TWO NEW SPECIES OF *WEINMANNIA* (CUNONIACEAE: CUNONIEAE) FROM SOUTHERN ECUADOR

Zachary S. Rogers

Missouri Botanical Garden
P.O. Box 299
St. Louis, MO 63166-0299, U.S.A.
zachary.rogers@mobot.org

ABSTRACT

Two new species of Cunoniaceae, ***Weinmannia bradfordiana*** Z. Rogers and ***Weinmannia condorensis*** Z. Rogers are described and illustrated. Both sclerophyllous species are known only from their type localities and were collected from the Cordillera del Cóndor mountain range in the province of Morona Santiago, Ecuador.

KEY WORDS: Cunoniaceae, Cunonieae, Ecuador, Neotropics, South America, *Weinmannia*

RESUMEN

Se describe y se ilustra ***Weinmannia bradfordiana*** Z. Rogers y ***Weinmannia condorensis*** Z. Rogers. Estas dos especies esclerofilas son conocidas únicamente de las localidades de los tipos, y fueron colectadas en la región de la Cordillera del Cóndor en la provincia de Morona Santiago, Ecuador.

INTRODUCTION

The family Cunoniaceae is composed of 26 genera and about 300 species (Bradford & Barnes 2001). The australly-distributed genus *Weinmannia* L. accounts for about 150 species in five sections (Bradford 1998; Bradford 2002). All American species are in section *Weinmannia*, with the greatest species richness found in northwestern South America (i.e. Venezuela, Colombia, Ecuador and Peru) (Bernardi 1961; Harling 1999).

Weinmannia bradfordiana and *Weinmannia condorensis* were collected by the late Alwyn H. Gentry (1945–1993) on his last major expedition, and were filed in a "family indeterminate" folder for a number of years, despite the good quality of the specimens in flower and fruit. Later, while sorting Gentry's collections, Ron Liesner (MO) came across the specimens but did not initially consider the specimens as belonging to the family Cunoniaceae because of their uncharacteristically short inflorescences, but he did notice a few small fruits that looked remarkably like the septicidal capsules of *Weinmannia*. Ron then showed the material to Jason Bradford, who was studying Neotropical *Weinmannia* at the time, and Jason confirmed that they were, in fact, Cunoniaceae and annotated the specimens as new species of *Weinmannia* (Ron Liesner and Jason Bradford, pers. comm.).

Both species, as well as another recently described species of *Weinmannia*

from the Cóndor (Rogers 2002), have adapted extremely sclerophyllous habits due to the very wet and windy weather conditions and the very thin, nutrient-poor sandstone substrate. Many other woody genera on the summits of the Cordillera del Cóndor have similar sclerophyllous adaptations, and many of these species will also turn out to be new and locally endemic to the range.

Weinmannia bradfordiana and *Weinmannia condorensis* are known only from their types and are probably closely related, due to their similar leaf morphology and ecology and because they were collected from sites about 10 km apart, but significant differences exist between the two including: leaf size, leaflet shape, number of flowers per inflorescence, and trichome density and distribution on the stems, leaves, stipules and sepals. Based upon experience with other recognized species of *Weinmannia* and character variation within and among species, the differences observed from these specimens suggest they represent distinct species. This analysis is based entirely on a subjective study of the type collections and available herbarium specimens, so more collections will be needed to elucidate the patterns of variation in these species. At this time, the type localities are unable to be revisited because the sites have been covered by deadly land mines since the border dispute between Ecuador and Peru in January 1995, which was about 18 months after the types were originally collected. The mine field will not be cleared for at least several more years, but when the situation is resolved, further exploration will be needed and may expose intermediates that support a notion expressed by one reviewer (David Neill), who felt that both collections could represent a single species.

