-Bolivian forest in the Tariquía Flora and Fauna National Reserve, southern Bolivian Andes, with notes on ecoregion endemism and conservation. *The Pan-Pacific Entomologist* 89: 209–221.
Prado, D. 1998. *Schinus gracilipes* var. *pilosus*. The IUCN Red List of Threatened Species 1998:e.T38205A10104678. https://dx.doi.org/10.2305/IUCN.UK.1998.RLTS.T38205A10104678.en. (last accessed October 2021).
Punt, W., P. P. Hoen, S. Nilsson, and A. Le Thomas. 2007. Glossary of pollen and spore terminology. *Review of Palaeobotany and Palynology* 143: 1–81.
QGIS Development Team. 2015. QGIS 2.6.1 Brighton. Geographic Information System. Open Source Geospatial Foundation Project. http://doc.qgis.org.
Richter, M., K.-H. Diertl, P. Emck, T. Peters, and E. Beck. 2009. Reasons for an outstanding plant diversity in the tropical Andes of Southern Ecuador. *Landscape Online* 12: 1–35.
Särkinen, T. E., S. Knapp, and M. Nee. 2015. Two new non-spiny *Solanum* species from the Bolivian Andes (Morelloid Clade). *PhytoKeys* 47: 97–109.
Schulenberg, T. S., B. K. Holst, R. B. Foster, and L. H. Emmons. 1997. Introduction. Pp. 6–11 in *A Rapid Assessment of the Humid Forests of South Central Chuquisaca, Bolivia.* RAP Working Papers 8, eds. T.S. Schulenberg and K. Awbrey. Washington, DC: Conservation International.
Silva-Luz, C. L., J. R. Pirani, J. D. Mitchell, D. Daly, N. V. Capelli, D. Demarco, S. K. Pell, and G. M. Plunkett. 2019. Phylogeny of *Schinus* L. (Anacardiaceae) with a new infrageneric classification and insights into evolution of spinescence and floral traits. *Molecular Phylogenetics and Evolution* 133: 302–351.
Stafleu, F. A. and R. S. Cowan. 1976. *Taxonomic Literature* 2nd Ed, vols. 1–7. Utrecht: Bohn, Scheltema and Holkema.
Steudel, B. 2011. A new species of *Stelis* (Pleurothallidinae, Orchidaceae) from South Yungas, Bolivia. *Phytotaxa* 38: 49–52.
Swenson, J. J., B. E. Young, S. Beck, P. Comer, J. H. Córdova, J. Dyson, D. Embert, F. Encarnación, W. Ferreira, I. Franke, D. Grossman, P. Hernandez, S. K. Herzog, C. Josse, G. Navarro, V. Pacheco, B. A. Stein, M. Timaná, A. Tovar, C. Tovar, J. Vargars, and C. M. Zambrana-Torrelio. 2012. Plant and animal endemism in the eastern Andean slope: Challenges to conservation. *BMC Ecology* 12: 1.
Takeda, I. J. M., P. V. Farago, M. K. Souza, and V. V. Gelinski. 2000. Catálogo polínico do Parque Estadual de Vila Velha, Paraná – 1ª Parte. *Arquivos de Ciências da Saúde da UNIPAR* 6: 61–73.
Tank, D. C. and R. G. Olmstead. 2009. The evolutionary origin of a second radiation of annual *Castilleja* (Orobanchaceae) species in South America: The role of long distance dispersal and allopolyploidy. *American Journal of Botany* 96: 1907–1921.
Thiers, B. 2022 (continuously updated). Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden. http://sweetgum.nybg.org/science/ih/.
Varela, F. J. and L. J. Novara. 2007. Anacardiaceae Lindl. Flora del Valle de Lerma. *Aportes Botánicos de Salta - Serie Flora* 8: 1–28.
Vásquez, R. and P. L. Ibisch. 2000. *Orquídeas de Bolivia/Orchids of Bolivia. Diversidad y Estado de Conservación/Diversity and Conservation Status*, vol. 1, Pleurothallidinae. Santa Cruz de la Sierra, Bolivia: Editorial FAN.
Vásquez, R., P. L. Ibisch, and B. Gerkmann. 2003. Diversity of Bolivian Orchidaceae – a challenge for taxonomic, floristic and conservation research. *Organisms, Diversity & Evolution* 3: 93–102.
Wolfe, K. L. and D. Herbin. 2002. A new *Citheronia* from Bolivia and its immature stages. *Nachrichten des Entomologischen Vereins Apollo* 23: 49–52.
World Wildlife Fund. 2012. Terrestrial Ecoregions of the World. https://www.worldwildlife.org/publications/terrestrial-ecoregions-of-the-world (last accessed October 2021).

