

Subspecific variation:—Four traits vary within this species (stem branching, stem type, leaf division, leaf plication). There is geographic discontinuity, and Central American specimens are isolated from South American ones. All Central American specimens have plicate leaves, whereas few South American specimens do. Specimens from Central America differ significantly from South American ones in eight variables (rachis width, basal pinna angle, apical pinna length, apical pinna angle, prophyll length, peduncular bract length, peduncle length, rachilla width)(*t*-test, $P < 0.05$). Based on these results and geographic discontinuity, the two subgroups are recognized as subspecies (subsp. *corrugata*, *lehmannii*).

Key to the subspecies of *G. lehmannii*

- 1 Peduncles 38.7(12.5–63.0) cm long; South America (Venezuela, Colombia, Ecuador, and Peru) ... subsp. *lehmannii*
- Peduncles 62.9(19.0–88.5) cm long; western Panamasubsp. *corrugata*

32a. *Geonoma lehmannii* subsp. *lehmannii*

Geonoma helminthostachys Burret (1930a: 176). Type: COLOMBIA. Antioquia: Western Cordillera, above Ciudad Antioquia, 1800–2400 m, August 1891, *F. Lehmann 7233* (holotype B, destroyed, isotypes F!, K!).

Geonoma acutangula Burret (1930a: 177). Type: COLOMBIA. Antioquia: Plateado, 2150 m, 6 April 1880, *W. Kalbreyer 1570* (holotype B, destroyed). Neotype (designated by Bernal *et al.* 1989): COLOMBIA. Antioquia: Mun. Salgar, camino de ascenso al cerro Plateado, ca. 2200 m, 4 November 1985, *P. Franco et al. 2353* (neotype COL!, isoneotype AAU, *n.v.*).

Geonoma parvifrons Burret (1930a: 178). Type: ECUADOR. Loja: Loja to Zamora, 1500–2000 m, no date, *F. Lehmann 5288* (holotype B, destroyed, isotype K!).

Leaves seldom plicate. Inflorescences prophylls 20.8(10.0–35.0) cm long; peduncles 38.7(12.5–63.0) cm long.

Distribution and habitat:—From 9°53'N–13°00'S and 69°56'–79°03'W in the Andes of South America in Venezuela, Colombia, Ecuador, and Peru at 2100(1200–2900) m elevation in montane rainforest (Fig. 22).

Geonoma lehmannii subsp. *lehmannii* is widespread and variable, and occurs in several, disjunct populations. In Venezuela, most specimens occur in one area in Portuguesa and Trujillo, with an outlier in Lara. They have leaves with 3(3–5) pinnae per side of the rachis. They are geographically isolated and differ from the closest population in northern Colombia in nine variables.

In northern Colombia, specimens occur in the Central and Western Cordilleras only. Leaves are usually pinnate with 4(1–8) pinnae per side of the rachis, although rarely they are undivided and plicate. The types of *G. lehmannii*, *G. helminthostachys*, and *G. acutangula* are from this area. In Antioquia, specimens from the Central Cordillera tend to be smaller and those from the Western Cordillera larger, although there are exceptions. One specimen (*Callejas 2138*) has two inflorescences inserted at the same node. Specimens from southern Colombia (Caquetá, Huila, Putumayo) are geographically isolated but similar to those from the Central Cordillera in Antioquia.

To the south, specimens are from scattered areas in southern Ecuador and northern Peru, central Peru, and southern Peru. They have leaves with 3(1–7) pinnae per side of the. The type of *G. parvifrons* is from southern Ecuador. Four specimens from the Cordillera del Condor in Ecuador (*Croat 98964*, *Neill 14982*, *15024*, *Quizhpe 2222*) have undivided, plicate leaves, but other specimens from the same region have non-plicate leaves. Most specimens from Cajamarca in Peru have slender peduncles not covered by the bracts. In San Martín, one specimen (*Smith 4475*) has undivided leaves with more or less parallel sides.

32b. *Geonoma lehmannii* subsp. *corrugata* Henderson, subsp. nov. (Appendix IV, Plate 39)

Geonomae lehmannii subsp. *lehmannii* pedunculis longioribus differt.

