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A new endangered species of *Chusquea* (Poaceae: Bambusoideae) from the Acatlán volcano in central Veracruz, Mexico, and keys to the Mexican *Chusquea* species

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Abstract

Mexico has 19 species of the diverse neotropical bamboo genus *Chusquea,* 15 of them growing in Neotropical cloud forests, with ten of those 19 species endemic to Mexico. The cloud forest is one of the most threatened types of vegetation in Mexico. Based on fieldwork at the Acatlán volcano in the Mexican state of Veracruz and morphological analysis of live and herbarium specimens, here we describe and illustrate a new endemic and endangered *Chusquea* species. *Chusquea enigmatica* is a narrow endemic to volcano Acatlán and has an unusual reduction of vegetative morphological characters. *Chusquea enigmatica* is compared with *C. glauca*, *C. muelleri* and *C. repens*, from which it can be separated by its delicate and erect culms, extravaginal or intravaginal branching pattern and reduction of bud size. *Chusquea enigmatica* only inhabits the rim of the volcano Acatlán in cloud forest dominated by *Fagus grandifolia* in small patches, for which reason we propose to include this species in the IUCN red list under the "endangered" category of protection. Keys to the currently recognized species of *Chusquea* in Mexico are also provided.

Keywords: Bambusoideae, Chusqueinae, endemic, Neotropical cloud forest, Trans-Mexican Volcanic Belt, woody bamboo

Resumen

México tiene 19 species del género de bambú neotropical más diverso, *Chusquea*, donde 15 especies crecen en el bosque mesófilo de montaña, con diez de las 19 especies endémicas a México. El bosque mésofilo es uno de los tipos de vegetación más amenazados en México. Basados en trabajo de campo realizado en el volcán de Acatlán en el estado de Veracruz, México y en el análisis morfológico de especímenes vivos y de herbario, describimos e ilustramos una nueva especie endémica y amenazada de *Chusquea*. *Chusquea enigmatica* se compara con *C. glauca*, *C. muelleri* y *C. repens*, de las cuales se puede separar por tener culmos delicados y erectos, ramificación extravaginal o intravaginal y reducción del tamaño de las yemas. *Chusquea enigmatica* solo habita en la cima del volcán de Acatlán en bosque mesófilo de montaña, dominado por *Fagus grandifolia* en pequeños parches, razón por la cual proponemos que esta especie se incluya en la lista roja de la IUCN en la categoría de protección "amenazada". También se presentan claves de identificación para las especies mexicanas de *Chusquea.*

Introduction

The *bosque mesófilo de montaña* (Rzedowski 1978) or Neotropical cloud forest (*sensu* Webster 1995) is one of the more threatened types of vegetation in Mexico as well as in Mesoamerica. Less than 1% of the total area remains and has been replaced by other, mainly secondary, vegetation types (Rzedowski 1996; Aldrich *et al*. 2000; Luna-Vega *et al*. 2000). However this vegetation type possesses a great biodiversity and provides important

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environmental services to human settlements close to this type of forest (Williams-Linera *et al*. 2002). The plant biodiversity that inhabits this vegetation type reaches 2,500 to 3,000 species in Mexico (Rzedowski 1996) and represents 10% to 12% of the total plant species diversity in the country, making the Neotropical cloud forests the most diverse habitat per unit area in Mexico (Williams-Linera *et al.* 2002). The Neotropical cloud forest has a geographical distribution from southern Tamaulipas in Mexico to Chile and Argentina, but this forest type remains as small isolated fragments restricted to ravines and patches along mountain slopes from 600 to 3000 m elevation (Rzedowski 1996; Webster 1995; Ornelas *et al*. 2013). In Veracruz the Neotropical cloud forest and other types of forest have been strongly affected by human activities (Williams-Linera *et al*. 2002), which may be one reason why Veracruz state has the highest number of endangered species in Mexico (Flores-Villela & Gerez 1988).

Mexico has 19 species of the diverse neotropical bamboo genus *Chusquea* Kunth (1822: 151) (Ruiz-Sanchez & Clark 2013), 15 of them growing in Neotropical cloud forests, with ten of those 15 species endemic to Mexico (Table 1). The Mexican *Chusquea* species are classified into *C*. subgen. *Chusquea* with four sections: sect. *Longifoliae* L. G. Clark (1989: 105); sect. *Serpentes* L. G. Clark (1989: 91); sect. *Verticillatae* L. G. Clark (1989: 74) and *C*. subgen. *Swallenochloa* (McClure) L. G. Clark (1997: 42) with one section: sect. *Swallenochloa* (McClure) L. G. Clark (1989: 29) (Table 1).

TABLE 1. Infrageneric classification of the 15 Mexican *Chusquea* species inhabiting Neotropical cloud forests. Endemic species are marked with *.

