Two New Species in *Cuphea* (Lythraceae), and a Note on Alzateaceae

Shirley A. Graham
Department of Biological Sciences, Kent State University, Kent, Ohio 44242 U.S.A.

ABSTRACT. *Cuphea* (sect. *Melvilla*) *alaniana* from central Mexico and *C.* (sect. *Diploptychia*) *armata* from Central America are described and illustrated. The monotypic family Alzateaceae, long known from Peru and Bolivia, and more recently discovered in Costa Rica, Panama, and Colombia, is here reported from Ecuador for the first time. Of the two Ecuadorian collections, one belongs to the northern, broad-leaved *Alzatea verticillata* subsp. *amplifolia*; the other is most similar to the southern subspecies *verticillata*. Apical leaf glands are a newly recognized feature of the genus. They are interpreted as extra-floral nectaries.

In revisionary studies of *Cuphea*, two new North American species were discovered among collections on loan from a number of North American herbaria. *Cuphea alaniana* is a large-flowered perennial of section *Melvilla*, subsection *Polyspermum* (Koehne, 1903). It is one of four species of the subsection, which is endemic to the western and southern mountains of Mexico. *Cuphea armata*, discovered in neighboring areas of Guatemala, El Salvador, and Honduras is a new species of section *Diploptychia*.

Cuphea alaniana S. A. Graham, sp. nov. TYPE: Mexico. Guerrero: Distrito Adama, Temisco, Barranca del Consuelo, 500 m, 15 Nov. 1937, *Mexia 8810a* (holotype, UC; isotype, GH). Figure 1a–d.

Suffrutices vel frutices, probabiliter ad 1.5 m, caulis simplex, erectus, viscosissimus. Petioli 5–10 mm longi, ad summum caulis sessiles; folia 25–100 mm longa, 5–35 mm lata, anguste lanceolata vel linearia. Flores 25–32 mm longi, rubro-purpurei, glanduloso-hispidi; lobus dorsalis calycis ceteris paullo major; appendices prominentes, setosae. Petala 6, roseo-purpurea, inaequalia, 2 dorsalia 7–9 mm longa, manifeste unguiculata, 4 ventralia 1.0–2.5 mm longa. Ovula 40–50. Discus 2–3 mm longus, 2.5 mm latus, 2 mm crassus, basi ovarii late affixus.

Suffrutescent or shrubby perennials, probably 0.5–1.5 m tall, stems simple, erect, from a fibrous-rooted base, branched distally in the inflorescence; stems and pedicels highly viscous, the vestiture densely, minutely glandular-puberulous and glandular-hispid, the hairs thin, erect, colorless or reddish purple, bulbous-based, minute (< 0.25 mm) or 0.5–1 mm long; internodes up to half as long as the subtending leaves. *Leaves* with petioles 5–10 mm long, becoming subsessile or sessile distally in the inflorescence; blades 25–100 mm long, 5–35 mm wide, membranous, crowded on the upper stem, narrowly lanceolate-linear, base acute, apex acute; blade surface minutely scabrous, or scabrous with sparse to abundant white, weak, slightly appressed hairs to 1 mm long, the margins of young leaves densely ciliate, the hairs erect, glandular-viscous, to 1 mm long; upper leaves very gradually diminishing in size to become the lanceolate-linear bracts of the inflorescence. *Inflorescences* densely flowered, terminal, leafy racemes; flowers solitary at the nodes, interaxillary; pedicels 4–6 mm long; bracteoles 1.5 mm long, lanceolate-linear or reduced to a few fleshy hairs, positioned 1.0–1.5 mm below the apex of the pedicel. *Floral tubes* 25–32 mm long, including a rounded, horizontal base extending 1 mm beyond the pedicel, 4–5 mm wide in lateral view at anthesis, dorsally slightly convex, the neck slightly or not at all narrowed, the mouth flaring, oblique in lateral view, the ventral side extended 1 mm or less beyond the dorsal side, the floral tube more distinctly convex and distended in fruit, the neck contracted; outer surface reddish purple, straw-colored ventrally at the mouth, glandular-puberulous and glandular-hispid with abundant, erect, thin, colorless or reddish purple hairs to 1 mm long; inner surface pale, neither bialate nor vesiculate, glabrous or lightly villous above the stamens, glabrous below; calyx lobes subequal, the dorsal lobe deltoid, 2 × 3 mm, the others 1 × 2 mm, margins not ciliated; appendages at the sinuses of the lobes prominent, 1 mm long, equaling the calyx lobes, thick, green or reddish purple, the apex bulbous, crowned by 5–8 setae 1–2 mm long. *Petals* 6, rose-purple, the 2 dorsal 7–9 mm long including a slender claw 1–2 mm long, narrowly obovate, the 4 ventral 1.0–2.5 mm long, linear-spathulate, caducous. *Stamens* 11, all inserted at ⅚ the length of the floral tube, the 2 dorsalmost shortest, included, the 5 antesepalous exserted, the 4 antepetalous included to subexserted; filaments gla-

