

width 0.17, and apical pinna angle 0.50. There is a change in leaf shape, from specimens in the east having shorter petioles and fewer, wider and longer pinnae with narrower angles to those in the west having longer petioles, more, narrower and shorter pinnae with wider angles.

In Brazil (Acre) and adjacent Peru most specimens are relatively uniform. There are some specimens (e.g., *Daly 10582, 10947*) with thicker rachillae and the flower pits arranged in closer spirals, as in central Peru (see below).

There is extreme variation in central Peru on eastern Andean slopes and adjacent areas. In Ayacucho, Huánuco, Pasco, San Martín, and Ucayali some specimens have larger leaves and longer, thicker rachillae along which the flower pits are wider and are arranged in closer spirals (*large-sized* morphotype). These larger-sized specimens sometimes occur together with the more usual-sized specimens. Some resemble *G. poeppigiana* and two (*Schunke 16280, 9912*) have bracts more like those of *G. poeppigiana*, and may be hybrids with that species.

Two other specimens (*Foster 7846, Roncal 182*) from Pasco have longer stems. One (*Foster 7846*) has a stem that is reported to be 2–3 m tall, and the other (*Roncal 182*) has cane-like stems with the internodes longer than wide. Both have short inflorescences, and in *Roncal 182* they appear to be pendulous. One other specimen (*Smith 3849*) appears similar. These occur near to an isolated population of *Geonoma deversa* subsp. *deversa, killipii* morphotype, and it is possible they represent hybrids with that morphotype. These and other possible hybrids are excluded from the above description.

In San Martín, one specimen (*Schunke 8080*) has the shortest prophyll (5.7) cm and interbract distance (0.5 cm) of all specimens, and the adaxial veins are not raised. It occurs sympatrically with another isolated population of *G. deversa* subsp. *deversa*, and may also be a hybrid.

One specimen from Huánuco (*Moore 8355*), with branched inflorescences, has unusually short rachillae and comes from an unusually high elevation (1575 m). It may be a hybrid.

Most specimens from southern Peru (Cusco, Madre de Dios, Puno) and Bolivia have non-raised adaxial veins, and thin, elongate rachillae along which the pits may be tricussately arranged, especially in the central part of the rachilla. A few specimens from northern Bolivia (*Moreno 124, Fuentes 3911, Macia 3986, Beck 18258, Croat 51638, Beck 16466, Williams 941, Williams 939*) and southern Peru (*Foster 9721, 9576*) have thicker rachillae and the flower pits arranged in closer spirals, as found in the large central Peruvian specimens. A few specimens (*Moreno 227, Gerlach 214, Foster 13393, Hodge 6079, Plowman 5062*) from southern Peru and Bolivia have exceptionally long interbract distances (10.3–18.5 cm).

There is variation in connectives in this species. Specimens are scored as having the thecae inserted almost directly onto the filament apices, the connectives bifid but scarcely developed. However, in some specimens the connectives appear not to be bifid, and are similar to those of *G. macrostachys*.

6b. *Geonoma brongniartii* subsp. *pascoensis* Henderson, subsp. nov. (Appendix IV, Plates 2 & 3)

Geonomae brongniartii subsp. *brongniartii* inflorescentiis saepe ramosis atque fructibus parvioribus differt.

Type: PERU. Pasco: near Pozuzo, opposite the town, steep slope above river opposite margin of Rio Pozuzo, along road that runs south, 11 September 1998, A. Henderson, E. Ferreira & M. Arakaki 3012 (holotype USM!, isotype NY!).

Leaves veins raised and rectangular in cross-section adaxially. Inflorescences unbranched or usually branched 1 order; fruits 5.9(5.7–6.1) mm long, 4.8(4.5–5.2) mm in diameter.

Distribution and habitat:—From 9°37'–10°33'S and 74°55'–75°34'W in sub-Andean regions of Peru (Junin, Pasco) at 417(200–1000) m elevation in lowland rainforest (Fig. 10).

7. *Geonoma calyptrogynoides* Burret (1930a: 223). Type: COLOMBIA. Antioquia: La Mesa, no date. W. Kalbreyer 1398 (holotype B, destroyed). Neotype (designated by de Nevers & Grayum 1988): COLOMBIA. Chocó: Zona de Urabá, Cerro del Cuchillo, sector Cuchillo Blanco, 10–20 m, 15 October 1987, D. Cárdenas 668 (neotype MO!).

