

- Leaves undivided; Panama 8
- 8 Rachis 22.6(19.0–29.0) cm long; El Copé, Coclecito Road, El Valle subsp. *minor*
- Rachis 56.6(40.0–88.0) cm long; Santa Fé to the western end of the Serranía de San Blás subsp. *Indivisa*

14a. *Geonoma cuneata* subsp. *cuneata* (Plates V & VI)

Geonoma obovata Wendland ex Spruce (1871: 104). Type: COSTA RICA. Heredia: Sarapiquí, near Pedregal, August 1857, *H. Wendland s. n.* (holotype K!).

Geonoma gracilis Wendland ex Spruce (1871: 105). *Geonoma cuneata* var. *gracilis* (Wendland ex Spruce) Skov ex Govaerts & Dransfield (2005: 114). Type: COSTA RICA. Heredia: Sarapiquí, August 1857, *H. Wendland s. n.* (holotype K!).

Geonoma cuneatoidea Burret (1930a: 167). Type: COLOMBIA. Antioquia: Murri, ca. 1000 m, 21 July 1880, *W. Kalbreyer 1828* (holotype B, destroyed). Neotype (selected by Bernal *et al.* 1989): COLOMBIA. Antioquia: Mun. Frontino, Corregimiento de Murri, La Blanquita, 815 m, 22 March 1982, *R. Bernal & G. Galeano 286* (neotype COL!).

Leaves undivided or pinnate; petioles drying green or yellowish; veins raised and rectangular in cross-section adaxially; rachis 45.1(12.0–250.0) cm long; pinnae 3(1–35) per side of rachis. *Inflorescences* staminate flowers deciduous after anthesis; non-fertilized pistillate flowers deciduous after anthesis.

Distribution and habitat:—From 12°18'N–1°48'S and 71°20'–85°23'W in Nicaragua, Costa Rica, Panama, Colombia, Venezuela, and Ecuador at 541(2–1750) m elevation in lowland or montane rainforest (Fig. 13).

Geonoma cuneata subsp. *cuneata* is made up of a series of slightly differing morphotypes. There are a few specimens that do not fit into any of these morphotypes. These are usually single specimens from isolated areas.

Specimens from the Atlantic slope in Costa Rica (*atlantic* morphotype), a few specimens just reaching the Pacific slope, and a few from adjacent Panama have undivided or pinnate leaves with raised adaxial veins. When pinnate, the apical pinna is usually wide. The types of *G. cuneata*, *G. gracilis*, and *G. obovata* come from this area. Regression shows there are significant associations between elevation and three leaf variables. Squared multiple *R* for the regression of rachis length on elevation is 0.32, basal pinna angle 0.38, and apical pinna angle 0.40. Specimens from higher elevations tend to have shorter rachis and wider basal and apical angles.

There are two unplaced specimens from this region. In Nicaragua there is a single specimen (*Nee 28420*) from cloud forest in Chontales. To the south of this, at a lower elevation, is another single specimen (*Stevens 8967*), with a undivided leaf with a narrow basal angle. Both these are separated from other Atlantic slope specimens in Costa Rica by a large population of subsp. *procumbens*.

On the Pacific slope (*pacific* morphotype), specimens occur only in Costa Rica, and are concentrated in the Osa Peninsula region. They are similar to Atlantic slope specimens in their undivided or pinnate leaves with raised adaxial veins. They differ in their shorter plant height, shorter leaf sheaths, shorter and thinner rachis, more pinnae, wider basal pinna angles, shorter and thinner apical pinnae, thinner peduncles, and shorter rachillae.

There are three unplaced specimens from this region. Two specimens (*Grayum 5960*, *Jiménez 891*) from the Montañas Jamaica have smaller, undivided leaves with less pronounced raised veins. One specimen (*Davidse 26231*) from the Cordillera de Talamanca has orange-brown petioles and rachis.

