

Specimens from southern Ecuador and northern Peru, and continuing south to Bolivia (*southern* morphotype), are very variable. In northern Peru, there are three distinct groups of specimens from San Martín occurring in the same area. One group (*Gentry 45513, Smith 4590*) has regularly pinnate leaves and inflorescences branched to two orders; the second (*Smith 4842*) has regularly pinnate leaves and two, thick rachillae; and the third (*Gentry 45312, 45403, 45512, 45538*) with undivided leaves and few, thin rachillae. There are two very distinct groups from the Cerro del Sira in Huánuco. One has finely pinnate leaves and small inflorescences and occurs at lower elevations (*Dudley 13064, Rainer 133288, 1330188, 2214988, 2314988, Wolfe 12335*); the second (*Rainer 2513988*) has irregularly pinnate leaves and larger inflorescences, and occurs at higher elevations.

Specimens from southern part of Peru (Cuzco, Pasco, Puno) have wider rachillae. In Bolivia, some specimens have wide apical pinna and short, thick, densely tomentose rachillae, e.g., the type of *G. pachydicrana*. Other specimens have narrow and widely spaced pinnae, unbranched or branched inflorescences (sometimes on the same specimen), the bracts cover the peduncle, and glabrous rachillae. The types of *G. orbignyana* and *G. jussieuana* have this kind of inflorescence.

45b. *Geonoma orbignyana* subsp. *hoffmanniana* (Wendland ex Spruce) Henderson, comb. & stat. nov.

Basionym: *Geonoma hoffmanniana* Wendland ex Spruce (1871: 106). Type: COSTA RICA. Heredia: Volcán de Barba, no date, *H. Wendland s.n.* (holotype K!).

Geonoma molinae Glassman (1964: 7). Type: NICARAGUA. Matagalpa: Santa María de Ostuma, between Matagalpa and Jinotega, 1300–1500 m, 8 January 1963, *L. Williams, A. Molina, & R. Williams 23507* (holotype F!).

Inflorescences peduncular bracts 20.6(10.7–27.5) cm long; peduncles 32.4(20.9–56.0) cm long.

Distribution and habitat:—From 8°52'–13°02'N and 82°33'–86°20'W in Nicaragua, Costa Rica, and Panama at 2008(1400–3000) m elevation in montane rainforest (Fig. 30).

This subspecies occurs in three separate areas; Nicaragua, the central part of Costa Rica, and eastern Costa Rica/western Panama.

There are six specimens from Nicaragua and these are small in size. There are no differences in any quantitative variable between these specimens and those of central Costa Rica, although they do occur at lower mean elevations (1475 m versus 2030 m).

In central Costa Rica specimens occur on three separate Cordilleras; Pacific slope on Tilarán (Monteverde), Atlantic slope on Central (Barva); and Pacific and Atlantic slope on Central. Specimens from Tilarán (Monteverde) have unbranched inflorescences, as does one specimen from Central. Specimens from Barva and the Pacific and Atlantic slopes of Central are small in size and similar to those from Nicaragua.

In eastern Costa Rica and western Panama, on the Talamanca, some specimens are also small (*Davidse 26197, Fletes 1, Gamboa 708*) but the others are the largest of any area, and occur at higher elevations. These specimens occur sympatrically with large specimens of *G. undata* subsp. *edulis*. Hammel *et al.* (2003) considered that larger specimens of subsp. *hoffmanniana* (as *G. hoffmanniana*) and sympatric subsp. *edulis* (as *G. edulis*) were 'virtually indistinguishable'.

There is geographical variation in this subspecies. Regression shows there are significant associations between elevation and one plant, three leaf, and one inflorescence variable. Squared multiple *R* for the regression of stem height on elevation is 0.32, rachis width 0.24, basal pinna length 0.43, apical pinna length 0.33, and peduncle width 0.17. Values of these variables increase with increasing elevation. Stems become taller, rachis wider, basal and apical pinnae longer and peduncles wider with increasing elevation.

46. *Geonoma paradoxa* Burret (1934a: 1040). Type: COLOMBIA. Cauca: Coteje and Santa María on Río Timbiquí, 200–600 m, 1898, *F. Lehmann 8957* (holotype B, destroyed, isotypes K!, NY!).

