

Geonoma linearis—a Rheophytic Palm from Colombia and Ecuador

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Rheophytes are very rare among the numerous life forms encountered in the Palm family. Van Steenis (1981), in his "Rheophytes of the World," defines a rheophyte as a "plant species which in nature is confined to the beds of swift-running streams and rivers and grows there up to flood-level, but not beyond the reach of regularly occurring flash floods." He refers to four palm species known to him as rheophytes. Dransfield (1978) recognizes three palms as true rheophytes. A *Geonoma* collected in western Colombia by H. E. Moore is illustrated in both mentioned works. It is not referred to as a species, and both authors indicate that this might be an undescribed species.

Recent fieldwork carried out in Ecuador and Colombia has produced several vouchers of the rheophytic *Geonoma*, which appears to be common along rivers in lowland rain forest of north-western Ecuador and western Colombia. One of these was collected on the type locality of *Geonoma linearis* Burret and fits the description of this species (Burret 1933)

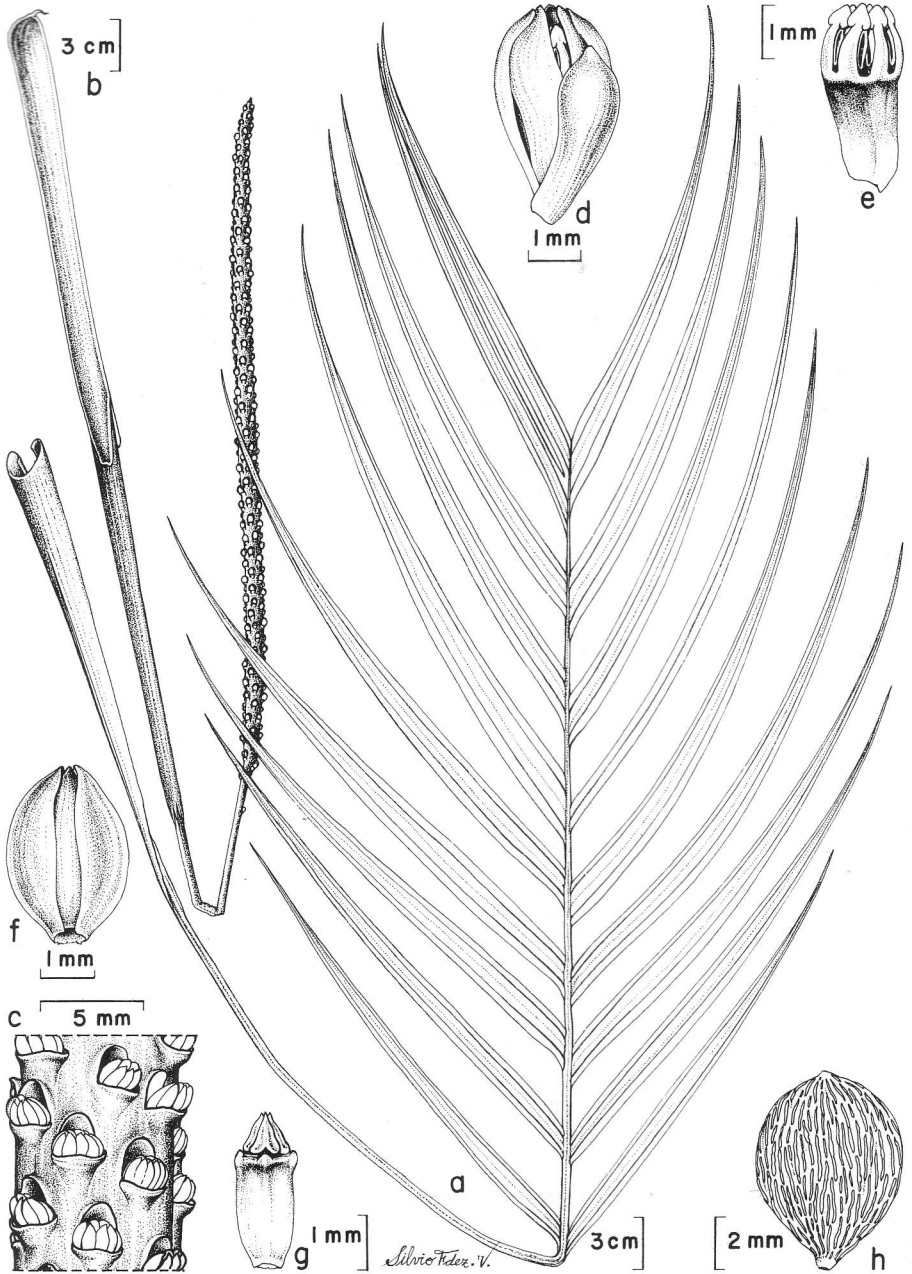
The type of *G. linearis* was destroyed in Berlin during World War II. Wessels Boer (1968) tentatively included *G. linearis* as a synonym of *G. sodiroi* Dammer ex Burret. His conclusion was based on the study of a sterile specimen (*Killip* 35375, US, COL) which he referred to as *G. linearis*. According to Wessels Boer the Killip collection matches the description of *G. linearis* "so well that it seems to be almost identical with the original specimen." Because the Killip collection also resembled *G. sodiroi* rather well, the