These new species can be easily distinguished from other Ecuadorian species by their small trifoliolate (rarely unifoliolate) compound leaves on short petioles that can appear to be simple and sessile to the naked eye, and by their extremely short inflorescences (i.e. pseudoracemes) due to inconspicuous peduncles. The highly reduced inflorescences are very uncharacteristic of the genus because almost all *Weinmannia* have elongated inflorescence axes measuring several cm or more in length.

Color images of the type collections can be found on the W3 TROPICOS database at: <http://mobot.mobot.org/W3T/Search/vast.html>.

Weinmannia bradfordiana Z. Rogers, sp. nov. (**Fig. 1**). TYPE: ECUADOR. MORONA SANTIAGO: Cantón Gualaquiza: Campamento Achupalla, Cordillera del Cóndor, 15 km E of Gualaquiza, tepui-like bromeliad sward with scattered, small trees, 03° 27'S, 78° 22'W, 2090 m, 21 Jul 1993 (fl., fr.), *Gentry 80312* (HOLOTYPE: QCNE-092179; ISOTYPES: AAU, GB-186976, MO-5544000, NY, US).

Haec species ad *Weinmanniam cochensem* Hieron. et *W. mariquitae* Szyszyl. maxime accedit, sed a hac inflorescentia subsessili, ab illa foliis multo minoribus ut videtur simplicibus sessilibusque propter petiolum perbrevem atque foliolis integris, ab ambabus foliis plerumque trifoliolatis interdum unifoliolatis distinguitur; a *W. condorensi* inflorescentia ex pseudoracemo fasciculis 2- ad 8-floris constante atque foliolis minoribus secus margines apicem versus trichomatibus plus quam 20 ciliatis distinguitur.