Chusqea subg. *Chusquea*			*Chusquea* subg. *Swallenochloa*
sect. *Longifoliae*	sect. *Serpentes*	sect. *Verticillatae*	sect. *Swallenochloa*
**C. aperta* L. G. Clark *C. cortesii* L. G. Clark & Ruiz-Sanchez *C. longifolia* Swallen *C. nelsonii* Scribn. & J. G. Sm. **C. muelleri* Munro **C. repens* L. G. Clark & Londoño **C. sulcata* Swallen	**C. glauca* L. G. Clark **C. enigmatica* Ruiz-Sanchez, Mejía-Saulés & L. G. Clark	**C. galeottiana* Munro *C. pittieri* Hack.	**C. bilimekii* E. Fourn. *C. lanceolata* Hitchc. **C. matlatzinca* L. G. Clark & Ruiz-Sanchez **C. perotensis* L. G. Clark, Cortés & Cházaro

Based on fieldwork during the summer of 2010 and 2013 at the volcano Acatlán in central Veracruz, we collected one specimen that did not match any known Mexican *Chusquea* species morphologically. After conducting a morphological analysis and comparing the new collections with the three described *Chusquea* species growing in similar habitat in Veracruz, Oaxaca and Chiapas [*C. glauca* Clark (1989: 95), *C. muelleri* Munro (1868: 65), *C. repens* Clark & Londoño (1991: 327)], we decided to describe and illustrate *Chusquea enigmatica*, an endemic species from central Veracruz. This new species is classified in *Chusquea* subg. *Chusquea*, sect. *Serpentes* because it has one triangular central bud and one or two subsidiary smaller buds, although *C. enigmatica* is unusual in the section because of its extravaginal or intravaginal branching pattern.

The discovery of this new species has come as part of a project to inventory the native bamboos of Mexico. We therefore present keys to all the species of *Chusquea* in Mexico, one based on vegetative features and one based on both vegetative and reproductive features.

Key to the species of *Chusquea* present in Mexico (based on vegetative characters)

1. Internodes hollow 2
1. Internodes solid, sometimes becoming fistulose with age 3

2. Internodes thin-walled; subsidiary buds/branches at mid-culm nodes numerous, verticillate, subequal; foliage leaf blades abaxially glabrous ..... *C. perotensis* Clark, Cortés & Cházaro (1997: 225)
2. Internodes thick-walled; subsidiary buds/branches at mid-culm nodes 5–16, constellate, of two sizes; foliage leaf blades abaxially ciliate at the blade base ..... *C. matlatzinca* Ruiz-Sanchez & Clark (2013: 3)

3. Subsidiary buds/branches at mid-culm nodes numerous, verticillate or nearly so 4
3. Subsidiary buds/branches at mid-culm nodes few to numerous, constellate or linear but not encircling the node..... 7

4. Central bud circular; apex of culm leaf sheath short and more or less broad ..... *C. liebmannii* Fournier (1886: 587)
4. Central bud triangular; apex of culm leaf sheath narrow and elongate..... 5

5. Culms 3–5 cm in basal diameter, 10–20 m tall, erect to scandent at the tips; root thorns encircling the lower and middle nodes of culm and major branches, some root thorns usually present on upper nodes of culms and major branches ..... *C. pittieri* Hackel (1903: 153)
5. Culms to 2.5 cm in basal diameter, to 15 m tall, arching and clambering, not erect; root thorns usually absent, rarely a few present at mid-culm nodes..... 6

6. Subsidiary branches 60–100 or more per node, 0.3–0.5 mm in diameter, exserted more or less horizontally; foliage leaf blades 0.3–1.2 cm wide, L:W = 5.8–10, the base attenuate, the apex apiculate ..... *C. coronalis* Soderstrom & Calderón (1978: 158)
6. Subsidiary branches 20–50 per node, 0.6–0.9(–1) mm in diameter, exserted more or less vertically; foliage leaf blades 0.3–0.7 cm wide, L:W = 8–16.5(–23), the base attenuate to rounded-attenuate, the apex apiculate to subulate ..... *C. circinata* Soderstrom & Calderón (1978: 156)

7. Foliage leaf blades (1.6–)2–4.2 cm wide; subsidiary branches 2–6 per node..... 8
7. Foliage leaf blades 0.3–1.8(–2.5) cm wide; subsidiary branches (5–)10–100 per node 9

8. Branching infravaginal (sometimes appearing extravaginal), subsidiary branches 2(–4) per node, central branch sometimes developing; foliage leaf blades abaxially glaucous, not tessellate, apex acuminate ..... *C. glauca*
8. Branching extravaginal, subsidiary branches 2–6 per node; foliage leaf blades abaxially green, tessellate, apex short setose ..... *C. lanceolata* Hitchcock ex Morton (1935: 145)

9. Culms 0.05–0.15 cm in diameter, 0.2–1 m tall, erect; bud complement consisting of 1–3 buds, the central bud only slightly larger than the subsidiaries; endemic to Volcan Acatlán, Veracruz, Mexico ..... *C. enigmatica*
9. Culms 0.2–6 cm in diameter, 1–15(–25) m tall, erect or arching to scandent or trailing and climbing; bud complement of at least 6 buds, the central bud usually much larger than the subsidiaries (often subequal in *C. bilimekii*); occurring widely in central and southern Mexico, including Veracruz, but not found on Volcan Acatlán 10