Plants 0.8(0.7–1.0) m tall; stems 0.2(0.1–0.3) cm tall, 1.3(1.2–1.3) cm in diameter, solitary, not cane-like; internodes 0.4(0.3–0.4) cm long, not scaly. *Leaves* 9(6–12) per stem, undivided or irregularly pinnate, not

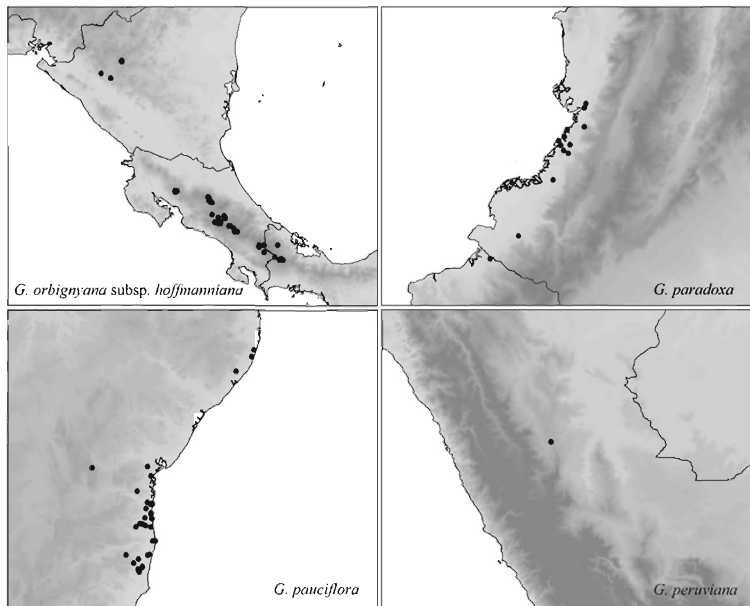


FIGURE 30. Distribution maps of *Geonoma orbignyana* subsp. *hoffmanniana*, *G. paradoxa*, *G. pauciflora*, and *G. peruviana*.

Plants 1.9(1.0–3.0) m tall; stems 2.3(1.5–3.0) m tall, 0.7(0.5–1.2) cm in diameter, solitary or clustered, cane-like; internodes 2.0(0.9–2.9) cm long, yellowish and smooth. *Leaves* 12(7–19) per stem, undivided or irregularly pinnate, not plicate, bases of blades running diagonally into the rachis; sheaths 8.4(3.7–15.5) cm long; petioles 12.8(4.5–27.0) cm long, drying green or yellowish; rachis 24.2(13.0–44.0) cm long, 2.5(1.2–4.5) mm in diameter; veins not raised or slightly raised and triangular in cross-section adaxially; pinnae 2(1–6) per side of rachis; basal pinna 17.5(10.5–26.0) cm long, 3.0(1.4–6.0) cm wide, forming an angle of 36(14–66)° with the rachis; apical pinna 11.8(7.0–18.5) cm long, 8.3(5.0–18.0) cm wide, forming an angle of 30(17–45)° with the rachis. *Inflorescences* unbranched or branched 1 order; prophylls and peduncular bracts not ribbed with elongate, unbranched fibers, flattened (if tubular, narrow, and elongate then not ribbed), deciduous or persistent; prophylls 13.5(7.0–19.0) cm long, not short and asymmetrically apiculate, the surfaces not ridged, without unequally wide ridges; peduncular bracts 12.4(5.4–18.5) cm long, well-developed, inserted 3.1(1.6–5.1) cm above the prophyll; peduncles 20.8(10.5–33.5) cm long, 2.7(1.2–5.0) mm in diameter; rachillae 3(1–6), 10.7(4.7–18.2) cm long, 2.9(1.6–4.3) mm in diameter, the surfaces without spiky, fibrous projections or ridges, drying brown or yellow-brown, without short, transverse ridges, not filiform and not narrowed between the flower pits; flower pits usually spirally arranged, sometimes decussately or tricusately, then the groups not closely spaced nor consistently arranged throughout the rachillae, glabrous internally; proximal lips without a central notch before anthesis, not recurved after anthesis, not hood-shaped; proximal and distal lips drying the same color as the rachillae, not joined to form a raised cupule, the proximal lip