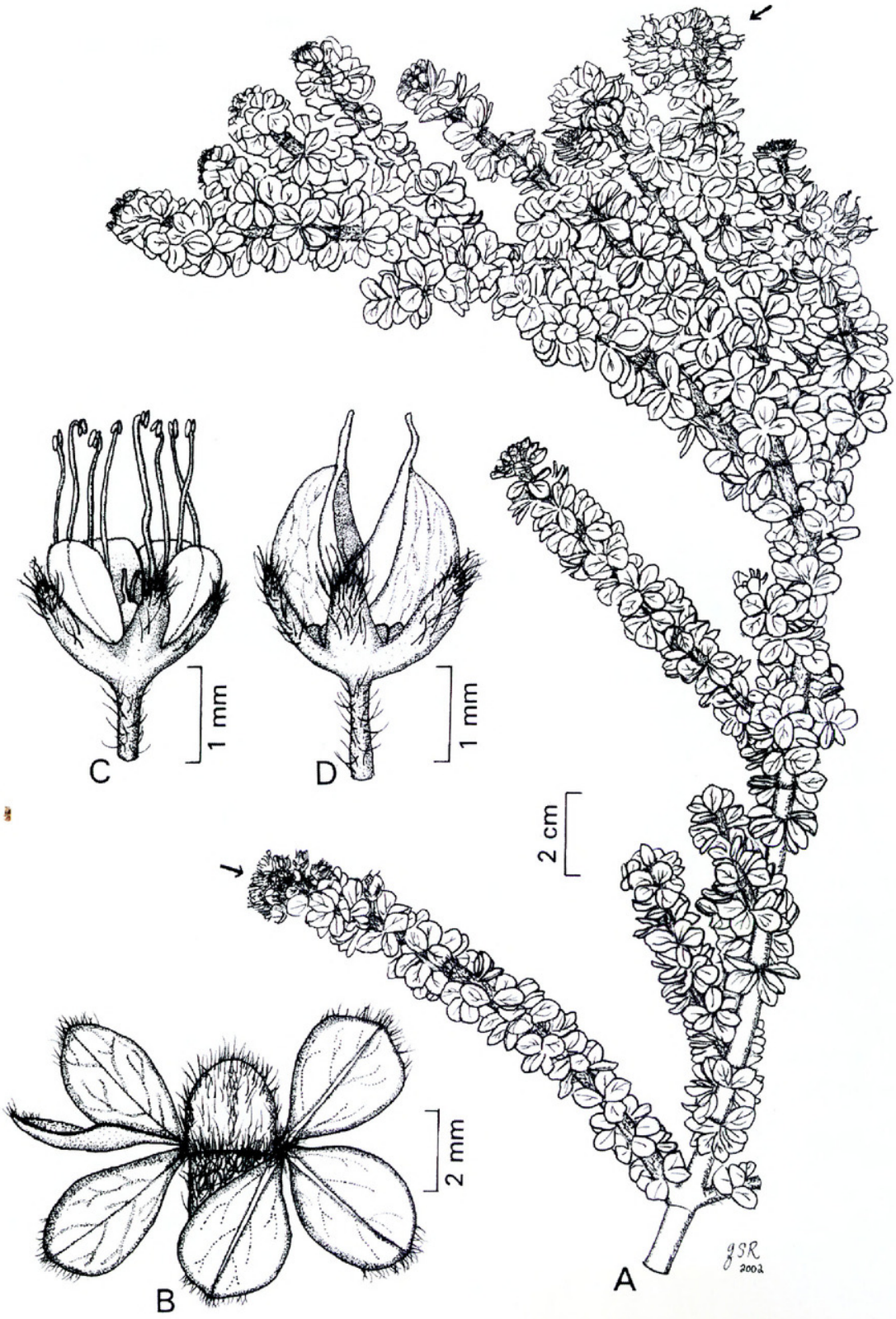

FIG. 1. *Weinmannia bradfordiana* Z. Rogers. A. Habit. B. Trifoliolate leaves showing the lower surfaces of the leaflets on the left side of the stem and the upper surfaces on the right. C. Flower. D. Septicidal capsule at maturity. Arrows point to inflorescences. All illustrations drawn by the author from the MO isotype (*Gentry 80312*).

Shrubs to 1 m; *young stems* covered with dense lanate or tomentose trichomes, the trichomes to 1.3 mm long, simple, unicellular, matted, stiff, white, nodes densely hirsute. *Leaves* to 5.3 mm long, opposite, compound, trifoliolate (rarely unifoliolate), densely congested; leaflets 2.0–4.9 × 1.4–3.3 mm, broadly obovate to nearly orbicular, broadly boat-shaped to nearly planar, upturned at apex, all leaflets similar in size and shape, coriaceous, thick, membranous and thin along the margins, shiny, drying dark brown on the upper surface and light brown on lower surface, midvein raised on upper and lower surface, thicker near the base, secondary veins 3–5 pairs per side, slightly raised to nearly inconspicuous on the upper surface, prominently raised on the lower surface, blade surfaces glabrous, usually lanate or tomentose along the upper one-third of the apical margins (usually more than 20 trichomes per apex), the trichomes are similar to those found on the young stems, 0.4–1.0 mm long, upper surface scrobiculate, lower surface scrobiculate and rugose, base cuneate to slightly oblique, margin entire, apex obtuse to slightly apiculate; petioles 0.1–0.4 mm long, reduced to inconspicuous or indiscernible protuberances, obscured by the dense pubescence at the nodes, dark red or black, densely hirsute or tomentose; petiolules 0.1–0.4 mm long, swollen, dark red or black, glabrous, rugulose; stipules 2.2–3.6 mm × 1.8–2.7 mm, interpetiolar, paired, free, broadly ovate to suborbicular, membranous to subcoriaceous, dark red or brown, outer surface densely lanate or tomentose, becoming more dense towards the apex and along the margin, trichomes to 1.1 mm long, similar to those found on the young stems, inner surface glabrous, base truncate, margin entire, apex rounded to obtuse, caducous. *Pseudoracemes* paired, unbranched, densely compacted, axillary on young growth at the terminus of the stem; peduncles to 0.9 mm long, reduced to inconspicuous protuberances, densely lanate or hirsute; fascicles (2-)4–8-flowered, densely compacted and congested; pedicels to 0.9 mm long in flower, to 1.9 mm long in fruit, sparsely lanate or hirsute; bracteoles not seen. *Flowers*, actinomorphic, bisexual, diplostemonous, recorded as white in color on the label; sepals 4, 1.0–1.2 × 0.5–0.9 mm in flower, to 1.4 mm long in fruit, ovate, subcoriaceous, adaxial surface glabrous, abaxial surface densely lanate to sparsely tomentose, denser near the apex and along the margin; petals 4, 1.0–1.2 × 0.8–1.0 mm, broadly elliptical to broadly obovate, membranous, white, midvein conspicuous, slightly raised and dark, glabrous, base truncate, margin entire and ciliated along the upper portion, apex rounded; stamens 8; filaments 0.8–2.0 mm long, 0.4–0.6 mm wide at base, flattened, slender at apex, glabrous; anthers 0.3–0.4 × 0.4–0.5 mm, orbicular, introrse, dorsifixed, longitudinally dehiscent; nectary disk annular with 8 concrescent lobes, surrounding the ovary, persistent in fruit; ovary 0.7–0.9 × 0.3–0.5 mm, superior, bicarpellate, syncarpous, red or brown, glabrous; styles 2, 0.2–0.4 mm long in flower, 0.6–0.9 mm long in fruit, divergent near the apex of the carpels, persistent in fruit; stigma simple, capitate. *Fruits* 1.9–2.4 × 1.4–1.8 mm (length measurement not includ-