10. Branching intravaginal; subsidiary buds both flanking and subtending the central bud, forming a line extending up to half the circumference of the node; foliage leaf blades abaxially tessellate ..... *C. bilimekii* Fournier (1886: 132)
10. Branching infravaginal or extravaginal; subsidiary buds strictly constellate, subtending or curving around the central bud; foliage leaf blades abaxially usually not tessellate..... 11

11. Branching extravaginal, culm leaves often deciduous as branches develop; foliage leaf blades usually with an abaxial tuft of hairs at the base (sometimes lacking in *C. sulcata*) 12
11. Branching infravaginal; culm leaves usually persistent; foliage leaf blades abaxially glabrous, pilose or with scattered hairs but lacking a defined tuft of hairs at the base..... 15

12. Central bud circular; internodes 27–50 cm long..... *C. galeottiana* Munro (1868: 59)
12. Central bud triangular; internodes 10–22 cm long..... 13

13. Foliage leaf blades 0.7–1.5 cm wide, L:W = 5–8.5; culms climbing and hanging; tropical or montane forest ..... *C. simpliciflora* Munro (1868: 54)
13. Foliage leaf blades 0.3–0.9 cm wide, L:W = 8–30; culms erect and arching only at the apices to arching; montane or pine-oak forests..... 14

14. Culm leaf sheaths narrowed and elongate toward the apex, bottle-shaped; foliage leaf blade L:W = 8–16.5(–23); culms arching; supranodal ridge a line, not prominent; sometimes a patch of subsidiary buds or branches present on the opposite side of the node from the main bud/branch complement..... *C. circinata*
14. Culm leaf sheaths more or less triangular with rounded shoulders; foliage leaf blade L:W = (15–)17–30; culms erect, arching at the apices; supranodal ridge prominent; buds/branches strictly constellate..... *C. sulcata* Swallen (1940: 209)

15. Culms erect, sometimes arching toward the apex; foliage leaf blades yellowish-green, abaxially strongly tessellate ..... *C. aperta* Clark (1987: 74)
15. Culms arching and scandent or trailing and clambering; foliage leaf blades green, abaxially not tessellate 16

16. Subsidiary branches 80–100 per node; culms 2–6 cm in basal diameter, erect at the base and then arching to scandent; foliage leaf blades L:W = 16–33 ..... *C. longifolia* Swallen (1940: 30)
16. Subsidiary branches 5–30 per node; culms 0.2–1 cm in basal diameter; arching to scandent or trailing and clambering; foliage leaf blades L:W = 6–20 17

17. Foliage leaf blades abaxially glabrous 18
17. Foliage leaf blades abaxially pilose (completely or only toward the base) 19

18. Central bud circular; subsidiary branches 6–14 per node, usually rebranching; foliage leaf blades narrowly ovate ..... *C. muelleri*
18. Central bud triangular; subsidiary branches 10–25 per node, usually not rebranching; foliage leaf blades linear-lanceolate ..... *C. repens*

19. Subsidiary branches 5–10 per node; foliage leaf blades 1.1–1.8 cm wide ..... *C. cortesii* Ruiz-Sanchez & Clark (2013: 7)
19. Subsidiary branches 10–30 per node; foliage leaf blades 0.3–1.1 cm wide 20

20. Culms 0.2–0.3 cm in basal diameter, trailing and clambering; Chiapas and Oaxaca ..... *C. repens*
20. Culms 0.5–1 cm in basal diameter, arching and scandent; Guerrero, Michoacan, Chiapas ..... *C. nelsonii* Lamson-Scribner & Smith (1897: 16)

Key to the species of *Chusquea* present in Mexico (based on vegetative and reproductive characters, excluding *C. enigmatica* and *C. matlatzinca*)

1. Synflorescences open, with at least the primary branches strongly spreading away from the rachis 2
1. Synflorescences contracted, the primary branches appressed to the rachis 9

2. Synflorescences racemose, of 3–4 spikelets ..... *C. simpliciflora*
2. Synflorescences paniculate, at least 2 orders of branching present, of more than 4 spikelets 3

3. Spikelets dorsally compressed; central bud circular; foliage leaf blades with an abaxial tuft of hairs at the base 4
3. Spikelets terete or laterally compressed; central bud triangular; foliage leaf blades abaxially glabrous or pilose, without a defined tuft of hairs at the base 5

4. Spikelets 11.3–15.5 mm long; subsidiary branches constellate; root thorns absent ..... *C. galeottiana*
4. Spikelets 7.2–9 mm long; subsidiary branches verticillate; root thorns present ..... *C. liebmannii*

5. Synflorescences subtended by a narrow, spathe-like bract; internodes hollow; subsidiary branches verticillate ..... *C. perotensis*
5. Synflorescences lacking a subtending spathe-like bract; internodes solid; subsidiary branches constellate 6