two species were considered to be conspecific. Study of a duplicate of *Killip* 35375 kept at COL shows that this is not *G. linearis*, but a specimen of *G. deversa* (Poi.) Kunth, with linear pinnae.

Study of all available material of *G. linearis* shows that it is different from *G. sodiroi*. The holotype of *G. sodiroi*, which was kindly made available from P, and several recent collections from the type locality near Santo Domingo in Ecuador show that this species is a small, often stemless, understory palm of Terra Firme forest. It is distinct in having leaves with sigmoid pinnae. *G. linearis* seems most closely related to *G. cuneata* Wendl. ex Spruce, with which it is sympatrically distributed in western Colombia and Ecuador. The populations of *G. linearis*, however, are so distinctive with the consistently riparian habitat, linear pinnae and fibrous fruits, that we considered that *G. linearis* must be treated as a separate species.

A full description of *G. linearis* is given below and, since no isotypes of it are known, a specimen from the type locality is here designated as neotype.

***Geonoma linearis* Burret**, Notizbl. Bot. Gart. Berlin-Dahlem 11: 861. 1933 (Fig. 1). TYPE: COLOMBIA: Barbacoas, Río Telembí, 10 Aug 1880, *Lehmann 51* (HOLOTYPE destroyed at B). NEOTYPE: COLOMBIA: Nariño, Municipio de Barbacoas, Río Telembí, 160 m alt., 20 Nov 1986, *Bernal & Hammel 1320* (NEOTYPE COL; ISONEOTYPES: AAU, BH, K, MO, NY, PSO).



1. *Geonoma linearis*. a, leaf; b, inflorescence; c, detail of the spike; d, staminate flower; e, staminal tube with stamens; f, pistillate flowers before anthesis; g, gynoecium with staminodial tube; h, mature fruits (Bernal & Hammel 1320).

Solitary or caespitose. Stem erect or procumbent, 0.2–3 m long, 1.3–4 cm diam, green, yellowish-green or light brown, conspicuously ringed, internodes 1–3 cm apart. Sometimes with adventitious roots. Leaves 3–19, spreading; sheath and petiole 23–73 cm long, 0.3–0.4 cm wide below rachis, sheath covered with a dense brown tomentum, marginally fibrous, distal 17–37 cm petiolar-like, concave above, rounded below with a prominent ridge, green, glabrous; blade oblanceolate in outline, up to 45 cm wide; rachis 22–57 cm long; pinnae (4–)7–12 per side, linear to linear-lanceolate, each with 1–3 primary veins, the apical ones up to 5–6 primary veins; basal pinnae 20–33 cm long, middle pinnae 26–34 cm long, apical pinnae 14–21 cm long; primary veins 14–26 per side, emerging at an angle of 20–35° from the rachis, prominent and acute on either side; secondary veins sunken above, prominent and rounded below. Inflorescence interfoliar, erect, spicate; prophyll 8–19 cm long, 1–1.5 cm wide, flattened, membranous, becoming fibrous apically, covered with a caducuous, greyish-brown woolly tomentum; peduncular bract 15–34 cm long, inserted 0.5 cm above the prophyll, otherwise similar to the prophyll, peduncle 17–60 cm long, ca. 0.5 cm wide at apex, compressed, glabrous, apically with up to 8 small, rounded bracts less than 0.3 cm long; spike 9.5–28 cm long, 0.4–0.7 cm diam, purplish-green in fruit, the surface minutely tuberculate; flowerpits bilabiate, spirally arranged in 8–9 vertical series, ca. 2 mm apart, flowerpits ca. 2 mm wide, upper lip entire, short, lower lip rounded shortly cleft and slightly projecting. Staminate flowers obovate to elongate, 3–3.5 mm long; sepals ca. 1 mm long, oblanceolate, acute and thickened apically, shortly ciliate at margins; petals 3–3.5 cm long, oblanceolate, acute and thickened apically, basally fused for $\frac{2}{3}$ of their length; stamens 6, basally fused for 1.5–2 mm, the free part linear, 1–1.2 × 0.2 mm, anthers 1–1.5 mm long, linear; pistillode