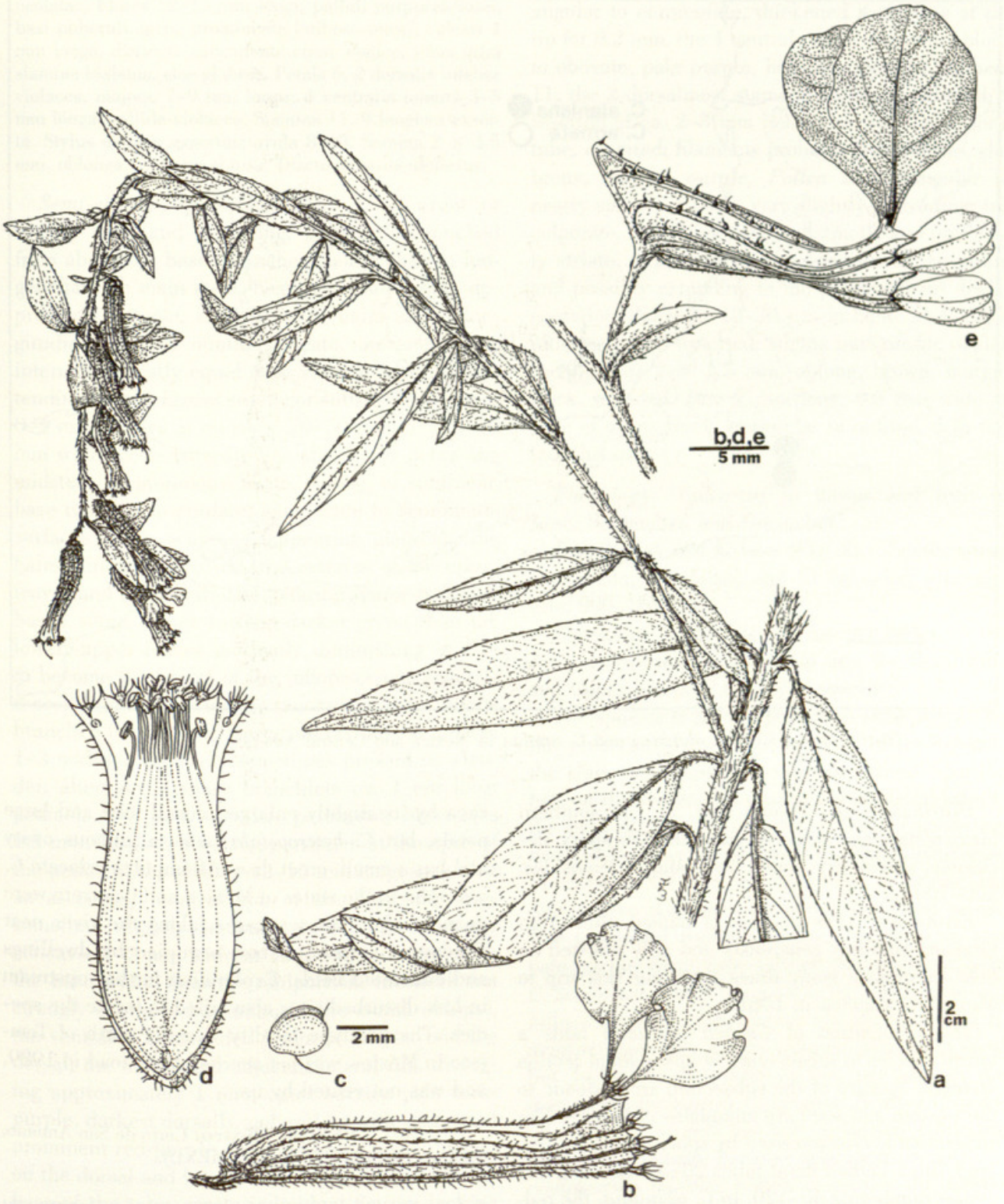

Figure 1. a–d, *Cuphea alaniana* S. A. Graham. —a. Habit. —b. Lateral view of flower. —c. Nectariferous disc at base of the ovary within the floral tube. —d. Floral tube opened dorsally, ovary removed to show position and number of stamens. —e. *Cuphea armata* S. A. Graham, lateral view of flower. Drawn from the holotypes.