6. Glumes III and IV abaxially pubescent toward the apices; branching extravaginal ..... *C. lanceolata*
6. Glumes III and IV abaxially glabrous; branching infravaginal 7

7. Synflorescences 14–18 cm long; foliage leaf blades 2–4 cm wide ..... *C. glauca*
7. Synflorescences 5–11 cm long; foliage leaf blades 0.8–1.5 cm wide 8

8. Spikelets 6–8 mm long, glumes III and IV extending 2/3–3/4 the length of the spikelet; synflorescences 7–11 cm long; foliage leaf blades yellowish-green ..... *C. aperta*
8. Spikelets 8–11 mm long, glumes III and IV extending ca. ½ the length of the spikelet; synflorescences 5–7 cm long; foliage leaf blades green ..... *C. muelleri*

9. Spikelets glabrous 10
9. Spikelets scabrid-pubescent to pubescent or glumes III and IV apically pubescent (sometimes sparsely so) 14

10. Spikelets 10–13 mm long; culms to 5 cm in basal diameter; root thorns encircling the lower and middle nodes of culms and major branches, some root thorns usually present on the upper nodes of culm and major branches ..... *C. pittieri*
10. Spikelets 5–8.6 mm long; culms 0.2–2.5 cm in basal diameter; root thorns absent 11

11. Spikelets laterally compressed; subsidiary branches constellate; culms trailing to clambering or erect 12
11. Spikelets dorsally compressed; subsidiary branches verticillate; culms arching to drooping, sometimes trailing 13

12. Spikelets 6.3–7 mm long, glume III ca. ½ the spikelet length and glume IV 3/5–2/3 the spikelet length; branching infravaginal; culms trailing to clambering; culm leaf blades reflexed ..... *C. repens*
12. Spikelets 6.7–8.6 mm long, glumes III and IV 2/5–1/2 the spikelet length; branching extravaginal; culms erect; culm leaf blades erect ..... *C. sulcata*

13. Spikelets 5–5.7 mm long, glumes III and IV ca. ½ the length of the spikelet; rachis glabrous; subsidiary branches exserted more or less horizontally ..... *C. coronalis*
13. Spikelets 5.6–8.4 mm long, glumes III and IV 5/8–3/4 the length of the spikelet; rachis puberulent; subsidiary branches exserted more or less vertically ..... *C. circinata*

14. Spikelets 12.8–18 mm long; glume III 5/8–2/3 the spikelet length, glume IV 0.9 to 1.0 the spikelet length, lemma aristate; subsidiary branches 80–100 per node ..... *C. longifolia*
14. Spikelets 5.5–10.4 mm long; glumes III and IV ½–5/8 the spikelet length, lemma apiculate to subulate; subsidiary branches 2–35 per node 15

15. Spikelets 8.9–10.4 mm long; branching intravaginal ..... *C. bilimekii*
15. Spikelets 5.5–9 mm long; branching extravaginal or infravaginal 16

16. Subsidiary branches 2–6 per node, greater than 1.5 mm in diameter; foliage leaf blades (1.6–)2.3–4.2 cm wide ..... *C. lanceolata*
16. Subsidiary branches 5–35 per node, up to 1 mm in diameter; foliage leaf blades 0.5–1.8 cm wide 17

17. Spikelets 5.5–6.5 mm long; subsidiary branches 5–10 per node ..... *C. cortesii*
17. Spikelets 6.6–8.6 mm long; subsidiary branches 15–35 per node 18

18. Spikelets shiny, with glumes I and II no more than 1/16 the spikelet length and glumes III and IV 2/5–1/2 the spikelet length; culms erect, arching slightly at the apices; branching extravaginal ..... *C. sulcata*
18. Spikelets dull, with at least glume II 1/5–1/11 the spikelet length and glumes III and IV ½–2/3 the spikelet length; culms arching to scandent; branching infravaginal ..... *C. nelsonii*

Chusquea enigmatica Ruiz-Sanchez, Mejía-Saulés & L. G. Clark, *spec. nov.*, Fig. 1, Fig. 2 A–F, Fig. 3 B–I

TYPE:— MEXICO. Veracruz: cima del volcán de Acatlán sobre el anillo de la parte sureste, suelo negro, planta estéril, bosque de *Fagus grandifolia* Ehrhart (1788: 22) con *Podocarpus matudae* Lundell (1937: 212), 19°47'48.2" N, 100°41'42.3" W, 1960 m elevation, 19 February 2013, *E. Ruiz-Sanchez & T.M. Mejía-Saulés* 434a (Holotype: XAL!, isotypes: IEB!, ISC!, MEXU!).

Chusquea enigmatica is similar to *Chusquea glauca*, *C. muelleri* and *C. repens* but differs in having leptomorph rhizomes, delicate small culms, erect habit and an intravaginal or extravaginal branching pattern.