In western Panama in the Fortuna area (*fortuna* morphotype), in Chiriquí and Bocas del Toro, there is a homogeneous morphotype from higher elevations (1180 m mean elevation), compared with 496 m mean elevation for Atlantic and Pacific slope morphotypes. All specimens except one have undivided leaves with raised adaxial veins, and small inflorescences. Specimens differ from the nearest others, the Atlantic slope morphotype in Costa Rica, in their shorter petioles, shorter and narrower rachis, narrower basal pinna angles, narrower peduncles, and shorter and thinner rachillae.

There is a similar morphotype from the Santa Fé region in Panama (*santafe* morphotype). Specimens have undivided or pinnate leaves with raised adaxial veins. They differ from Fortuna specimens in their longer

petioles, more pinnae, wider basal pinna angles, and shorter apical length. About half the specimens have pinnate leaves, which accounts for their wider basal pinna angles. This morphotype also occurs at lower mean elevations than the *fortuna* morphotype (888 versus 1140) m.

At the eastern end of the Central Cordillera at El Copé and the Coclecito Road (*elcope* morphotype) there is a morphotype with smaller, pinnate leaves and a slender, short rachilla. Specimens differ from Santa Fé ones in nine variables, particularly in their smaller leaves.

At El Valle and El Copé (*elvalle* morphotype) there is a morphotype with larger, undivided or pinnate leaves with pronounced adaxial veins and long, stout rachillae.

Specimens from Río Guanche, Santa Rita Ridge, Cerro Bruja, and Serranía de San Blás (*guanche* morphotype) are particularly variable, especially in rachilla size. They have undivided or pinnate leaves with pronounced adaxial veins. Some specimens have leaves which dry a gray-green color.

Some specimens from the Serranía de San Blás (*sanblas* morphotype) have small, usually undivided leaves with raised veins and small inflorescences.

In northwestern Colombia and just reaching eastern Panama, with an outlier on the Sierra Nevada de Santa Marta there is a morphotype (*cuneatoidea* morphotype) with large, undivided leaves or with 2–8 pinnae per side with pronounced raised veins and large inflorescences. The type of *G. cuneatoidea* is of this morphotype.

In the northern half of the Chocó region, and extending into eastern Panama, the Magdalena valley, the Central and Western Cordilleras, and western Venezuela is a morphotype (*choco* morphotype) with leaves with 3–7 pinnae per side, rarely undivided, and raised adaxial veins. Two specimens (*Bernal 2174*, *Juncosa 1228*) from this area are unplaced. They are similar to subsp. *indivisa* except they have orange-brown petioles and rachis.

Stauffer (1998) reported that *G. cuneata* occurred in Apure, Venezuela. The specimens cited by Stauffer have not been seen, but another specimen from the same locality is here determined as *G. brongniartii*. *Geonoma cuneata* does, however occur in Zulia, Venezuela in its *cuneatoidea* morphotype.

In northwestern Colombia, southwestern Colombia, and northwestern Ecuador (*multi-pinnate* morphotype), there is a pinnate leaved morphotype with 6–35 pinnae per side of the rachis, raised adaxial veins, and large inflorescences. There is no significant difference in any variable between the two areas where this morphotype occurs.

In western Ecuador (Esmeraldas) and extreme southwestern Colombia (*esmeraldas* morphotype) at low elevations (50–350 m), a few specimens, have small, undivided leaves with raised adaxial veins.

In western Ecuador and just reaching southwestern Colombia (*ecuador* morphotype) at higher elevations (200–1375 m) there is a morphotype with large, undivided or divided leaves with 2–6 pinnae per side of the rachis and prominent raised adaxial veins. This morphotype differs from the similar *cuneatoidea* morphotype in its narrower rachis and shorter rachillae. The specimen from the most southerly location (*Jativa 231*) is smaller than the others.

