

A NEW SPECIES OF *ETLINGERA* (ZINGIBERACEAE) FROM BOUGAINVILLE ISLAND, PAPUA NEW GUINEA

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A new species, *Etingera frederikii*, is described and illustrated, and is the first record of the genus in the Bougainville Region. *Etingera frederikii* and *E. cevuga*, which occurs in Fiji and Samoa, are the two most easterly species in the distribution range of the genus. The new species differs from *Etingera cevuga* in its much larger leaves, with a conspicuously silky-haired band on the ligule; the smaller, narrowly ovoid to cylindrical inflorescence with pale brown bracts (not hemiglobose with reddish brown bracts); and fewer, smaller flowers.

Keywords. Alpinieae, *Amomum cevuga*, ginger, IUCN, New Guinea, taxonomy, Western Pacific.

INTRODUCTION

Etingera Giseke (1792) comprises more than 150 species distributed from India in the west, through Southeast Asia and Malesia to Australia and the Western Pacific in the east. It is one of the largest genera of Zingiberaceae in this region, especially as *Alpinia* Roxb. and *Amomum* Roxb. are not monophyletic (Kress *et al.*, 2007) whereas *Etingera* is (Pedersen, 2004). Among the nine genera currently recognised in New Guinea, however, *Riedelia* has more than 83 published names whereas only 18 are placed in *Etingera*. In addition to these, *Etingera australasica* (R.M.Sm.) R.M.Sm. is found to the south in Australia and *Etingera cevuga* (Seem.) R.M.Sm. occurs in the Pacific further to the east.

A recent revision of *Etingera* in the island of Sulawesi (Poulsen, 2012) increased the number of known species from 5 to 46, and it is expected that fieldwork and a similar revision in New Guinea and adjacent islands will more than double the number of species here. A high percentage of endemism is predicted.

The taxonomy of *Etingera* is challenging (Poulsen, 2006, 2012) because pickled material of flowers is essential to describing and measuring diagnostic characters accurately. Therefore, fieldwork in known type localities must be carried out to collect pickled material and complete such a revision.

The new species described in this paper was discovered during the Galathea 3 circumnavigation of the world, 2006–2007. Because no species-level revisions of the

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whole family Zingiberaceae have been carried out since that of Schumann (1904), all protologues and available type material of relevant published names in genera with a radical inflorescence (*Amomum*, 8; *Etilingera*, 17; and *Nicolaia*, 2) from the relevant geographical area were scrutinised. In this, we have been greatly helped by the 12 beautifully illustrated descriptions made by Valetton (1913, 1914), which are so much more informative than purely written descriptions, especially when, in addition, type specimens have been lost.

TAXONOMY

***Etilingera frederikii* A.D.Poulsen, sp. nov.**

Similar to *Etilingera cevuga* (Seem.) R.M.Sm. but differs in the larger lamina (83–96 × 18–19 cm versus 30–38 × 6–8 cm), the shape of the inflorescence (narrowly ovoid to cylindrical not hemiglobose), the colour of the bracts (creamish brown not reddish brown) and the colour of the corolla (red versus pale red). – Type: Papua New Guinea, Autonomous Region of Bougainville, Bougainville Island, 1.5 km W of Togarau village, slope of Hirayo Hill, 5°58'S, 155°5'E, 850 m, flowering 21 i 2007, *Axel Dalberg Poulsen, Billy Bieso Bau, Thomas Akoitai & Saxon Akai* 2593 (holo LAE; iso C, E). **Figs 1, 2.**