Rhizomes leptomorph to 40 cm long. Culms 0.2–1.0 cm tall, 0.5–1.5 mm in basal diameter, erect, decumbent and geniculate. Internodes 1–3.5 cm long, 12–15 per culm, terete, glabrous, green, solid. Culm leaves 2.3–4.8 cm long, glabrous, straw-colored, deciduous as branches develop; sheaths 1.8–3.9 cm long, rectangular with rounded shoulders, 4–6 times as long as the blade, the margins entire or ciliate on both sides, glabrous; blades 3–9 mm long, narrowly triangular, erect, deciduous, apex acuminate, margins entire or slightly ciliate, glabrous; girdle not developed, inner ligule 0.2–0.5 mm long, glabrous, truncate. Nodes at mid culm with 1–3 buds, composed of one larger triangular central bud subtended by 1–2 slightly smaller triangular, closely adjacent subsidiary buds arranged in a single line; nodal line horizontal, supranodal ridge present and prominent. Branching extravaginal or intravaginal, the sheaths deciduous, 1–3 branches per node, diverging from the main culm at 45°, 9–15 cm long, 1–1.5 mm in diameter, some rebranching. Foliage leaves (5)6–9(11) per complement; sheaths glabrous, the summit short ciliate; leaf blades 10–11.7 cm long, 0.8–1.2 cm wide, L:W = 8–14, abaxially glaucous and adaxially green, glabrous, not tessellate, the base oblique, the apex apiculate, the margin finely serrulate on both sides; pseudopetioles 1–1.5 mm long, adaxially and abaxially glabrous, inner ligule 2–3 mm, rounded; outer ligule to 0.2–0.3 mm long, glabrous or finely ciliate. Synflorescences not seen.

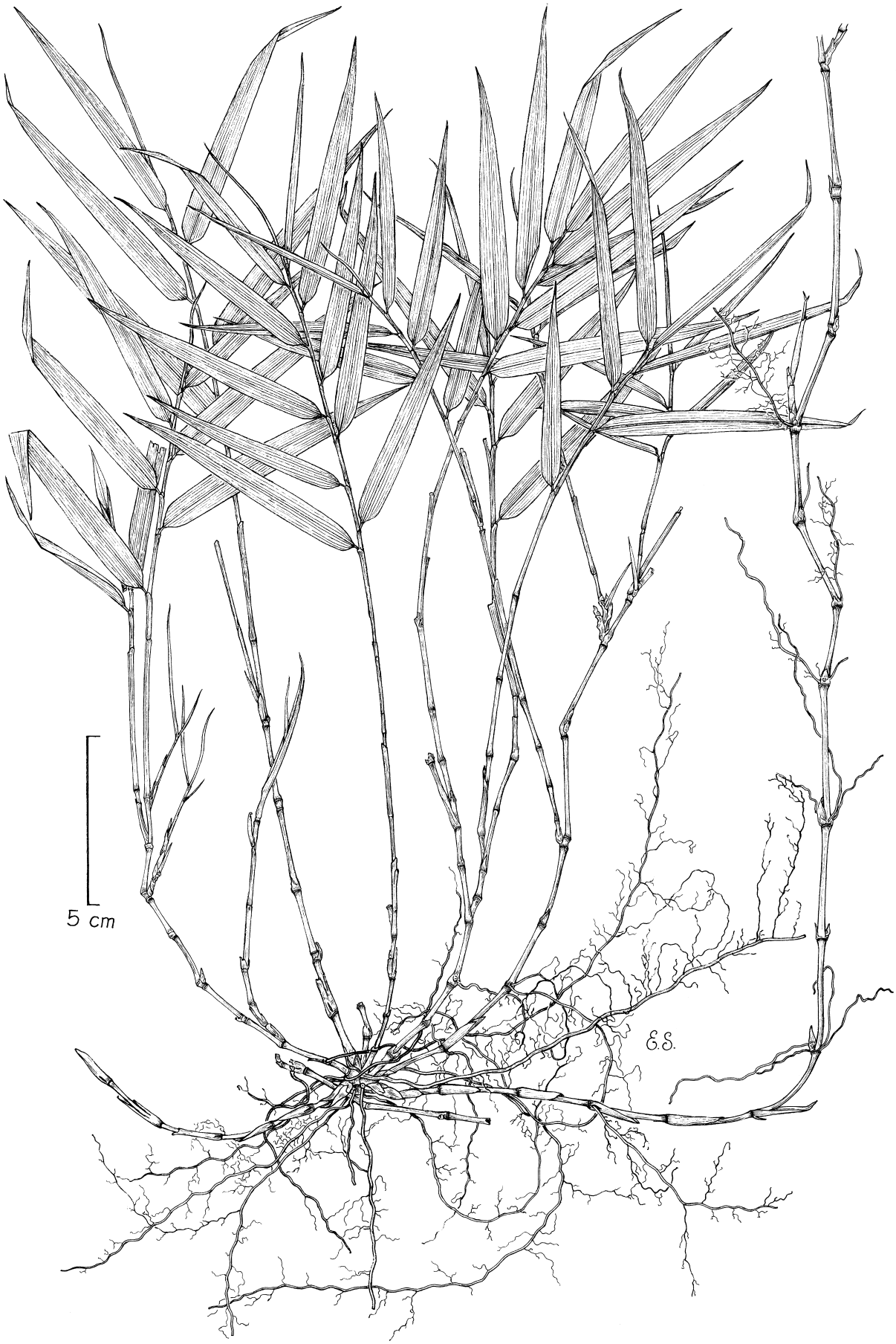

FIGURE 1. *Chusquea enigmatica*. Complete plant with leptomorph rhizomes (right, vertical orientation). Based on *E. Ruiz-Sanchez & T.M. Mejía-Saulés 434a*. Drawn by Edmundo Saavedra.