APPENDIX 1. Numerical list of taxa.

1. *Schinus congestiflora* Silva-Luz & Pirani
2. *Schinus gracilipes* I.M.Johnst.
3. *Schinus meyeri* F.A.Barkley
4. *Schinus microphylla* I.M.Johnst.
5. *Schinus minutiflora* Silva-Luz & Pirani
6. *Schinus myrtifolia* (Griseb.) Cabrera
7. *Schinus obliqua* Silva-Luz & J.D.Mitch.
8. *Schinus subtridentata* (Kuntze) Silva-Luz
9. *Schinus tarijensis* Silva-Luz & J.D.Mitch.
10. *Schinus venturii* F.A.Barkley
11. *Schinus villosa* Silva-Luz & J.D.Mitch.

APPENDIX 2. Index to scientific names in *Schinus* sect. *Myrtifolia*. Accepted names are in **boldface;** synonym taxa are in *italics*. Each name is followed by its number (for synonyms, the number of its accepted name) in this paper.

Schinus congestiflora Silva-Luz & Pirani, 1
Schinus gracilipes I.M.Johnst., 2
Schinus gracilipes var. *pilosa* Barkley, 2
Schinus meyeri F.A.Barkley, 3
Schinus microphylla I.M.Johnst., 4
Schinus dependens Ortega var. *parviflora* Marchand, 4
Duvaua dependens (Ortega) DC. var. *parviflora* (Marchand) Arechaval., 4
Schinus polygama (Cav.) Cabrera fo. *parviflora* (Marchand) Cabrera, 4
Schinus polygama (Cav.) Cabrera var. *parviflora* (Marchand) F.A.Barkley, 4
Schinus dependens Ortega var. *crenata* Engl., 4
Duvaua dependens (Ortega) DC. var. *crenata* (Engl.) Arechaval., 4
Schinus dependens Ortega var. *andina* Engl., 4
Schinus andina (Engl.) I.M.Johnst., 4
Schinus minutiflora Silva-Luz & Pirani, 5
Schinus dependens var. *andina* Engl. fo. *grandifolia* Loes., 5
Schinus myrtifolia (Griseb.) Cabrera, 6
Cybianthus myrtifolius Griseb., 6
Schinus obliqua Silva-Luz & J.D.Mitch., 7
Schinus subtridentata (Kuntze) Silva-Luz, 8
Schinus huyngan var. *subtridentata* Kuntze, 8

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

Schinus andina var. *subtridentata* (Kuntze) F.A.Barkley, 8
Schinus tarijensis Silva-Luz & J.D.Mitch., 9
Schinus venturii F.A. Barkley, 10
Schinus villosa Silva-Luz & J.D.Mitch., 11

Appendix 3. List of exsiccatae. The numbers in parentheses correspond to the species numbers in the preceding numerical list of taxa.