Terrestrial perennial herb. *Rhizome* creeping, axis c.2 cm diam., ± sericeous, more so towards base of leafy shoot; scales to 4–6 cm long, pubescent in lower half; stilt roots absent. *Leafy shoots* to 5.3 m long, 24–50 cm apart, with up to 26 leaves per shoot; base to 7–9 cm diam., pale brown, densely golden-pubescent at base, green; sheath dark green, smooth; ligule to 15–18 mm long, rounded, entire (but sometimes splitting at apex), mid-green, sericeous in a distinct central band, especially at base and apex, margin brown, ciliate, apex tufted; petiole to 10–20 mm long, mid-green; lamina narrowly elliptic, to 83–96 × 18–19 cm, length:width ratio 4.6–5.1, smooth, mid-green to dark green above, midrib pale green beneath, glabrous, base oblique (by c.13 mm), margin ciliate, especially in upper half, apex acuminate, 1–1.5 cm long. *Flowering shoot* 12–27 cm long, arising from rhizome, receptacle 1–2 mm long, convex, with 9–16 flowers, 1–6 open at a time; peduncle 6–18 cm long, subterranean, ascending, sericeous, peduncular bracts distichous, to 4.5–5.6 × 1.5–2.5 cm, upper longest and covering base of spike, narrowly obovate, pale brown, ± pubescent near base, otherwise puberulous; spike (including flowers) 6 × 5.5 cm, narrowly ovoid to cylindrical, flowers extending 2–2.5 cm above bracts, spike only including bracts 4–5.5 × 2.5–3.5 cm long; sterile bracts 3 or 4, outer not in line with peduncular bracts, lower to 4–5.5 × 1.2–1.5 cm, upper to 4–5 × 1–1.3 cm, narrowly ovate to spatulate (widest at upper 1/4), cream with brownish margin, pubescent to puberulous, apex a thickened knob (not mucronate); fertile bracts 3.5–4.6 × 1–1.7 cm, broadly spatulate to obovate, apex rounded, lower bracts thickened at apex, translucent cream to pale brown; apex pinkish red, densely pubescent, margin densely ciliate, pedicel to 2 mm long, below bracteole, sericeous; bracteole tubular in lower part, 3.2–3.4 cm long, translucent, cream to pale brown; apex pinkish red, with one fissure of 1.7 cm or two of c.2.5 cm, densely pubescent, apex