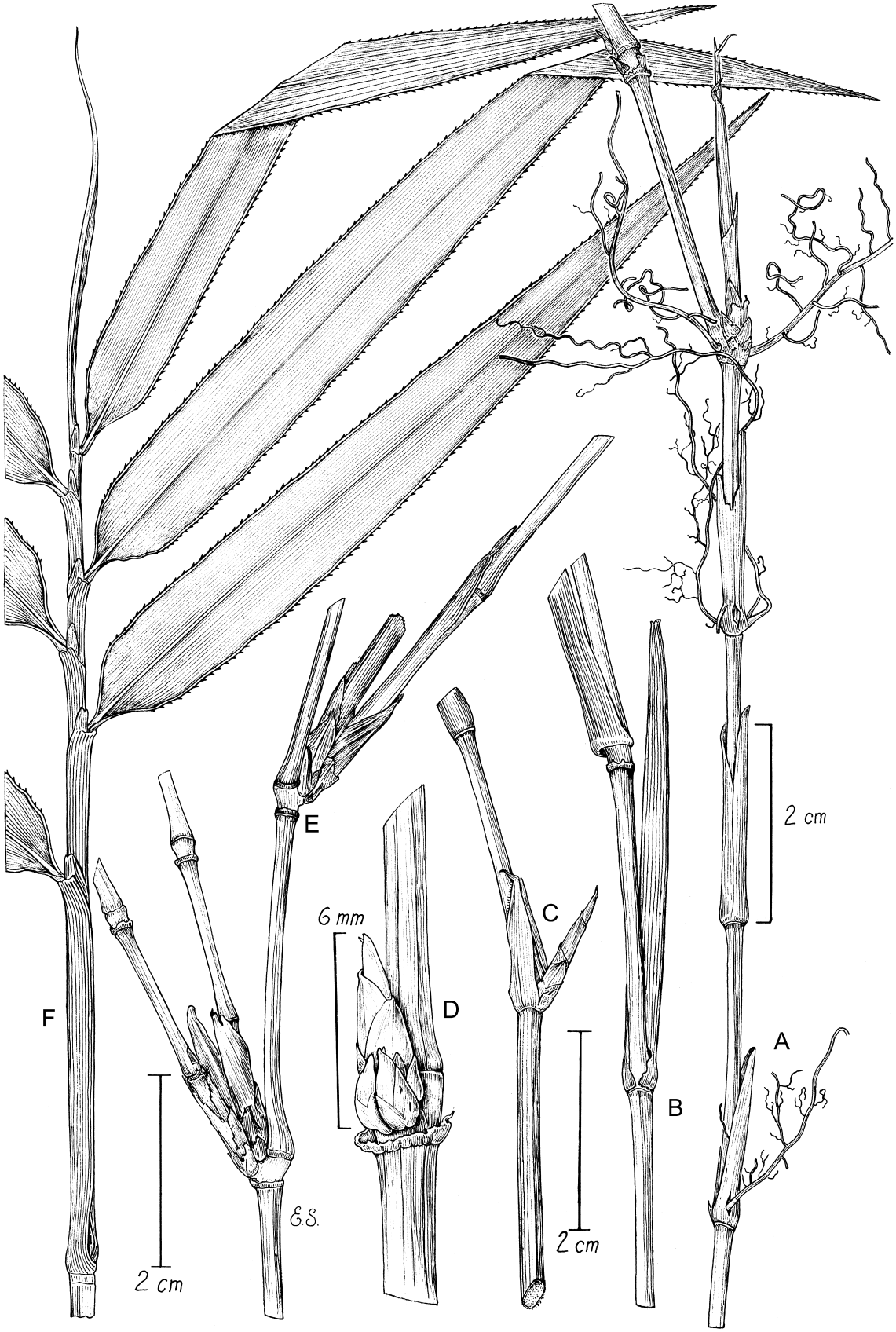

FIGURE 2. *Chusquea enigmatica*. A. Part of leptomorph rhizome, shown with vertical orientation. B. Culm fragment showing intravaginal branch pattern and culm leaves. C. Culm fragment showing extravaginal branch pattern, complete culm leaves with erect blade and development of a new branch. D. Nodal section of the culm, showing bud complement, with one main central bud and two subsidiary smaller buds. E. Culm fragment, showing two nodal regions with well development branches. F. Foliage leaf complement, showing inner ligule and finely serrulate margins. Based on *E. Ruiz-Sanchez & T.M. Mejía-Saulés 434a*. Drawn by Edmundo Saavedra.