minute, shortly tricuspidate. Pistillate flowers ovoid, 3–3.5 mm long; sepals 3–3.5 mm long, lanceolate; petals ca. 3 × 2 mm, ovate-triangular, basally fused for ca. $\frac{1}{2}$ their length, acute apically; staminodial tube ca. 2 mm long, shortly dentate; ovary subglobose. Fruit ovoid to subglobose, with a narrow base, shortly pointed apically, 6–8 mm long, 4–5 mm diam, black at maturity, the surface somewhat striate, pericarp of fresh fruits very fibrous; seed subglobose, ca. 4 mm diam, dark brown.

Habitat and Distribution: *G. linearis* is exclusively confined to sides of streams and small, fast-flowing rivers, sometimes even growing partially submerged (Fig. 2). It usually forms large populations. It is found from NW Colombia in the Chocó region through the Pacific lowlands to NW Ecuador, up to altitudes of about 200 meters.

Vernacular Name: “Caló” in San Francisco de Ichó, Chocó. A population is called “calosal.” The Cayapa Indians in NW Ecuador use the name “Yullo-po-chui-tapé” and say the plant is a “brojo,” a magic plant, used for pains in the stomach (Barfod and Balslev 1987, Barfod et al. in press).

Other Specimens Examined: Colombia: Chocó: Municipio de Quibdó, San Francisco de Ichó, Río Ichó, 150 m alt., 11 Jul 1981 Galeano & Bernal 450 (COL); 8 km de Tutunendo a San Francisco de Ichó, 150 m alt., 6 Jul 1986, Bernal et al. 1077 (AAU, BH, COL, CHOCO, FTG, HUA, K, NY). Valle del Cauca: Costa del Pacífico, Río Yurumanguí, entre isla de Golondro y la Amargura, 10–40 m alt., 7 Feb 1944, Cuatrecasas 16042 (COL, US); about 18 km east of Buenaventura, 50 m alt., 14 Feb 1939, Killip & Garcia-Barriga 33287 (COL); Bajo Calima, 27 Nov 1974, Moore 1027 (BH, COL). Ecuador: Esmeraldas: Río Grande, tributary of Río Cayapas at Zapallo Grande, Barfod & Skov 60115 (AAU); Río San Miguel, one hour upstream from San Miguel de Cayapas; Holm-Nielsen et al. 25437 (AAU).



2. *Geonoma linearis*. Habit. From Chocó in Colombia. 3. *Geonoma linearis*. Fresh fruits showing the fibrous pericarp.

The biology of *G. linearis* is particularly interesting. Most plants observed are caespitose and have one to many basal shoots, so that a large amount of propagation is apparently due to vegetative reproduction. Many adventitious roots are also of great importance in anchoring the palm to the substrate. This property along with the finely divided pinnate leaves, which offer less resistance to flowing water, is an advantage during flash floods, when the risk of being swept away is high. Although the very fibrous pericarp of the ripe fruits (Fig. 3) suggests that the fruits are adapted to floating, field experiments have demonstrated that the fruits cannot float. Van Steenis (1981) argued that buoyancy is not an advantage for a rheophytic plant, since it could displace the seeds downstream and remove them from the rheophytic niche. Consequently, a peak of flowering and fruiting would be expected during the dry season, when the water level in the rivers are low. Populations of *G. linearis* flower and produce fruits throughout the year; however, in the Chocó region the largest amount of mature fruits is found in July, which is in the middle of the dry season.

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