brous to lightly villous, reddish; anthers purple. *Pollen* triangular in polar view; tricolporate, syncolpate, pores not protruding; exine uniformly finely striate, the striae extending ca. ½ the distance to the poles, partially anastomosing; diameter 24–28 μm in lactic acid. *Style* exserted at maturity, glabrous; stigma punctiform; ovary gibbous dorsally, the gibbosity pronounced in flower; ovules 40–50. *Seeds* numerous, 2 mm long, 1.5 mm wide. *Disc* massive, 2–3 mm long, 2.5 mm wide, 2 mm thick, horizontal, oblong-rectangular in dorsal view, broadly attached at the base of the ovary.

Phenology. Collected in flower and fruit in November.

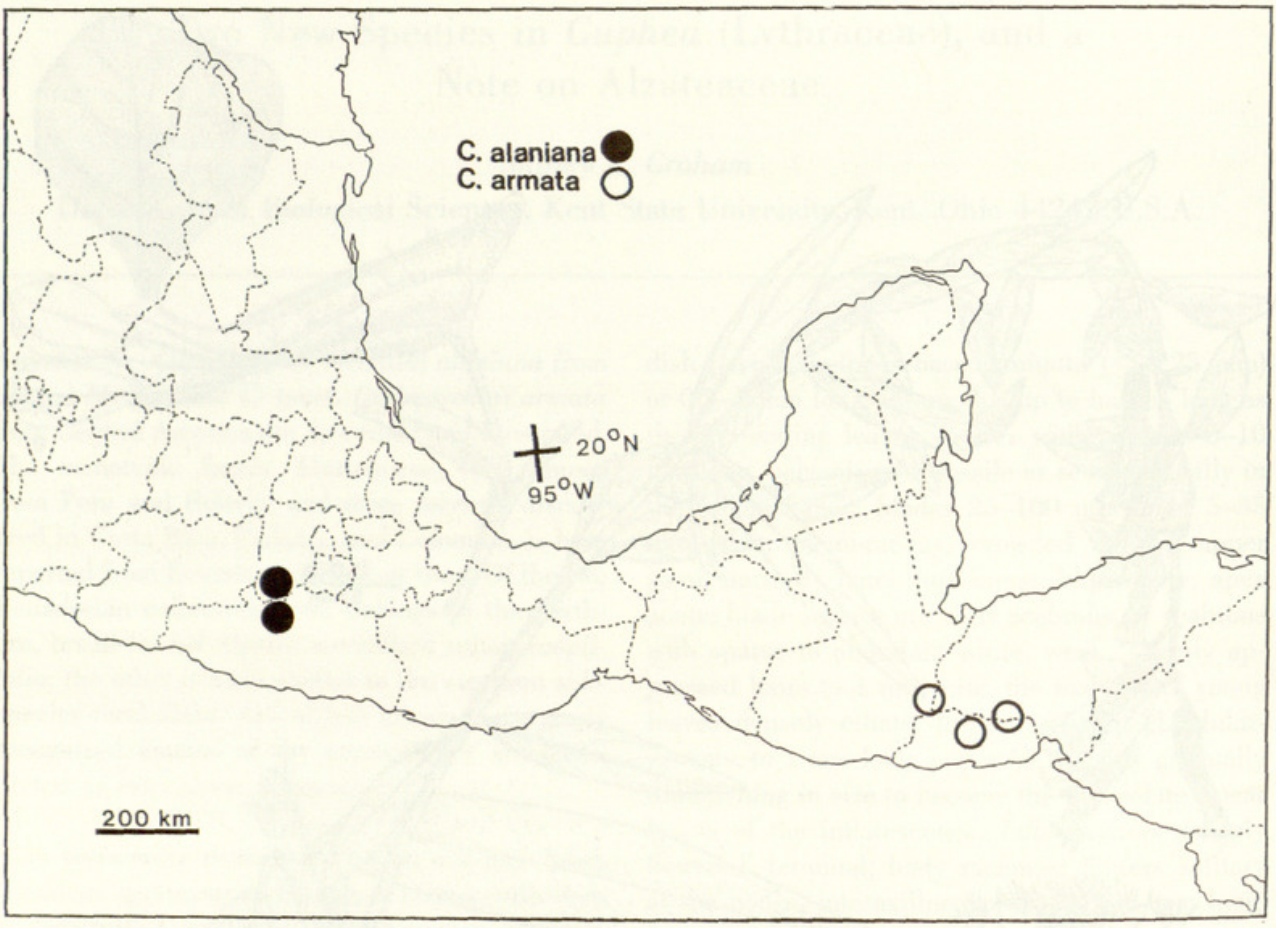

Figure 2. Distribution of *Cuphea alaniana* and *C. armata* in Mexico and Central America.

Distribution and habitat (Fig. 2). In southern México state and adjacent Guerrero; low spiny, deciduous woods, dry slopes, and sandy streamsides; 500–700 m.

Etymology. The species is named after Alan Graham, who has generously and ably assisted on field excursions many times since our first trip to Mexico for *Cuphea* in 1961.

The recognition of *Cuphea alaniana* adds a fourth species to subsection *Polyspermum* of section *Melvilla*. Species of the subsection are endemic to the western and southern mountains of Mexico. The subsection is characterized by spurless, deeply colored, thick-bodied floral tubes 20–32 mm long and ovules numbering 40–120. In *C. alaniana*, the reddish purple floral tube with two large erect, clawed dorsal petals, four small ventral petals, and a massive horizontal nectary termed the "disc" serve best to distinguish it from *C. micropetala* var. *hirtella* Koehne, to which it is surely most closely related. The latter differs in having six minute petals of equal size and a small disc. Both species share an unusual, dorsally gibbous