Abbott, J. and Jardim, A. 17233 (1)
Acevedo-Rodriguez, P. 6574 (1)
Ahumada, O. and Aguero, J. 8342 (3)
Ahumada, O. and Rotman, A. 4372 (6)
Altamirano, J.P. 474 (1)
Apaza, O. et al. 32 (5)
Arbo, M.M. et al. 9084 (3)
Araque, J. s.n. (2)
Araque, J. and Balegno, B. 112 (2)
Arrázola, V. 193.3 (8)
Arroyo, L. 3937 (1)
Arroyo, L. et al. 1839 (1), 1883 (5), 3875 (5), 3969 (1), 4795 (5)
Balcazar, J. and Montaño, S. 728 (1)
Bang, A.M. 160 (8), 895 (4)
Beck, S.G. 2 (8), 795 (10), 1370 (4), 2335 (4), 2363 (4), 3922 (4), 4228 (4), 4238 (4), 4260 (4), 4376 (8), 6296 (5), 8652 (4), 8462 (4), 11368 (4), 11658 (4), 14337 (4), 17233 (4), 22894 (5)
Beck, S.G. and Barrientos, D. 31464 (7), 31470 (10)
Beck, S.G. and Liberman, M. 9348 (5), 9351 (5), 9548 (8), 9616 (3), 9656 (3)
Beck, S.G. and Paniagua, N. 26780 (6)
Beck, S.G. and Seidel, R. 14550 (5)
Beck, S.G. et al. 18051 (8), 26058 (9), 29317 (4)
Biloni, J.S. 6023 (6)
Brandbyge, J. 712 (8), 730 (1)
Bricker, J.S. et al. 182 (2)
Brown, et al. 1675 (6)
Brunch, C. s.n. (2)
Burkart, A. 22046 (2), 13141 (6), 13147 (6), 19145 (6)
Burkart, A. and Troncoso, N.S. 23 (6), 11198 (6), 11634 (6)
Burkart, A. et al. 30523 (6)
Cabrera, A.L. 13670 (2), 16269 (6), 16352 (6), 20220 (6)
Cabrera, A.L. and Fabris, H.A. 17441 (6), 19970 (6), 21064 (6), 21072 (6)
Cabrera, A.L. et al. 17340 (6), 24212 (6), 25529 (6), 25816 (6), 27342 (6), 28029 (6), 29774 (6), 29929 (6), 30922 (6), 32003 (6), 32081 (6)
Cañigueral, J. 888 (8)
Cárdenas, M. 2268, (8), 2308 (1), 4107 (8)
Cárdenas, M. et al. 7605 (4)
Chapin, A. 20517 (6)
Carretero, A. et al. 1197 (5)
Casas, J.F. 7758 (1), 7790 (8)
Castellanos, A. s.n. (2), s.n. (6)
Castillon 3512 (2)
Cervantes, E. et al. 13 (8), 174-A (8)
Charpin, A. 23037 (2)
Cialdella, A.M. et al. 67 (2)
Cook, O.F. and Gilbert, G.B. 427 (4)
Coro-Rojas 1428 (3)
Davidson, C. 3751 (8), 3767 (1), 5070 (8)
Del Castillo and Varela, F. 130 (6)
Dematteis, M. and Seijo, G. 751 (2)
Dorr, L. and Barnett, L.C. 6946 (4)
Eynde, K. s.n. (4)
Fabris, H.A. 4624 (6)
Fabris, H.A. et al. 5890 (6), 6330 (6)
Farfán, J. et al. 367 (4)
Fernández, E. et al. 447 (5), 464 (5), 2498 (1), 3553 (5)
Feuerer, T. 4019 (8)
Fiebrig, K. 2291 (10), 2477 (9)
Fuentes, A. and Aldana, C. 6711 (4)
Gallegos, S. et al. 305 (3), 346 (9), 354 (9), 367 (9)
García, E. 403 (4)
García, R.C.A. 545 (6)
Giusti, L. et al. 12090C (3)
Gutierrez, E. et al. 696 (8)
Gutiérrez, J. et al. 500 (6)
Gutte, P. 104 (4)
Hauman, L. s.n. (2)
Heller, E. 2173
Hensen. I. 223 (8), 1268 (8), 1906 (8)
Herrera, F.L. 2104 (4)
Herzog, T.C.J. 1714 (5)
Hilgert, N. 2149 (3)
Hilgert, N. and Arenas, P. 1446 (3), 1482 (3)
Hilgert, N. and Gil, G. 2339 (3)
Huamantupa, I. et al. 3571 (4)
Huaylla, H. and Lozano, R. 617 (5)
Hunziker, A.T. 19161 (2)
Hunziker, A.T. and Ariza 20419 (2)
Hunziker, A.T. et al. 10376 (2)
Ibisch, P. 112 (8)
Jardim, A. and Abbott, R. 2108 (1)
Jimenez, M. et al. 678 (5)
Jiménez, S. et al. 488 (1)
Job, M.M. 1363 (2)
Jörgensen, P. 991 (2)
Juárez, F. et al. 1279 (6)
Keller, H.A. 3162 (2)