ing the persistent styles), septicidal capsules, orbicular, occasionally widely ovate, dark red or brown, costate longitudinally, glabrous; seeds not seen.

Distribution and Habitat.—*Weinmannia bradfordiana* is known only from the type locality, collected near one of the summits of the Cordillera del Cóndor at about 2100 m elevation, and located about 15 km SE of the town of Gualaquiza. The Cóndor mountain range is covered by "dwarf-forest" vegetation consisting of many species of shrubs and small trees that have evidently adapted sclerophyllous habits due to thin, nutrient-poor sandstone substrate, and extremely wet and windy weather on the ridge.

Etymology.—The epithet was chosen in honor of Dr. Jason C. Bradford, who has spent a number of years in the field collecting Cunoniaceae, and who has made valuable contributions to our knowledge of the family through his continuing research efforts.

Weinmannia condorensis Z. Rogers, sp. nov. (**Fig. 2**). TYPE: ECUADOR. MORONA SANTIAGO: Cantón Gualaquiza: Crest of Cordillera del Cóndor, ridge top 15 km ENE of Gualaquiza, high montane forest and bromeliad sward. 03°22'S, 78°20'W, 2500 m, 26 Jul 1993 (fl., fr.), *Gentry 80465* (HOLOTYPE: QCNE-092303; ISOTYPES: AAU, MO-5613306, NY).

Haec species ad *Weinmanniam cochensem* Hieron. et *W. mariquitae* Szyszyl. maxime accedit, sed a hac inflorescentia subsessili, ab illa foliis multo minoribus ut videtur simplicibus sessilibusque propter petiolum perbrevem atque foliolis integris, ab ambabus foliis plerumque trifoliolatis interdum unifoliolatis distinguitur; a *W. bradfordiana* inflorescentia ex pseudoracemo fasciculis 1- ad 2-floris atque foliolis majoribus secus margines apicem versus glabris vel trichomatibus 5 vel minus ciliatis distinguitur.