ovary in addition to similar vegetative, trichome, and pollen morphology. Within the subsection, *C. alaniana* also resembles the poorly known *C. heteropetala* Koehne from Oaxaca by its slightly enlarged dorsal lobe and large petals, but *C. heteropetala* lacks a gibbous ovary and has a small, erect disc. Attempts to relocate *C. alaniana* in the states of México and Guerrero were unsuccessful. The type area, along the river near Temisco, Guerrero, is now occupied by dwellings and cultivated fields. Exploration further upstream in less disturbed sites also failed to locate the species. The paratype locality, directly north of Temisco in México, was not accessible by road in 1989, and was not visited by us.

Paratypes. MEXICO. **México:** Cerro de San Antonio, Tlatlaya, *Matuda 32110* (GH, MEXU).

Cuphea armata S. A. Graham, sp. nov. TYPE: El Salvador. Chalatenango: 4 km SSE of La Palma, pine forest, 950 m, 11 June 1970, *G. Davidse & R. Pohl 2073* (holotype, F; isotype, MO). Figure 1e.

Suffrutices, 0.5–1 m, caules erecti vel suberecti, pilis minutis albidis antrorsis adpressisque. Folia sessilia vel subsessilia, 20–50 mm longa, 5–12 mm lata ad medium caulis, ovata, oblonga, vel sublinearia, basi obtusa vel cordata, utrinque scabrella. Inflorescentia sat distincta, racemosa, interdum subcomposita; pedicelli gracili, 2–5 mm longi, persistentes; bracteolae 0.5 mm longae, lineari-lan-

ceolatae. Flores 12–15 mm longi, pallidi purpureo-rosei, basi puberuli saepe prominente bulboso-setosi, calcari 4 mm longo, distincte ascendente etiam conico; intus infra stamina bialatus, alae glabrae. Petala 6, 2 dorsalia intense violacea, majora, 7–9 mm longa; 4 ventralia minora 3–5 mm longa, pallide violacea. Stamina 11, 9 longiora exserta. Stylus demum exsertus; ovula 8–10. Semina 2 × 1.5 mm, oblonga, margine obtusa. Discus crassus, deflexus.