14b. *Geonoma cuneata* subsp. *guanacastensis* Henderson, subsp. nov. (Appendix IV, Plate 16)

A subspectebus aliis petiollis in sicco brunneo-aurantiactis differt.

Type: COSTA RICA. Guanacaste/Alajuela: slopes of Miravalles, above Bijagua, ca. 1500 m, November 1982, L. Gómez et al. 19053 (holotype NY!, isotype MO!).

Leaves undivided; petioles drying orange-brown; veins not raised or slightly raised and triangular in cross-section adaxially; rachis 27.6(17.7–31.5) cm long; pinnae 1 per side of rachis. *Inflorescences* staminate flowers deciduous after anthesis; non-fertilized pistillate flowers deciduous after anthesis.

Distribution and habitat:—From 10°35'N–10°59'N and 84°55'–85°27'W in Costa Rica (Cordilleras de Guanacaste and Tilarán) at 814(470–1500) m elevation in lowland or montane rainforest (Fig. 13).

Key to the subspecies of *G. congesta*

- 1 Rachillae 11.9(6.0–21.5) cm long; Honduras, Nicaragua, Costa Rica (excluding Osa Peninsula and adjacent areas), and western and central Panamasubsp. *congesta*
 - Rachillae 19.1(15.0–23.0) cm long; Osa Peninsula and adjacent areas on the Pacific slope in Costa Rica subsp. *osensis*

13a. *Geonoma congesta* subsp. *congesta*

Inflorescences rachillae 11.9(6.0–21.5) cm long.

Distribution and habitat:—From 8°30'–15°42'N and 79°45'–85°34'W in Central America in Honduras, Nicaragua, Costa Rica, and western and central Panama as far east as the Canal Zone at 255(25–1000) m elevation in lowland tropical rainforest (Fig. 13).

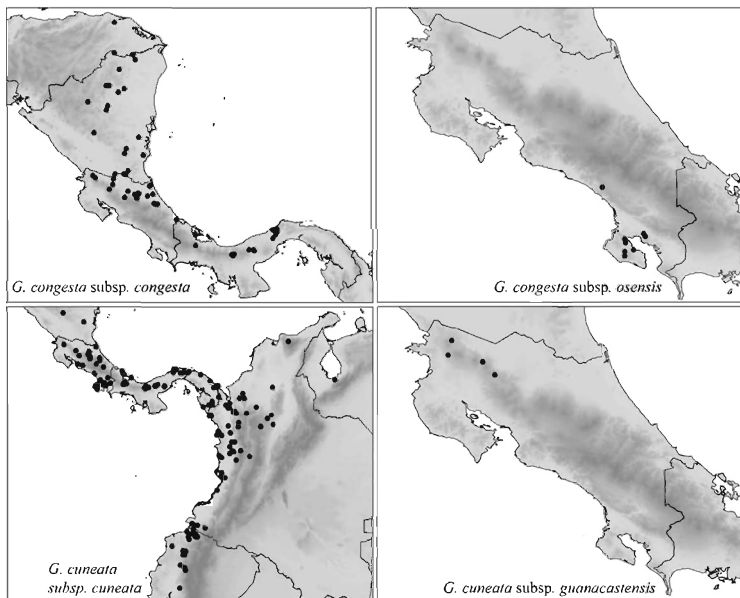


FIGURE 13. Distribution maps of *Geonoma congesta* subsp. *congesta*, *G. congesta* subsp. *osensis*, *G. cuneata* subsp. *cuneata*, *G. cuneata* subsp. *guanacastensis*.

13b. *Geonoma congesta* subsp. *osensis* Henderson, *subsp. nov.* (Appendix IV, Plates 10–15)

A *Geonoma congesta* subsp. *congesta* rachillis longioribus differt.

Type: COSTA RICA. Puntarenas: Esquinas Forest Preserve between Palmar Sur and Golfito on United Fruit Company railroad, 9 March 1953, *H. Moore 6534* (holotype NY!, isotype BH!).