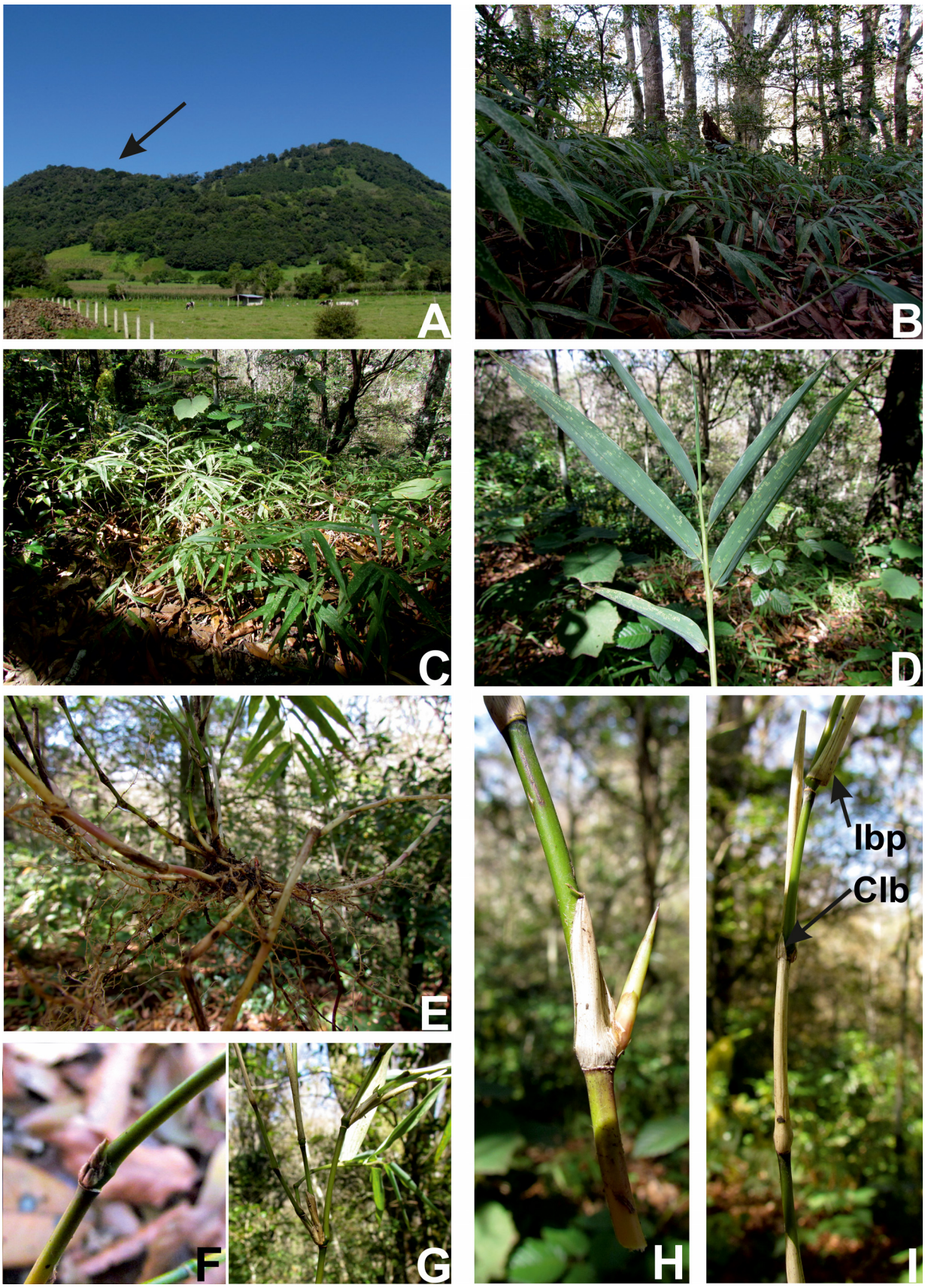

FIGURE 3. Habitat and plants of *Chusquea enigmatica*. A. Acatlán volcano, black arrow indicates the location of *C. enigmatica* in *Fagus grandifolia* dominated Neotropical cloud forests. B. Plants of *C. enigmatica* in the understory of *Fagus grandifolia*. C. Small patch of *C. enigmatica* showing erect habit. D. Foliage leaf complement abaxial view, showing six foliage leaves. E. Leptomorph rhizome. F. Bud complement, showing one triangular central bud and two smaller subsidiary buds. G. Branches, showing three branches per node. H. Extravaginal branch pattern. I. Culm leaves and intravaginal branch pattern. Clb = culm leaf erect blade, Ibp = intravaginal branch pattern. Photos by E. Ruiz-Sanchez.