Semi-shrubby perennials, 0.5–1 m, erect or weakly erect and sprawling, irregularly branched from above the base, branches shorter than to longer than the main stem, bearing minute white, appressed, antrorse, sharp-pointed hairs and a longitudinal row of minute, falcate, antrorse hairs; internodes mostly equal to or shorter than the subtending leaves. *Leaves* sessile or subsessile, petioles 0–1 mm; blades at midstem 20–50 mm long, 5–12 mm wide, decreasing in size above and below the midstem, membranous, ovate, oblong, or sublinear, base rounded to cordate, apex acute to acuminate; surfaces finely scabrous, appearing glabrous, the hairs minute, appressed, the margins of the upper leaves and bracts ciliolate, bearing sparse bulbous-based setae, upper surface darker green than the lower; upper leaves gradually diminishing in size to become the bracts of the inflorescence. *Inflorescences* terminal bracteolate racemes or loose, short-branched thyrses; one flower interaxillary at a node, 1–3 additional flowers sometimes present on slender, alternate, axillary branchlets ca. 1 cm long; pedicels 2–5 mm, slender, persistent; bracteoles 0.5 mm, linear-lanceolate, persistent at the apex of the pedicel. *Floral tubes* 12–15 mm long, including an ascending, conical spur 4 mm long, the apex sometimes slightly descending, floral tubes dorsally concave, 1–2 mm wide at anthesis, in lateral view the base wider than the midportion, the neck not strongly contracted at anthesis, the mouth oblique, the ventral side extended 1 mm or less beyond the dorsal, the dorsal and adjacent lateral ribs diverging approximately 1 mm; outer surface pale rose-purple, darkest dorsally, puberulent with sparse but prominent red-purple, bulbous-based setae present on the dorsal and lateral ribs, especially toward the base of the tube, rarely individual flowers lacking setae, setae 0.5 mm long; inner surface lightly villous to glabrous above the stamens in a shallow ventral pouch, glabrous below, the alae glabrous; calyx lobes subequal, broadly triangular, 1.0 × 1.5 mm, margins of the dorsal lobe setulose-ciliolate, rarely glabrous, the others glabrous; appendages 0.5 mm long, terminating in a short bristle. *Petals* 6, unequal, the 2 dorsal largest, 7–9 mm long, oblong to nearly orbicular, not clawed, deep purple, held erect or reflexed slightly back over the dorsal side of the tube, subtended at the base by a triangular to corniculate, thickened scale free at the tip for 0.2 mm, the 4 ventral petals 3–5 mm, oblong to obovate, pale purple, held horizontally. *Stamens* 11, the 2 dorsalmost stamens shortest, included, 9 inserted at ca. 2–3 mm below the rim of the floral tube, exserted; filaments probably pale purple, glabrous; anthers purple. *Pollen* oval-triangular to nearly spherical, pores very slightly protruding; tricolporate, syncolpate; exine distinctly and uniformly striate, striae covering the surface of the grain, and possibly extending to the poles without disaggregation; diameter 18–20 μm in lactic acid. *Style* ultimately well-exserted; stigma punctiform; ovules 8–10. *Seeds* 2 × 1.5 mm, oblong, brown, margin thick, rounded. *Disc* 1 mm long, 0.5 mm wide at base of ovary, thick, triangular in outline, deflexed into the spur.

Phenology. Collected in flower and fruit in June, September, and December.

Distribution and habitat (Fig. 2). Southeastern Guatemala, Honduras, and El Salvador; pine forests; 900–1640 m.

Etymology. The specific epithet refers to the red-purple, bulbous setae that arm the floral tube and upper bracts of the inflorescence.

The species is placed in section *Diploptychia* by the presence of the key character of the section, the alae, two wings of tissue that extend from the base of the dorsalmost stamens in the floral tube to the base of the tube (Koehne, 1903). *Cuphea armata* bears close resemblance to *Cuphea pinetorum* Bentham and *C. avigera* Robinson & Seaton but differs from both by its unequal, bicolored petals. The prominent reddish, bulbous-based setae and pale purple floral tube further distinguish it from *C. pinetorum*, which has a white to rose, hirsute and pubescent floral tube. *Cuphea armata* resembles *C. avigera* especially by its conical, ascending spur, but lacks the glandular-viscous patches on the stems that distinguish *C. avigera*. Neither *C. pinetorum* nor *C. avigera* has been collected within the range of *C. armata*. Because agamospermy with accompanying infertile pollen is present in several species of the section, pollen of *C. armata* was tested for pollen viability. In cotton blue-lactic acid after 24 hours, 99% of all pollen stained deeply, indicating viable protoplasm. The pollen exine seems to lack the meshwork of striae at the poles that is typical of the pollen group to which *C. avigera* and *C. pinetorum* pollen types belong (Graham, in prep.), but this needs to be confirmed by SEM observations when more abundant material becomes available.