Trees to 3 m; *young stems* covered with dense lanate or hirsute trichomes, the trichomes to 1.1 mm long, simple, unicellular, matted, stiff, white, nodes densely hirsute. *Leaves* to 7.6 mm long, opposite, compound, trifoliolate (rarely unifoliolate), congested; leaflets 3.6–6.8 × 1.9–4.5 mm, obovate to elliptical, broadly boat-shaped to nearly planar, upturned at apex, all leaflets similar in size and shape, coriaceous, thick, membranous and thin along the margins, drying dark brown, shiny, midvein prominently raised on upper and lower surface, thicker near the base, darker than blade, secondary veins 2–5 pairs per side, raised to nearly inconspicuous on the upper surface, more prominently raised on the lower surface, blade surfaces glabrous, infrequently having a few sparse trichomes at the apical margins (usually 5 or fewer trichomes per apex when pubescent), the trichomes are similar to those found on the young stems, 0.1–0.4 mm long, upper and lower surface scrobiculate and rugose, base cuneate to slightly oblique, margin entire, apex obtuse to slightly apiculate; petioles 0.7–1.2 mm long, often inconspicuous, obscured by the dense pubescence at the nodes, dark red or black, sparsely hirsute or tomentose; petiolules 0.3–0.6 mm long, swollen, dark red or black, glabrous, rugulose; stipules 2.2–3.5 mm × 2.0–3.0 mm, interpetiolar, paired, free, ovate to suborbicular, membranous to sub-