Kessler, M. 2991(1), 3133 (7), 3139 (7), 3163 (7), 3243 (5), 2977 (8), 3017 (8)
Kiesling, R. et al. 537 (6)
Krapovickas, A. and Cristóbal, C.L. 17489 (6), 17495 (6), 24477 (2)
Krapovickas, A. and Legname, P.R. 10974 (2)
Krapovickas, A. et al. 26608 (6)
Kuntze, O. s.n. (6), s.n. (6), s.n. (8)
Legname, P.R. 4471 (2)
Legname, P.R. and Cuezzo, A.R. 4194 (2), 5085C (6), 5933C (6), 7274C (6), 7275C (10), 7944C (10), 8110C (10), 8620 (10), 8647 (3), 9757C (3), 9886C (3), 10007C (3)
Lewis, M. 35118 (8), 35286 (4), 35361 (8), 40623 (5)
Liberman, M. 2300 (8)
Liberman, M. and Beck, S.G. 1563 (9)
Liberman, M. et al. 1647 (6)
Lillo, M. 1163 (2), 2060 (2), 5710 (2)
Linneo, I. and Mendizabal, M. 1536 (1)
Linneo, I. et al. 774 (8)
Lliully, A. 768 (11)
Lliully, A. et al. 1193 (5)
López, R. 349 (4)
Lorentz, P.G. and Hieronymus, G.H.E.W. 317 (6), 942 (10), 1185 (2)
Mandon, G. 768 (4)
Marmol, L. s.n. (6), 73 (6), 152 (6)
Mendoza, M. and Galzadilla, E. 444 (1)
Mendoza, M. and Ledezma, R. 499 (5)
Mercado, M. 2048 (1), 2087 (1)
Meyer, T. and Vaca, A.A. 23617 (2)
Moraes, M. 690 (4),
Moraes, M. and Vargas, I. 1809 (5), 1834 (11)
Morales, E. 237 (8)
Moretti 2038 (2)
Morrone, O. et al. 3222 (6), 3247 (6), 3824 (3)
Muñoz, T. 1352 (11)
Murguia, O. 1 (8), 370 (8)
Murguia, O. and Muñoz, T. 228 (1)
Nee, M. 30518 (4), 38351 (11), 38397 (5), 38420 (5), 38440 (5), 38531 (5), 40331 (1), 40702 (1), 40711(1), 40732 (1), 45301 (1), 49631 (1), 50716 (1)
Nee, M.H. and Atha, D. 50015 (1)
Nee, M.H. and Chávez, E. 48946 (1)
Nee, M.H. and Mendoza, M. 52504 (1)
Nee, M.H. et al. 52432 (1), 52429 (1)
Novara, L.J. 2229 (6), 4268 (6), 5145 (3), 5233 (10), 8164 (6), 9100 (3)
Novara, L.J. and Bruno, S. 9393 (2), 12091 (6)
Novara, L.J. et al. 7101 (2), 9100 (3), 11143 (6), 12123 (2)
Nuñez, P. 9280 (4)
Nuñez, P. et al. 7007 (4), 7011 (4)
Obregoso 1117 (6)
Olea, D. 30 (2), 110 (2)
Ortin, A. 1643 (6)
Ortuño, T. 451 (4), 611 (4)
Parada, G.A. and Inturias, Y. 3615 (1)
Parada, G.A. et al. 3607 (1), 3935 (5)
Pentland, J.B. 18 (4)
Renvoize, S.A. 3458 (6)
Renvoize, S.A. et al. 3440 (6)
Ritter, N. 1166 (1)
Rodriguez, D. 29 (2)
Rotman, A. 505 (6), 553 (6), 811 (6), 897 (6)
Rotman, A. and Ahumada, O. 564 (6)
Rusby, H.H. 1446 (4)
Saldías, M. 546 (5)
Saldías, M. et al. 4960 (1)
Schiavone, M.M. et al. 11707C (3), 11883C (3)
Schickendantz, F. 293 (2)
Schinini, A. et al. 10066 (6), 10136 (6), 10153(6), 10286 (6), 34568 (10), 34717 (10)
Schreiter, R. 90 (2), 3312 (2), 6461 (2), 6547 (2), 6669 (2), 10875 (6)
Serrano, M. 656 (11),
Serrano, M. and Villalobos, J. 5347 (10)
Serrano, M. et al. 4865 (10), 5050 (9), 5055 (9), 6805 (5), 6985 (5),
Silva-Luz, C.L. and Luz, L.F. 234 (1), 241 (6), 242 (6), 243 (6), 250(1), 251 (1), 252 (1), 255 (4), 288 (6), 292 (6), 293 (6), 322 (6), 324 (6), 325 (6), 326 (6), 327 (6), 334 (4), 337 (4)
Sleumer, H. and Vervoorst, F. 2787 (6)
Solomon, J.C. 5849 (4), 6747 (4), 10327 (7), 10458 (10), 10481(10), 10610 (6), 10927 (10), 14349(4), 14444 (8), 14529 (8)
Solomon, J.C. and King, R.M. 15916 (1)