Paratypes. EL SALVADOR. **Chalatenango:** carretera

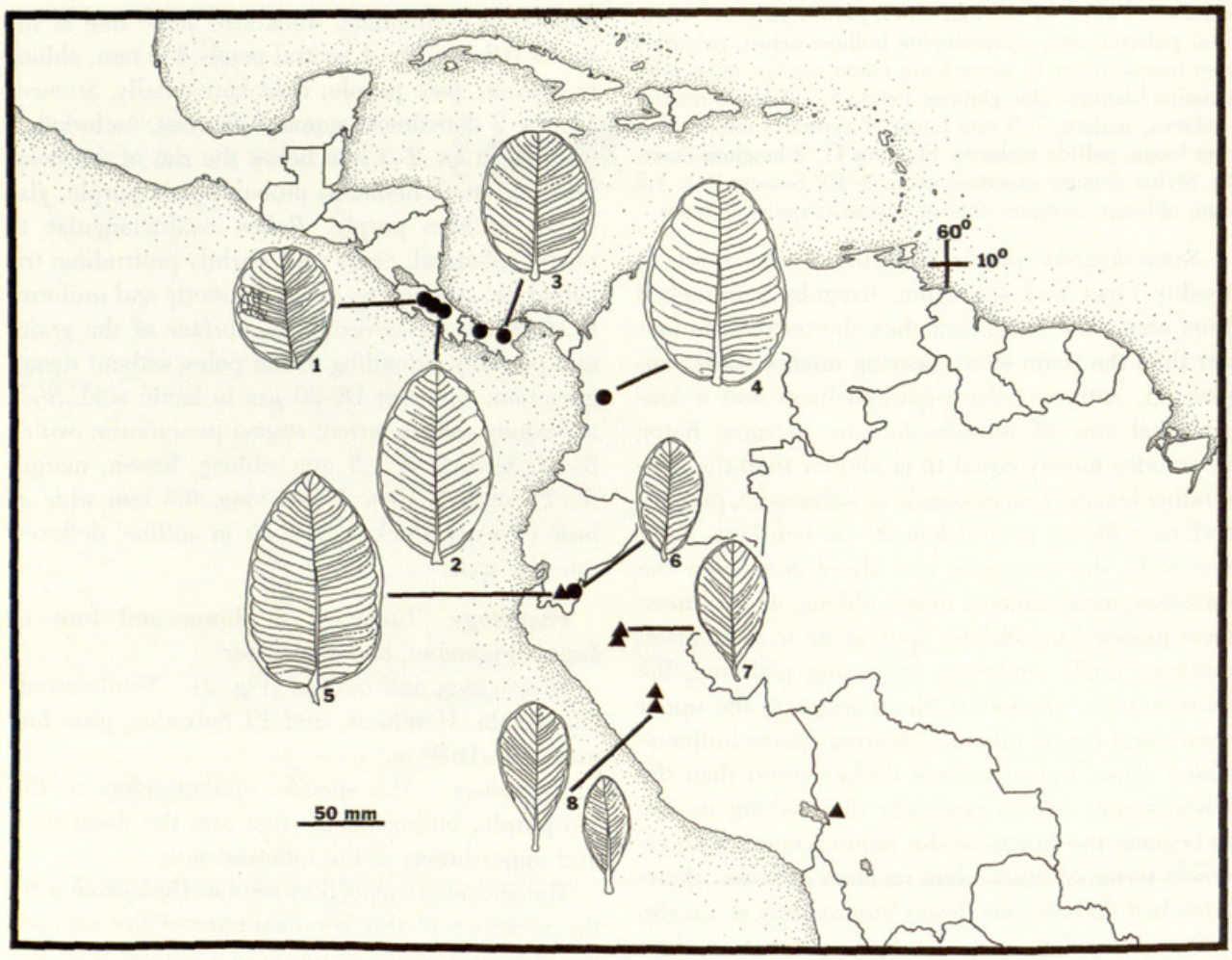

Figure 3. Distribution and variation in leaf shape, size, and petiole length in *Alzatea verticillata*. Examples 1–5 represent subspecies *amplifolia*, characterized by large, broad, oblong, sessile or subsessile leaves. Examples 6–8 represent subspecies *verticillata*, characterized by small, elliptical, oblong or obovate, distinctly petiolate leaves. Petioles on plants represented by examples 5 and 6 are approximately intermediate between the two subspecies. The major distinction remaining between the subspecies is leaf size, especially leaf width.