Plants 3.4(2.0–5.0) m tall; stems 2.9(1.5–4) m tall, 2.1(2.0–2.2) cm in diameter, solitary or clustered, cane-like; internodes 2.9(2.6–3.1) cm long, yellowish and smooth. *Leaves* 12(8–15) per stem, undivided or irregularly pinnate, not plicate, bases of blades running diagonally into the rachis; sheaths 30.2(19.5–43.5) cm long; petioles 35.5(19.0–50.0) cm long, drying green or yellowish; rachis 81.1(48.0–119.0) cm long, 6.8(4.4–9.9) mm in diameter; veins raised and rectangular in cross-section adaxially; pinnae 3(1–8) per side of rachis; basal pinna 64.9(42.0–82.5) cm long, 22.0(11.5–40.5) cm wide, forming an angle of 27(15–42)° with the rachis; apical pinna 37.1(17.5–48.0) cm long, 23.2(14.3–33.0) cm wide, forming a 29(22–35)° angle with the rachis. *Inflorescences* branched 1 order; prophylls and peduncular bracts not ribbed with elongate, unbranched fibers, flattened, deciduous or persistent; prophylls 22.1(16.0–28.2) cm long, not short and asymmetrically apiculate, the surfaces ridged with close, equal, parallel, non-dividing ridges, scarcely tomentose between the ridges, without unequally wide ridges; peduncular bracts 25.3(21.5–30.0) cm, well-developed, inserted 2.9(1.4–4.8) cm above the prophyll; peduncles 45.4(32.0–60.4) cm long, 7.3(4.5–10.3) mm in diameter; rachillae 5(3–9), 21.7(14.5–34.0) cm long, 6.1(4.5–8.3) 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 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 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 at the apex, those of non-fertilized flowers projecting and persistent after anthesis; *fruits* 13.2(11.8–15.5) mm long, 10.0(8.3–11.2) mm in diameter, the bases with a prominent, asymmetric stipe, the apices not conical, the surfaces not splitting at maturity, with fibers emerging, not bumpy, not apiculate; locular epidermis with operculum, smooth, with pores.

Distribution and habitat:—From 8°20'N–1°02' and 74°11'–78°42'W in eastern Panama, the Pacific coast of Colombia and Ecuador, and the Magdalena and Cauca valleys in Colombia, at 212(15–550) m elevation in lowland rainforest (Fig. 11).

Taxonomic notes:—This species was included as a synonym of *Geonoma congesta* by Henderson *et al.* (1995), but this placement was disputed by de Nevers & Grayum (1998). While closely related, *G. calyptrognoidea* differs from *G. congesta* by its proximal lips of flower pits without a central notch before anthesis.

Subspecific variation:—Two traits (stem branching, leaf division) vary within this species. There is evidence of geographic discontinuity and the species occurs in two areas—eastern Panama and the Pacific coast of Colombia and Ecuador (the gap in southern Colombia is likely to be an artifact of insufficient collecting), and the Magdalena and Cauca valleys in Colombia. The Magdalena and Cauca population has inflorescences with more, longer rachillae, but there are too few specimens to test for differences between the two areas.

8. *Geonoma camana* Trail (1876: 324). *Taenianthera camana* (Trail) Burret (1930a: 270)

Type: BRAZIL. Amazonas: San Antonia da Boa Vista, Rio Javari, 4 December 1874, *J. Trail 977/CLXXXII* (holotype K n.v., isotype P!).

Geonoma lageslana Dammer (1907: 121). *Taenianthera lagesiana* (Dammer) Burret (1930a: 270). Type: BRAZIL. Amazonas: Rio Juruá, Juruá-mirim, August 1901. *E. Ule 5745* (holotype not known, isotype MG!).