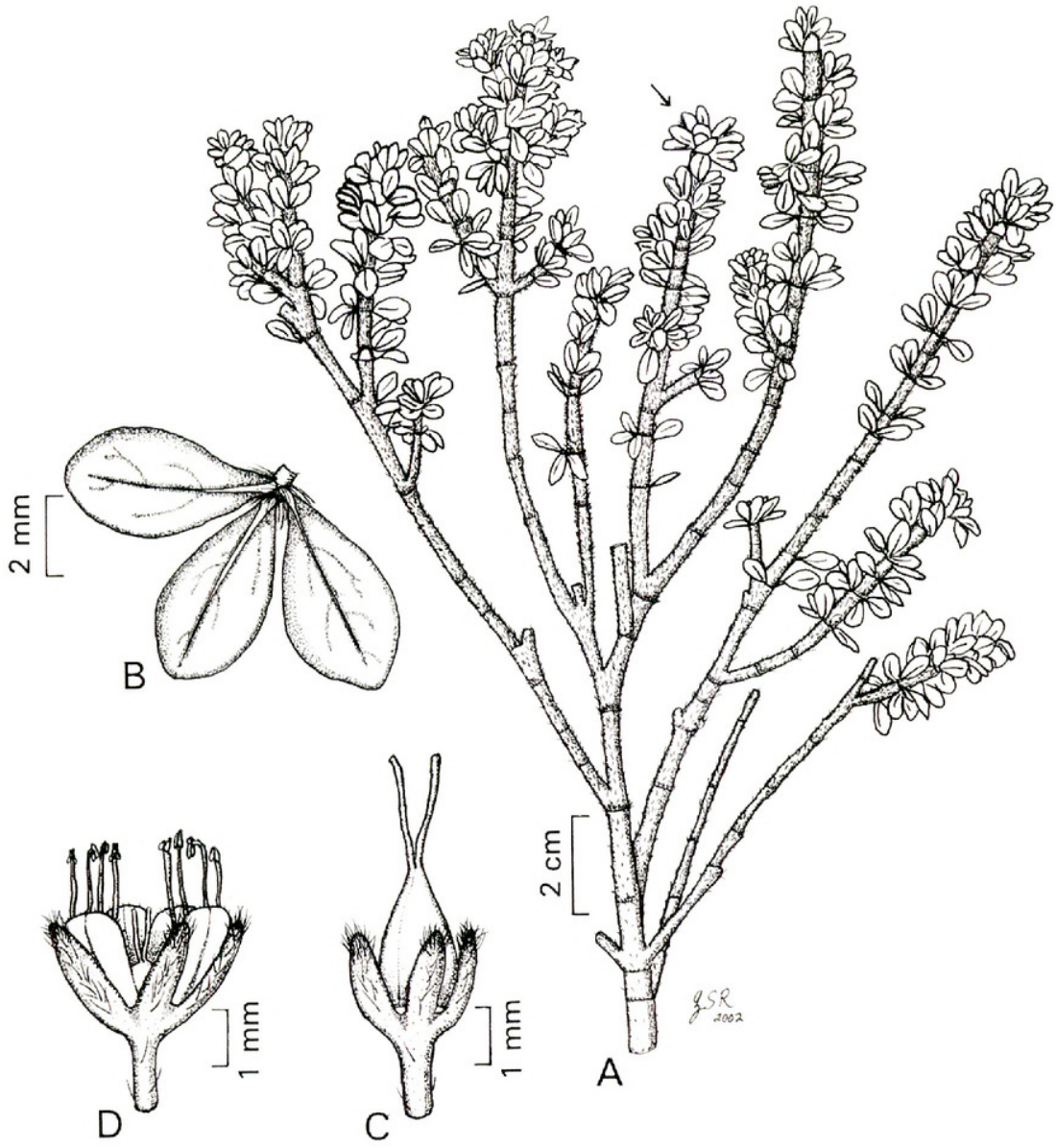

FIG. 2. *Weinmannia condorensis* Z. Rogers. A. Habit. B. Trifoliolate leaf. C. Immature capsule. D. Flower. The arrow points to the inflorescence. All illustrations drawn by the author from the type collection (*Gentry 80465*).

coriaceous, dark red or brown, outer surface glabrous to sparsely hirsute, densely hirsute along the margin, denser near the apex, trichomes 0.6–1.0 mm long, similar to those found on young stems, inner surface glabrous, base truncate, margin entire, apex rounded to obtuse, caducous. *Pseudoracemes* paired, unbranched, densely compacted, axillary on young growth, developing at 2 or more subsequent nodes at the terminus of the stem; peduncles to 0.4 mm long, reduced to inconspicuous protuberances in the leaf axils, lanate or hirsute, the trichomes are similar to those found on the young stems; fascicles 1- or 2-flowered, compacted and congested; pedicels to 1.2 mm in flower, sparsely hirsute; bracteoles not seen. *Flowers* actinomorphic, bisexual, diplostemonous, recorded as white

in color on the label; sepals 4, 1.6–2.4 × 0.8–2.0 mm, broadly ovate, subcoriaceous, adaxial surface glabrous, abaxial surface lanate, denser near the apex and along the midvein; petals 4, 1.6–2.0 × 1.2–2.2 mm, broadly elliptical to broadly obovate, membranous, white, midvein conspicuous, slightly raised and dark, glabrous, base truncate, margin entire and ciliated, apex rounded; stamens 8; filaments 0.8–2.5 mm long, 0.3–0.5 mm wide at base, flattened, slender at apex, glabrous; anthers 0.3–0.4 × 0.2–0.4 mm, orbicular, introrse, dorsifixed, longitudinally dehiscent; nectary disks annular with 8 concrescent lobes, surrounding the ovary, persistent in fruit; ovary to 0.9 mm long, to 0.6 mm wide, superior, bicarpellate, syncarpous, red or brown, glabrous; styles 2, to 2.1 mm long, divergent near the apex of the carpels, persistent in fruit; stigma simple, capitate. Fruits (immature) 1.8–2.5 mm long (measurement not including the persistent styles), septicidal capsules, ovate, dark red or brown, glabrous; seeds not seen.

Distribution and Habitat.—*Weinmannia condorensis* is known only from the type locality, collected on a ridge-top of the Cordillera del Cóndor mountain range at about 2500 m elevation, and located about 15 km ENE of the town of Gualaquiza. The site, as in the case of *W. bradfordiana*, is covered by "dwarf-forest" vegetation consisting of many species of shrubs and small trees with similar sclerophyllous adaptations.