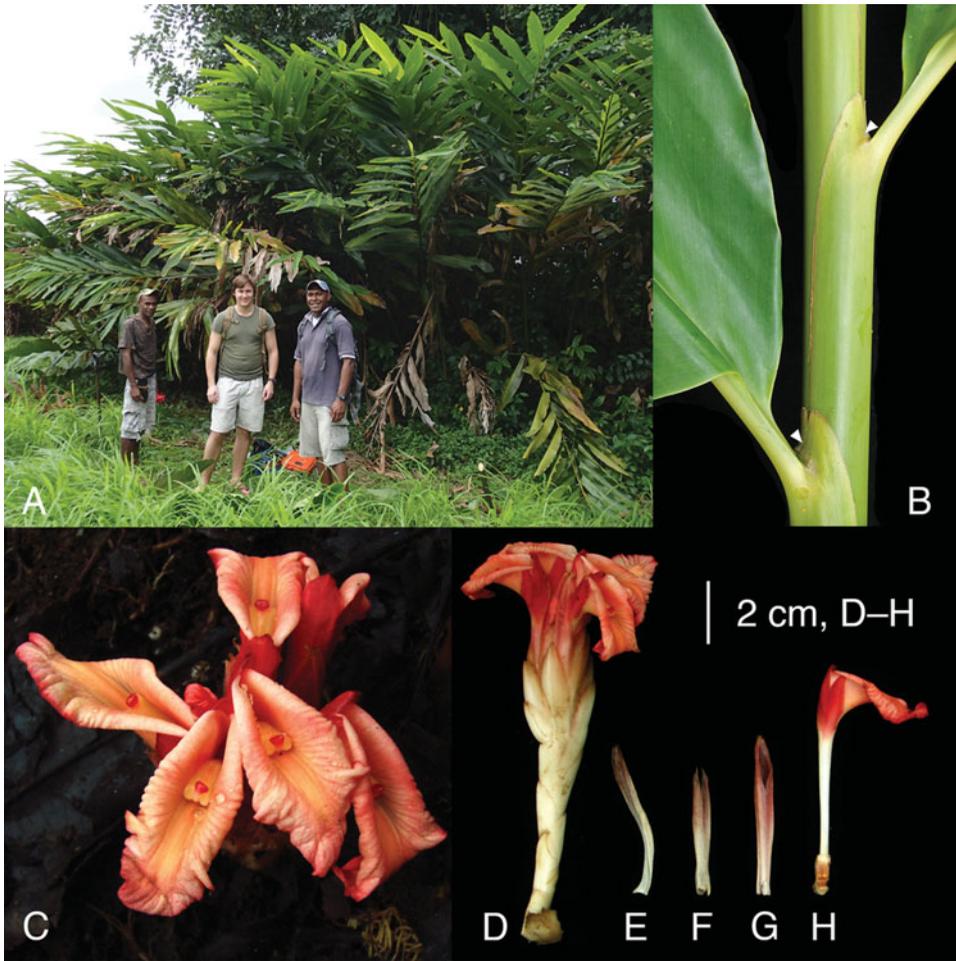


FIG. 1. Photographs of *Etilingera frederikii*. A, Clump of leafy shoots; B, leafy shoot with two ligules (white triangles indicating sericeous bands) and leaf bases; C, inflorescence *in situ*; D, inflorescence excavated; E, fertile bract; F, bracteole; G, calyx; H, flower, lateral view (calyx removed). A and B, *Poulsen et al.* 2880, made in Lae Botanic Gardens; C–H, the type, *Poulsen et al.* 2593. Photographs by A. D. Poulsen.

2-lobed, close together, tufted-ciliate. Flower to 6.1 cm long; calyx 3.9–4.7 cm, reaching 2 cm longer than bracteole, to base of anther and 11–12 mm short of apex of corolla lobes, translucent, cream to pale brown; apex pinkish red, with two fissures of c. 1.6 cm, \pm pubescent, especially at base and apex, margin ciliate, apex 3-pointed, close together, tufted-ciliate, floral tube 2.8–3.4 cm long, cream, densely hirsute, tube inside densely pubescent for 5–6 mm up to the point where the lobes are attached on the outside, extending into staminal tube adaxially, lobes red, with scattered appressed hairs in lower half; dorsal lobe reaching longer than calyx and \pm same length as stigma but