Plants 2.0(0.8–4.0) m tall; stems 0.5(0.1–1.3) m tall, 2.3(1.7–2.8) cm in diameter, solitary, not cane-like; internodes 0.6(0.5–0.6) cm long, not scaly. *Leaves* 9(5–14) per stem, irregularly pinnate or regularly pinnate and the pinnae with 1 main vein only, not plicate, the bases of blades running diagonally into the rachis; sheaths 19.2(5.0–50.0) cm long; petioles 71.0(24.0–140.0) cm long, drying green or yellowish; rachis

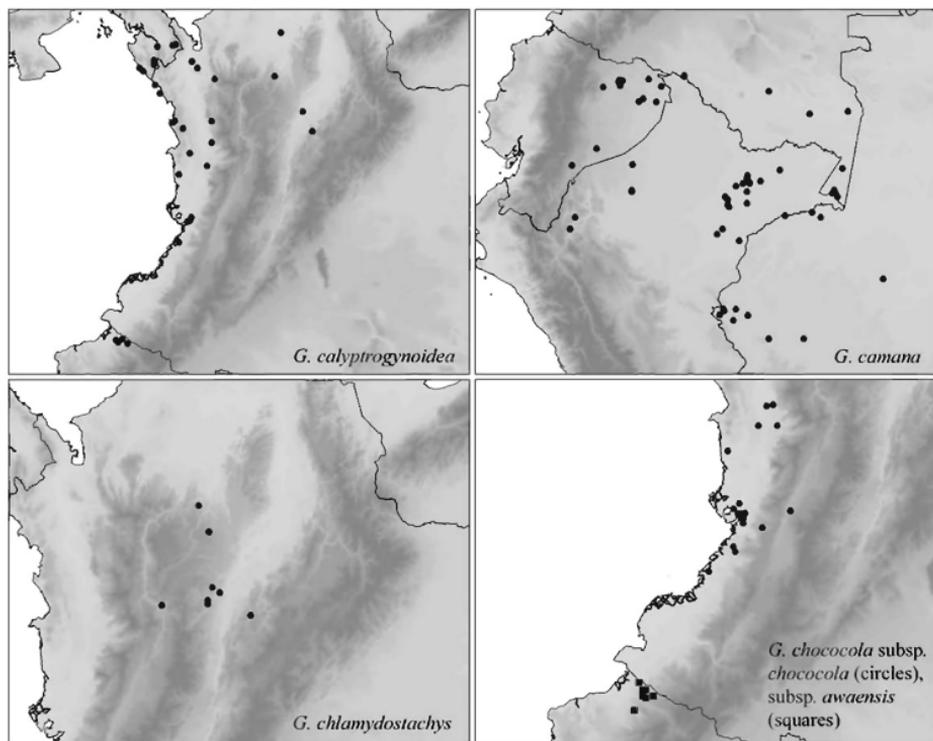


FIGURE 11. Distribution maps of *Geonoma calyptrogynoides*, *G. camana*, *G. chlamydostachys*, *G. chococola* subsp. *chococola*, and *G. chococola* subsp. *awaensis*.

Plants 1.8(1.0–3.0) m tall; stems 1.4(0.6–2.5) m tall, solitary. *Leaves* irregularly pinnate, not plicate, the bases of blades running diagonally into the rachis; sheaths 19.0 cm long; petioles 8.0 cm long, drying green or yellowish; rachis 44.6(36.5–57.0) cm long, 4.3(2.8–6.0) mm in diameter; veins not raised or slightly raised and triangular in cross-section adaxially; pinnae 5(3–9) per side of rachis; basal pinna 33.8(22.0–41.0) cm long, 11.6(1.8–17.0) cm wide, forming an angle of 32(23–43)° with the rachis; apical pinna 17.0(12.5–23.0) cm long, 11.7(8.4–14.5) cm wide, forming an angle of 38(32–45)° with the rachis. *Inflorescences* unbranched; prophylls and peduncular bracts ribbed with elongate, unbranched fibers, both bracts tubular, narrow, elongate, closely sheathing the peduncle, more or less persistent; prophylls 7.4(5.0–9.0) cm long, not short and asymmetrically apiculate, the surfaces not ridged, without unequally wide ridges; peduncular bracts 27.4(25.0–33.5) cm long, well-developed, inserted 0.6(0.4–0.9) cm above the prophyll; peduncles 43.2(36.2–49.0) cm long, 3.3(2.6–3.8) mm in diameter; rachillae 1, 17.9(14.5–26.4) cm long, 5.9(4.8–7.1) 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 spirally arranged, glabrous internally; proximal lips with a central notch before anthesis, often the two sides of the notch overlapping, not recurved after anthesis, not hooded; 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 directly onto the apiculate filament