Type: PANAMA. Chiriquí: Cerro Pate de Macho, 8°49'N, 82°24'W, 2150 m, 31 December 1985, *G. de Nevers & S. Charnley 6684* (holotype NY!, isotype MO!).

Leaves plicate. *Inflorescences* prophylls 30.8(16.5–41.5) cm long; peduncles 62.9(19.0–88.5) cm long.

Distribution and habitat:—From 8°29'–8°52'N and 81°05'–82°35'W in western Panama at 1715(1100–2500) m elevation in montane rainforest (Fig. 22). The outlying specimens are likely to be an artifact of insufficient collecting.

There is geographical variation in this subspecies (unlike subsp. *lehmannii*). Regression shows there are significant positive associations between elevation and one plant, five leaf and two inflorescence variables. Squared multiple *R* for the regression of stem height on elevation is 0.38, rachis width 0.19, number of pinnae 0.22, basal pinna length 0.38, basal pinna angle 0.29, apical pinna angle 0.34, peduncular bract length 0.67, and peduncle length 0.43. Values of all these variables increase with increasing elevation. Plants at higher elevations have taller stems, leaves with more pinnae and wider angles, and longer inflorescences. de Nevers and Grayum (1998) considered that there were two morphotypes of this taxon (as *G. jussieuana*); one with deciduous leaf bases and narrow, undivided leaves occurring in tall forest at lower elevations, and the other with persistent leaf bases and pinnate leaves occurring on wind-swept ridges in low forest at higher elevations.

33. *Geonoma leptospadix* Trail (1876: 327). Type: BRAZIL. Amazonas: Tonantins, 24 November 1874, *J. Trail 963/CLXXII* (holotype K!, isotypes F!, NY!, P!).

Geonoma saramaccana Bailey (1948: 104). Type: SURINAM. Saramacca River, 9 July 1944, *B. Maguire 24095* (holotype NY!).

Plants 1.5(0.5–3.0) m tall; stems 0.8(0.4–2.0) m tall, 0.7(0.5–0.9) cm in diameter, solitary or clustered, cane-like; internodes 0.9(0.5–1.6) cm long, yellowish and smooth. *Leaves* 13(10–17) per stem, undivided or rarely irregularly pinnate, not plicate, bases of blades running diagonally into the rachis; sheaths 9.0(7.0–12.0) cm long; petioles 6.6(2.5–13.0) cm long, drying green or yellowish; rachis 32.0(21.8–43.0) cm long, 2.7(1.5–4.3) mm in diameter; veins not raised or slightly raised and triangular in cross-section adaxially; pinnae 1(1–3) per side of rachis; basal pinna length and width not applicable, forming an angle 20(10–28)° with the rachis; apical pinna 11.4(6.3–15.3) cm long, width not applicable, forming an angle of 26(20–35)° with the rachis. *Inflorescences* branched 1 order; prophylls and peduncular bracts not ribbed with elongate, unbranched fibers, flattened, persistent; prophylls 5.9(4.3–10.4) cm long, not short and asymmetrically apiculate, the surfaces not ridged, without unequally wide ridges; peduncular bracts 5.0(3.7–6.4) cm long, well-developed, inserted 0.9(0.3–2.3) cm above the prophyll; peduncles 13.7(6.5–20.3) cm long, 2.4(1.4–3.3) mm in diameter; rachillae 4(2–6), 13.7(6.5–28.0) cm long, 1.3(0.9–1.8) mm in diameter, the surfaces without spiky, fibrous projections or ridges, drying brown, with faint to pronounced, short, transverse ridges, not filiform and not narrowed between the flower pits; flower pits spirally arranged, glabrous internally; proximal lips without a central notch before anthesis, not recurved after anthesis, hood-shaped at anthesis, sometimes splitting post-anthesis; proximal and distal lips drying the same color as the rachillae, not joined to form a raised cupule, the proximal lip margins overlapping the distal lip margins; distal lips well-developed; staminate and pistillate petals not emergent, not valvate throughout; staminate flowers deciduous after anthesis; stamens 6; thecae diverging at anthesis, inserted almost directly onto the filament apices, the connectives bifid but scarcely developed; anthers short and curled over at anthesis; non-fertilized pistillate flowers deciduous after anthesis; staminodial tubes crenulate or shallowly lobed at the apex, when lobed the lobes not spreading at anthesis nor acuminate, those of non-fertilized pistillate flowers not projecting and persistent after anthesis; *fruits* 8.0(7.0–9.4) mm long, 7.2(6.0–7.8) mm in diameter, the bases without a prominent stipe, the apices not conical, the surfaces not splitting at maturity, without fibers emerging, not bumpy and not apiculate; locular epidermis without operculum, smooth, without pores.