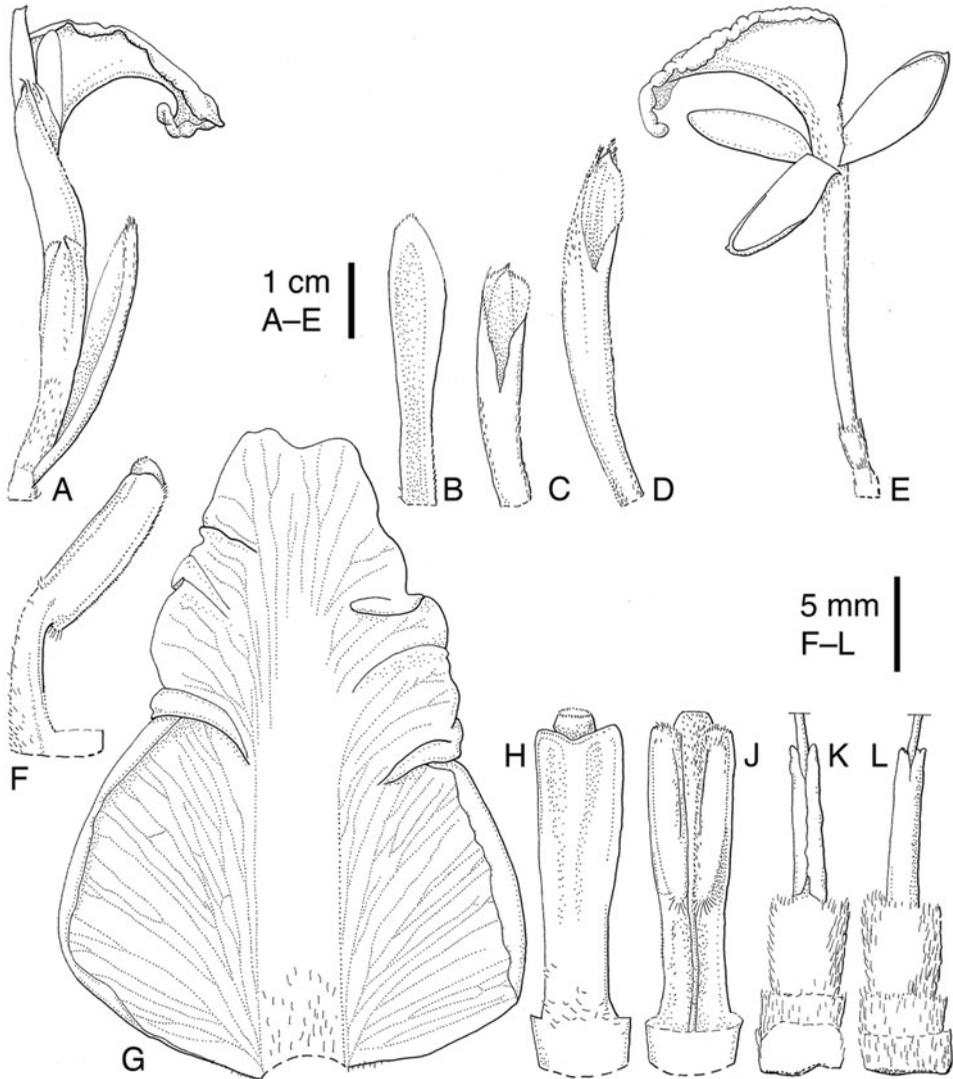


FIG. 2. *Etlingera frederikii*. A, Flower and fertile bract; B, fertile bract; C, bracteole; D, calyx; E, flower, lateral view (calyx removed); F, stamen, lateral view; G, labellum, ventral view; H, stamen, flattened, ventral view; J, stamen, flattened, ventral view; K, ovary and epigynous gland, dorsal view; L, ovary and epigynous gland, ventral view. All drawn from the type by A. D. Poulsen.

pushed up and away from the stamen, 20–22 × 10–11 mm, obovate, apex rounded, ± cucullate; lateral lobes 18–21 × 5.5–6 mm, narrowly ovate, rounded, cucullate, attached to the tube at an angle, ± at same level as dorsal lobe; staminal tube 5–7 mm long, densely pubescent outside, with scattered hairs inside; labellum 35 × 26 mm, pale pinkish orange; margin and apex darker; paler at margin of lateral lobe, hirsute near base ventrally, lateral lobes erect, margin reflexed, central lobe 15–20 × 15–20 mm,

reflexed, extending 20–22 mm beyond anther (when flattened); stamen 13–14 mm long, filament 6×3.2 –4.5 mm, cream, canaliculate, pubescent outside, slightly tomentose inside, anther 9×4 mm, parallel-sided, with scattered hairs near base and apex, angled at 155° to filament, pale yellow, anther crest slightly emarginate (0.5–1 mm) with a narrow red line, thecae dehiscent in upper half for c.5 mm from 3 mm above base to 1 mm below apex, puberulous, with tufted hairs at base; ovary 5×3.5 –4 mm, pale brown, densely pubescent, obconical barrel-shaped; epigynous gland(s) 6.5–8 mm long, entire, only split to base dorsally and 1.5 mm on opposite side or bilamellate, style 5–5.5 mm long, pubescent, especially in upper 2 cm, stigma 3 mm wide, brilliant red, \pm tomentose, ostiole 1.8–2.2 mm wide, narrowly elliptic, facing forwards to upwards. *Infructescence* not seen.

Etymology. Named in honour of HRH Frederik, Crown Prince of Denmark, who was the patron of the Danish Expedition Fund that planned and executed the Galathea 3 circumnavigation during which this new species was discovered. The Crown Prince has himself participated in expeditions to Central China and Northeast Greenland and has also supported an expedition to Borneo in 2002 led by the first author.

Distribution. Bougainville Island. So far, documented only from the type locality in ridge forest at 850 m. It is likely to occur naturally on the neighbouring island to the south-east, Choiseul, in the Solomon Islands. A cultivated plant with a dried-up inflorescence in a garden in Buka Town, Buka Island (just north of Bougainville Island) is very likely of the same species.

Conservation status. Data deficient (IUCN, 2001). During our survey in primary and secondary forests on the slopes of Mt Balbi in Central Bougainville, we encountered only one population of *Etilingera frederikii*. This population covered an area of c.50 m² but was by no means dense. After seeing its vigorous growth in areas with no canopy cover in Lae Botanic Gardens, we expect this species to be tolerant to change in vegetation cover.

Vernacular name. *Rurutate* (Rotokas language). Uses not known.

