

36.5) cm long, 2.5(1.4–3.7) mm in diameter; veins raised and rectangular in cross-section adaxially; pinnae 3 per side of rachis; basal pinna 17.7(6.2–23.5) cm long, 2.0(1.0–4.5) cm wide, forming an angle of 72(43–97)° with the rachis; apical pinna 16.6(5.5–21.5) cm long, 11.2(5.0–16.7) cm wide, forming an angle of 35(22–42)° with the rachis. *Inflorescences* branched 1 order; prophylls and peduncular bracts not ribbed with elongate, unbranched fibers, flattened, deciduous; prophylls 7.0(4.2–10.0) cm long, short, asymmetrically apiculate, the margins curved around the stem, the surfaces flat with dense, felty, brown tomentum, prophyll equal to and early deciduous with the peduncular bract, the surfaces not ridged, without unequally wide ridges; peduncular bracts 5.6(4.0–7.0) cm long, well-developed, inserted 0.4(0.2–0.5) cm above the prophyll; peduncles 6.0(4.0–10.2) cm long, 3.5(2.0–4.5) mm in diameter; rachillae 4(3–9), 23.1(7.3–33.5) cm long, 2.8(2.1–3.6) mm in diameter, the surfaces with 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 spirally arranged, 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 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 onto bifid and well-developed, non-jointed connectives; anthers short and curled over at anthesis; non-fertilized pistillate flowers deciduous after anthesis; staminodial tubes lobed at the apex, the lobes not spreading at anthesis, not acuminate, those of non-fertilized pistillate flowers not projecting and persistent after anthesis; *fruits* 6.9(6.5–7.3) mm long, 6.3(6.2–6.4) mm in diameter, the bases without a prominent stipe, the apices not conical, the surfaces not splitting at maturity, without fibers emerging; fruit surfaces not bumpy, not apiculate; locular epidermis without operculum, smooth, without pores.

**Distribution and habitat:**—From 4°57'N–3°22'S and 63°01'–70°50'W in the central–western Amazon region of Colombia, Venezuela, and Brazil (including an unmapped specimen, *Kuhlmann 1236*, from “Tocantins”, Pará) at 206(100–250) m elevation in lowland rainforest (Fig. 29).

**Taxonomic notes:**—This species was considered by Wessels Boer (1968) to be related to *Geonoma deversa*. In fact, the two are not related, and *G. oligoclona* forms a clade with *G. aspidiifolia* and *G. santanderensis*. All three species share internodes covered with reddish or brownish scales, rachillae surfaces with spiky, fibrous projections or ridges, and staminodial tubes lobed at the apex with the lobes not spreading at anthesis and not acuminate. *Geonoma oligoclona* differs from *G. aspidiifolia* and *G. santanderensis* in its prophyll which has the margins curved around the stem and the surfaces flat with dense, felty, brown tomentum.

**Subspecific variation:**—No trait varies within this species. The specimens come from scattered localities, but this is probably an artifact of insufficient collecting. One specimen (*Galeano 1869*) is much smaller than the others and is reported to come from a white sand savanna area.

#### 44. *Geonoma operculata* Henderson, *sp. nov.* (Appendix IV, Plate 52)

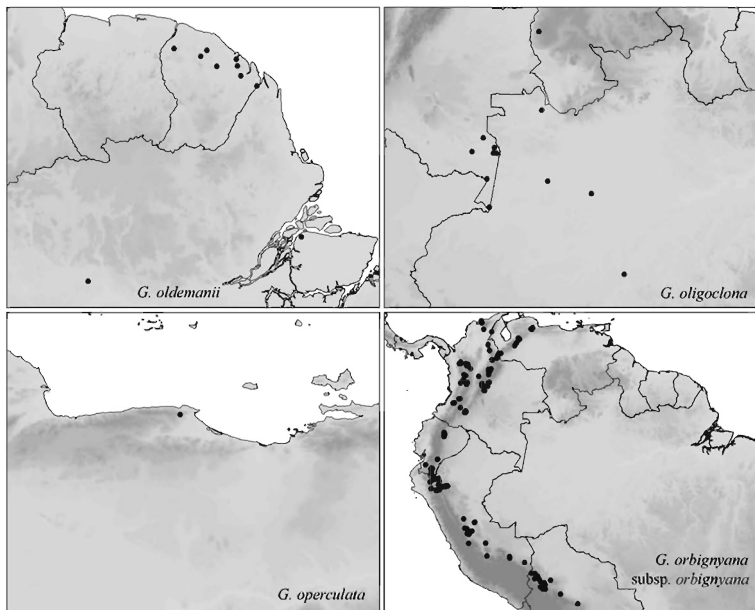
*A speciebus affinis operculo differt.*

Type: VENEZUELA. Miranda: Cordillera de la Costa, al noreste de Guaitre, Fila Juan Torres-Fila Las Perdices, por el río Guayabal hacia el pueblo Guayabal, 10°31'N, 66°20'W, 700–900 m, 19–22 February 1993, *W. Meier 3401* (holotype NY!, isotype VEN *n.v.*).