Distribution and habitat:—From 6°43'N–13°04'S and 46°26'–77°18'W in the Amazon region of Colombia, Venezuela, Guyana, Suriname, French Guiana, Brazil, Peru, Ecuador, and Bolivia at 361(125–850) m elevation in lowland rainforest (Fig. 23).

form a raised cupule, the proximal lip margins overlapping the distal lip margins; distal lips well-developed; staminate and pistillate petals not emergent, not valvate throughout; staminate flowers deciduous after anthesis; stamens 6; thecae diverging at anthesis, inserted almost directly onto the filament apices, the connectives bifid but scarcely developed; anthers short and curled over at anthesis; non-fertilized pistillate flowers persistent after anthesis; staminodial tubes crenulate or shallowly lobed at the apex, those of non-fertilized pistillate flowers not projecting and persistent after anthesis; *fruits* 8.1(6.6–10.7) mm long, 6.3(5.2–7.6) mm in diameter, the bases with a prominent, asymmetric stipe, the apices not conical, the surfaces not splitting at maturity, without fibers emerging, bumpy from the numerous, subepidermal, tangential, short fibers present, these coming to a point at fruit apices; locular epidermis without operculum, sculpted, usually also with a raised, meridional ridge, without pores.

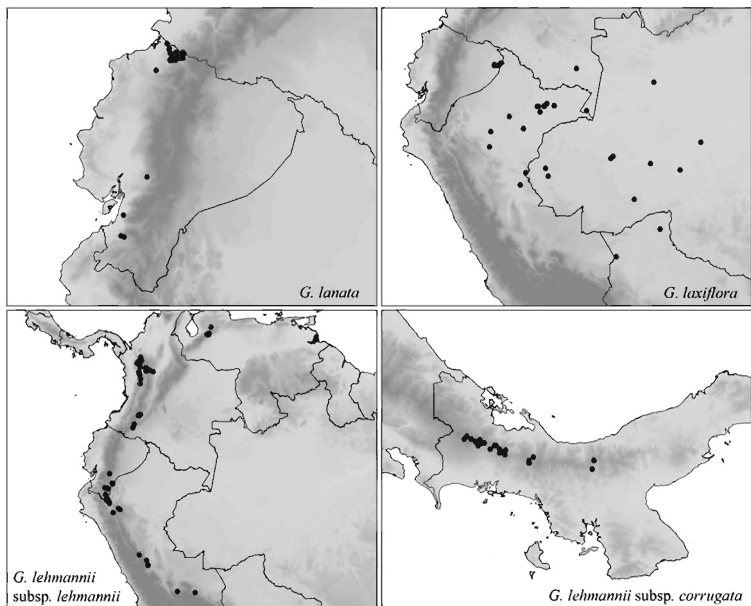


FIGURE 22. Distribution maps of *Geonoma lanata*, *G. laxiflora*, *G. lehmannii* subsp. *lehmannii*, and *G. lehmannii* subsp. *corrugata*.

Taxonomic notes:—*Geonoma lehmannii* is the first species dealt with here in a group of high elevation, Andean species, the *G. undata* clade. This group also includes *G. orbignyana*, *G. talamancana*, *G. trigona*, and *G. undata*. These species have been treated differently by both Wessels Boer (1968) and Henderson *et al.* (1995). They are closely related and three of them—*G. lehmannii*, *G. orbignyana*, and *G. undata*—are difficult to distinguish from one another, and extremely complex internally. *Geonoma lehmannii* differs from other species in this group, except *G. talamancana*, in its tubular, narrow, elongate, closely sheathing, more or less persistent prophylls and peduncular bracts which are ribbed with elongate, unbranched fibers. It differs from *G. talamancana* in its well-developed peduncular bract.