Etymology.—The specific epithet refers to locality of the type collection.

Affinities.—According to the key for the Cunoniaceae in the Flora of Ecuador (Harling 1999), *W. bradfordiana* and *W. condorensis* would fit between the couplet *W. cochensis* Hieron. and *W. mariquitae* Szyszyl. because they have small compound leaves measuring less than 5 cm in length, but *W. mariquitae* is very different morphologically because it has much larger leaves with 4–8 leaflet pairs per leaf. On the other hand, *W. bradfordiana* and *W. condorensis* can be easily distinguished from the most morphologically similar species from Ecuador, *W. cochensis*, because they have smaller, trifoliolate (rarely unifoliolate) leaves with smaller, entire-margined leaflets, and inconspicuous peduncles. No other currently described species of *Weinmannia* in Ecuador has such highly reduced compound leaves and peduncles.

Weinmannia bradfordiana can be vegetatively distinguished from *W. condorensis* by its smaller leaves, its smaller, more broadly obovate to suborbicular leaflets, by the presence of 20 or more trichomes found along the apical margins of most leaflets, and by its densely pubescent stipules. The inflorescences of *W. bradfordiana* are more congested by more numerous flowers, and have slightly longer, more globular peduncles than *W. condorensis*. In contrast, most leaflets of *W. condorensis* are typically larger, narrowly obovate to elliptical and glabrous. *Weinmannia condorensis* also has inflorescences that are reduced to only 1 or 2 flowers, and stipules that are mostly glabrous except for a dense apical pubescence.

Another novel and distinctive character separating the two species is that *W. condorensis* has a rare inflorescence architecture, where pairs of racemes develop at two successive nodes near the terminal end of the main stem. The inflorescence of section *Weinmannia* (i.e. all Neotropical species) is limited to a pair of racemes developing from axillary buds at the most distal node, and is a distinctive character of the section. The development of racemes at two subsequent nodes has not been found in other Neotropical members of the genus, but it has been observed in a small group of species from Madagascar and the Comores (Bradford, pers. comm.). Patterns in inflorescence architecture are relatively stable in *Weinmannia*, and in many cases, can be more helpful than plastic vegetative characters, which often prove to be similar among many closely related species (Bradford 1998). The interesting inflorescence architecture of *W. condorensis* will definitely warrant further investigation once more collections are made available.

KEY TO MORPHOLOGICALLY SIMILAR SPECIES OF *WEINMANNIA* IN ECUADOR

1. Leaves 10–20 mm long, margins crenate at apex, usually 3–5 teeth, rarely 0; petioles 2–4 mm long; peduncles to 15 mm long _____ **Weinmannia cochensis**
1. Leaves to 7.6 mm long, margins entire; petioles inconspicuous to 1.2 mm long; peduncles inconspicuous to 0.9 mm long.
   2. Leaflets broadly obovate, margins usually covered by a dense apical pubescence (20 or more trichomes); stipules densely pubescent throughout; inflorescences (2–)4–8-flowered, only developing at the most distal node of the terminal end of the main stems _____ **Weinmannia bradfordiana**
   2. Leaflets narrowly obovate to elliptical, margins usually glabrous, or rarely with about 5 or fewer trichomes at the apices; stipules pubescent, trichomes concentrated along the apices and along the midvein; inflorescences 1- or 2-flowered, developing at two or more successive nodes at the terminal end of the main stems _____ **Weinmannia condorensis**

ACKNOWLEDGMENTS

The author thanks Jason Bradford (MO-DAV), Richard Barnes (HO) and David Neill (MO-QCNE) for their helpful review suggestions on the manuscript. The author would also like to thank Ron Liesner (MO) and Jon Ricketson (MO) for their comments, Roy Gereau (MO) for his preparation of the Latin diagnoses, Barney Lipscomb (BRIT) for waving the publication costs of this manuscript, and Uno Eliasson (GB) for expeditiously providing loan material.

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