Habitat and distribution:—This species is only known from one population at the summit of the volcano Acatlán (Fig. 3A). This volcano is part of the easternmost portion of the Trans-Mexican Volcanic Belt in central Veracruz (Gómez-Tuena *et al*. 2007, Ferrari *et al*. 2012). *Chusquea enigmatica* inhabits *bosque mesófilo de montaña* (Rzedowski 1978) or Neotropical cloud forest (Webster 1995) dominated by *Fagus grandifolia* inside of the crater and codominant stands at the rim and top of the same volcano (Williams-Linera *et al*. 2000). The mean temperature is 15.2 ºC, and total mean annual precipitation is 1532 mm, with three seasons described: dry cold (October-March); dry warm (April–May) and wet warm (June–September). Humidity is high and fog is frequent during most days of the year (Williams-Linera *et al*. 2000).

Comparison:—At first glance *C. enigmatica* looks like an herbaceous bamboo in the forest understory; it is the presence of multiple buds per node that places it in *Chusquea*. The first collection of this plant was made in 2010 and the plants looked like seedlings. After three years collecting the species several times in the same place and during different seasons, it is observed that the size of the plants did not change. However, individual observations of plants growing in a clearing, exposed to direct sunlight, revealed that this group of plants registered the highest growth, reaching one meter tall. Further observation suggested some similarities to *C. glauca*, an endemic species of *Chusquea* sect. *Serpentes* occurring on the slopes of the Cofre de Perote volcano in central Veracruz, Mexico. *Chusquea enigmatica* can be distinguished from *C. glauca* by several characters such as delicate culms 0.2–1.0 m tall and 0.5–2 mm in diameter (vs. 5–6 m, to 1 cm), erect culms (vs. scandent), an extravaginal or intravaginal branching pattern (vs. infravaginal), and foliage leaf blades 10–11.7 cm long and 0.8–1.2 cm wide (vs. 14.4–29 cm, 2.1–4 cm). There are two other small Mexican *Chusquea* species from section *Longifoliae*, *C. muelleri* and *C. repens*, that could be regarded as similar to *C. enigmatica*, but there are several characters to differentiate them from it. *Chusquea enigmatica* has thin culms 0.5–2 mm wide (vs. 5–7 mm wide), one main and two subsidiary buds (vs. one main and several subsidiary buds), and an extravaginal or intravaginal branching pattern (vs. infravaginal).

Etymology:—The specific epithet refers to the unusual morphology with leptomorph rhizomes and reduction in bud and culm sizes and the consequent difficulty in classifying this species within one of the known sections of *Chusquea*.

Phenology:—Synflorescences and flowers of this species are unknown, but the plants are under cultivation in the National Bamboo Collection at the Francisco Clavijero Botanic Garden in Xalapa, Veracruz.

Additional specimens examined:—MEXICO. Veracruz: cima del volcán de Acatlán sobre el anillo de la parte sureste, suelo negro, planta estéril, bosque de *Fagus grandifolia* con *Podocarpus matudae*, 19°47'48.2" N, 100°41'42.3" W, 1960 m elevation, 28 June 2010, *E. Ruiz-Sanchez & J. F. Ornelas* 299 (XAL); 17 August 2013, *E. Ruiz-Sanchez & L. G. Clark* 460 (XAL).

Discussion

Chusquea enigmatica is classified in *Chusquea* subg. *Chusquea*, sect. *Serpentes* because it has one triangular central bud and one or two subsidiary smaller buds, although *C. enigmatica* is unusual in the section because of its extravaginal or intravaginal branching pattern. Additionally, scanning electron microscopy leaf epidermal micromorphology showed the presence of papillate subsidiary cells, which is a *Chusquea* synapomorphy (Fisher *et al*., 2009), and confirmed the strong similarity with *C. glauca.* (Mejía-Saulés *et al*., unpublished data).

The Acatlán volcano is one of the 8000 volcanic structures localized in the easternmost part of the Trans-Mexican Volcanic Belt, just 35km northeast of the Cofre de Perote volcano (Gómez-Tuena *et al*. 2007; Ferrari *et al*., 2012). This volcano is covered, at least toward the rim, by Neotropical cloud forest, dominated by *Fagus grandifolia* (Williams-Linera *et al*. 2000, 2003). *Fagus grandifolia* has a disjunct distribution between the United States and Mexico with only ten populations of this species present in Mexico (Williams-Linera *et al*. 2000, 2003).

From volcano Acatlán, Montoya *et al*. (2012) described a new milkcap species *Lactarius fuscomarginatus* Montoya, Bandala & Haug (2012: 176), and now we describe the endemic bamboo *Chusquea enigmatica*. This species only inhabits the rim of volcano Acatlán in small patches and because this is the only known population for this species, we propose to include it in the IUCN red list under the "endangered" category of protection. On the other hand, this uncommon forest on the volcano Acatlán is not under protection, and we strongly support giving this region some level of formal protection to preserve the cloud forest and its species, including the endemic *Lactarius fuscomarginatus* and *Chusquea enigmatica*.

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