a La Palma, *Montalvo 3682* (MO); Río Nunuapa near La Palma, *R. Seiler 574* (F). GUATEMALA. **Chiquimula:** pine forest between Guatemala–Honduras border and Atulapa, *Molina R. & Molina 25260* (F, MO). HONDURAS. **Intibuca:** 12.7 mi. N of Marcala along the road from Marcala to La Esperanza, *Davidse et al. 35191* (MO).

Note on Alzateaceae

The New World tropical family Alzateaceae is represented by the single species *Alzatea verticillata* Ruiz & Pavón. The species had been placed in eight families in five orders, including the Lythraceae, before its segregation to the monotypic family Alzateaceae (Graham, 1984). *Alzatea verticillata* was described first from the eastern side of the Peruvian Andes in 1798 (Ruiz & Pavón, Syst. Veg. Fl. Peruv. Chil. 1: 72). It was considered restricted to Bolivia and Peru until 1936, when it was collected in the low montane forests of Costa Rica. In 1978, it was discovered in the elfin cloud forest of Veraguas Province, Panama, and subsequently, in 1986, was found in Colombia on the Cerro del Torá, Departamento del Chocó (Silverstone-Sopkin & Graham, 1986). The distribution of the species is now further enlarged by collections made by the late Alwyn Gentry on his last field expedition to Ecuador. Two collections, *Gentry 80008* and *80334* (MO), from the Cordillera del Cóndor, near the disputed Ecuador–Peru border in Morona-Santiago Province, represent the first record of the family in Ecuador, and tenuously establish its continuous distribution in mid- to low-montane forests along the eastern slopes of the mountains from Bolivia to Costa Rica (Fig. 3). The species is one of an estimated 26% of Ecuadorian species restricted to mid-elevations (900–3000 m) with widespread distribution in the Neotropics (Balslev, 1988).

The two Ecuadorian collections differ in leaf shape and size, and represent two subspecies. *Gentry 80334*, collected from an 18-m-tall tree at 2100 m, is typical of the elliptical to oblong or obovate,

petiolate, small-leaved subspecies *verticillata* from Peru and Bolivia (Fig. 3). *Gentry 80008*, collected from a 5-m-tall tree at 1350 m, has the broad, oblong, large leaves of subspecies *amplifolia*, until now known from Colombia, Panama, and Costa Rica. Both collections have short-petiolate leaves and are intermediate for this character between the distinctly petiolate-leaved subspecies *verticillata* and the sessile-leaved subspecies *amplifolia*. The distinctions between the subspecies, which were described before the species was known from Colombia or Ecuador (Graham, 1984), are diminished by the partial intermediacy of the Gentry collections. If future collections of *Alzatea* from northern Peru and Ecuador sample a fuller range of leaf shape and size, it should be easy to decide whether or not to continue recognition of these intraspecific taxa.

Leaves of *Gentry 80334*, among all collections of *Alzatea*, are the first to display apical leaf glands. The glands are similar to the hydathodes and extrafloral nectaries described for several other genera of the Myrtales (Ross & Suessenguth, 1926; Rao & Chakraborti, 1982; Turner & Lersten, 1983; Graham, 1984). The shiny, hardened secretion at the *Alzatea* leaf apex suggests the secretory product is a sugar solution and the gland is probably an extrafloral nectary.

Specimens examined. ECUADOR. **Morona-Santiago:** Gualaquiza Cantón, Cordillera del Cóndor, ridge top above Banderas, primary forest, 03°28′S, 78°22′W, primary forest, 17 July 1993, *A. Gentry 80008* (MO); Campamento Achupalla, 15 km E of Gualaquiza, 03°27′S, 78°22′W, dense tangled scrubby forest, 22 July 1993, *A. Gentry 80334* (MO).

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