*Plants* 2.0 m tall; stems height and in diameter no data; internodes yellowish and smooth. *Leaves* irregularly pinnate, not plicate, bases of blades running diagonally into the rachis; sheaths no data; petioles drying green or yellowish; rachis 23.0 cm long; veins not raised or slightly raised and triangular in cross-section adaxially; pinnae 3 per side of rachis; basal pinna length, width and angle no data; apical pinna 12.5 cm long, 9.0 cm wide, forming an angle of 34° with the rachis. *Inflorescences* branched 2 orders; prophylls and peduncular

bracts not ribbed with elongate, unbranched fibers, flattened, deciduous or persistent; prophylls length 4 cm long, short, asymmetrically apiculate, the margins curved around the stem, the surfaces flat with dense, felty, brown tomentum, prophyll equal to and early deciduous with the peduncular bract, the surfaces not ridged, without unequally wide ridges; peduncular bracts no data; peduncles 12.0 cm long, 3.2 mm in diameter; rachillae 37, 15.0 cm long, 0.8 mm in diameter, the surfaces without spiky, fibrous projections or ridges, drying brown, with faint to pronounced, short, transverse ridges, filiform with extended narrowed sections between the flower pits; flower pits alternately arranged (sometimes distorted by twisting and contracting of 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, joined to form a raised cupule, the margins not overlapping; 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 no data; staminodial tubes crenulate or shallowly lobed at the apex, persistence no data; *fruits* 7.5 mm long, 5.8 mm in diameter, the bases without a prominent 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 with operculum, smooth, without pores.

**Distribution and habitat:**—At 10°31'N and 66°20'W in the Coastal Cordillera in Venezuela (Miranda) at 800 m elevation in lowland rainforest (Fig. 29).



**FIGURE 29.** Distribution maps of *Geonoma oldemanii*, *G. oligoclona*, *G. operculata*, and *G. orbignyana* subsp. *orbignyana*.

**Taxonomic notes:**—This species is based on a single specimen. This is very similar to specimens of *G. braunii*, and in fact it was identified as such by Stauffer (1997, as *G. spinescens* var. *braunii*). However, the fruits of the specimen (in a separate packet, see Appendix IV, Plate 52) have an operculum, and because of this the specimen is here recognized as a separate species. It is the only species outside of the *Geonoma congesta* clade to have fruits with an operculum. Apart from the operculum, the specimen bears no resemblance to species in the *G. congesta* clade but appears similar to specimens of *G. braunii*.

**Subspecific variation:**—No trait varies within this species and only one specimen is known.

**45. *Geonoma orbignyana* Martius (1843: 22).** Type: BOLIVIA. Cochabamba: Yuracares, no date, A. d'Orbigny 44 (holotype P n.v.).

*Plants* 2.0(0.5–7.0) m tall; stems 1.5(0.1–4.0) m tall, 1.2(0.5–2.2) cm in diameter, solitary or clustered, not cane-like or cane-like; internodes 1.0(0.2–3.8) cm long, yellowish and smooth, or, if short and congested, not scaly. *Leaves* 10(4–20) per stem, undivided or irregularly pinnate, sometimes regularly pinnate and the pinnae with 1 main vein only, not plicate or plicate, bases of blades running diagonally into the rachis; sheaths 18.5(5.0–60.0) cm long; petioles 30.0(1.5–90.0) cm long, drying green or yellowish; rachis 32.7(5.0–76.0) cm long 3.5(1.2–8.2) mm in diameter; veins raised and rectangular in cross-section adaxially; pinnae 5(1–26) per side of rachis; basal pinna 30.1(13.0–59.5) cm, long, 3.0(0.1–15.5) cm wide, forming an angle of 44(7–95)° with the rachis; apical pinna 20.6(7.7–47.5) cm long, 7.1(0.3–21.3) cm wide, forming an angle of 25(6–43)° with the rachis. *Inflorescences* unbranched or branched 1–2 orders; prophylls and peduncular bracts not ribbed with elongate, unbranched fibers, flattened (if tubular, narrow, and elongate then not ribbed), deciduous or persistent; prophylls 21.2(3.4–41.5) cm long, not short and asymmetrically apiculate, the surfaces not ridged, without unequally wide ridges; peduncular bracts 19.5(3.0–49.0) cm long, well-developed, inserted 9.8(0.8–39.0) cm above the prophyll; peduncles 30.9(6.0–88.5) cm long, 3.5(1.3–11.1) mm in diameter; rachillae 5(1–28), 15.3(5.0–31.0) cm long, 3.5(1.8–6.6) 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 tricussately, then the groups not closely spaced nor consistently arranged throughout the rachillae, glabrous internally; proximal lips apiculate and lobed before anthesis, tearing in the center after 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 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* 9.0(6.0–16.5) mm long, 6.8(5.1–12.9) 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, smooth, without pores.

**Taxonomic notes:**—*Geonoma orbignyana* is a member of a group of high elevation, Andean species, the *G. undata* clade, which also includes *G. lehmannii*, *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 orbignyana* differs from *G. lehmannii* and *G. talamancana* in its prophylls and peduncular bracts which are flattened and not ribbed with elongate, unbranched fibers; from *G. talamancana* in its well-developed peduncular bract; from *G. trigona* in its well-developed distal lips; and from *G. undata* in its prophyll surfaces which are not ridged and without unequally wide ridges.