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

Solomon, J.C. and Nee, M.H. 16035 (5), 16041 (5)
Sota, E. 2970 (6)
Soto, D. et al. 156 (1)
Spegazzini, C.L. s.n. (2), s.n. (2), 1336 (2), 1337 (2), 1338 (2), 1339 (2), 1357 (6), 1362 (2)
Steinbach, J. 8346 (1)
Steiphen and Tait, J. 32 (4)
Teran, J. et al. 540 (11), 1125 (8), 1303 (5)
Tolaba, J. 446 (6), 1070 (6)
Tolaba, J. and Aquino, V. 2273 (6)
Tolaba, J. et al. 2225 (2)
Toledo, C.S. 11916 (1), 12258 (1), 12533(1), 13602 (2), 13972 (10), 14420 (10)
Toledo, C.S. 11150 (8)
Toledo, C.S. et al. 13440 (2)
Torres, M. et al. 1371 (6)
Torrico, G. and Peca, C. 120 (8), 533 (8)
Tupayachi, A. 674 (4)
Türpe, A.M. et al. 5005 (3), 5018 (3)
Vaca, A.A. 167 (2), 267 (2)
Vargas, I.G. 310 (1), 817 (1), 957 (4), 7046 (1), 8752 (4)
Vargas, I.G. and Prado, E. 1305 (1)
Vargas, I.G. et al. 1508 (1), 2389 (1)
Vargas, L. and Moura, G. 205 (4)
Velayos, M. et al. 11118 (8)
Venturi, S. 198 (2), 2944 (2), 3650 (2), 3887 (2), 4173 (2), 5386 (2), 9571 (2), 9996 (2), 10260 (2), 10525 (6)
Vervoorst, F.B. 8556 (2)
Vervoorst, F.B. and Cuezzo, A.R. 7625C (6)
Vervoorst, F.B. and Legname, P.R. 4492 (10), 4493 (10), 4494 (3), 4561 (6)
Villa and Legname, P.R. 777 (6)
Villalobos, J. 1016 (11)
Villalobos, J. et al. 84 (11), 113 (11), 401 (11)
Wall, E. s.n. (2)
Weberbauer, A. 5552 (4), 5839 (4)
West, J. 3747 (4)
Wood, J.R.I. 7794 (8), 11623 (7), 12708 (11)
Wood, J.R.I. and Goyder, D.J. 16777 (3)
Wood, J.R.I. and Huaylla, H. 21198 (11)
Wood, J.R.I. and Ortuño, T. 19362 (4)
Wood, J.R.I. et al. 18937 (4), 19244 (8), 19554 (5), 19576 (11), 20137 (11), 21299 (1)
Zapata, S.R. 43 (6)
Zenteno, F. et al. 3593 (3), 3649 (9), 3653 (9), 3657 (9), 3690 (6), 4517 (10)
Zuloaga, F.O. and Morrone, O. 7052 (6)
Zuloaga, F.O. et al. 7795 (3), 7617 (6), 7859 (6)

Downloaded From: https://complete.bioone.org/journals/Systematic-Botany on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use