Additional specimen examined. PAPUA NEW GUINEA. Cultivated at Lae Botanic Gardens from rhizome collected from the same population as the type of *Etilingera frederikii*, flowering 20 iv 2013, Axel Dalberg Poulsen, Øystein Lofthus, Bernard Sule & Tiberius Jimbo 2880 (LAE, E, SING).

The only really distinctive vegetative character of *Etilingera frederikii* is the central band of silky hairs on the ligule. The inflorescence partly embedded in the ground with 1–6 open, peach-coloured flowers tinged rosy towards the margin is unlike any other species of *Etilingera* so far encountered. It is also the first species of the genus discovered on Bougainville Island. So far, *Etilingera* has not been documented from the neighbouring Solomon Islands, and the only known species occurring further into the Pacific is *E. cevuga*, first described from Fiji (as *Amomum cevuga* Seem.), which it most resembles. The protologue of *Amomum cevuga* (Seemann, 1868, p. 291) is short, and no pickled

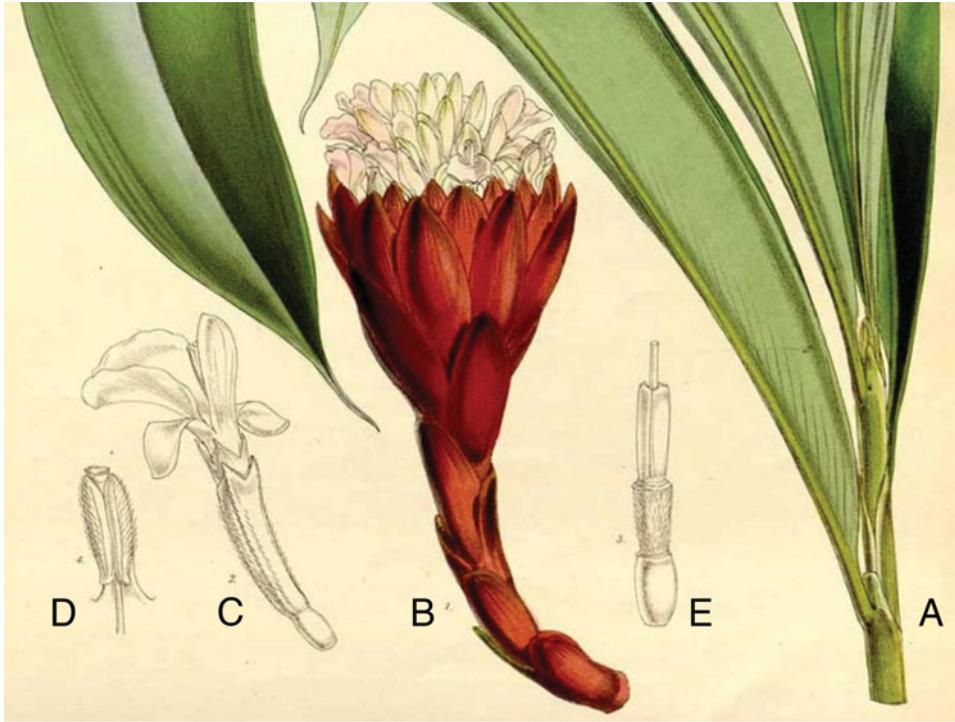


FIG. 3. *Etilingera cevuga* from Fiji. A, Top of leafy shoot; B, inflorescence; C, flower; D, stamen, style and stigma; E, ovary, epigynous gland and base of style. Lower part of plate 89 of *Amomum cevuga*, drawn by W. H. Fitch in Seemann (1868).

material from Fiji is available to us, but a study of the colour plate (Fig. 3) and type (Seemann 624, BM, GH) shows that this species lacks the hairy band in the centre of the ligule, and has a much stouter and hemiglobose spike (c.6 cm versus 3.5 cm wide), obviously with many more flowers than *Etilingera frederikii*. Photographs by the late Ray Baker of plants cultivated in Hawaii (exact origin unknown) match very well the plate in Seemann (1868) and were very useful to study. The purple bracts of *Etilingera cevuga* (not creamish brown) may indicate that it is not embedded in the ground.

Amomum vigneaui Rech., described from Samoa, was placed in synonymy under *Etilingera cevuga* by Smith (1979, p. 201). Rechinger (1907, pp. 228–229) described a much larger plant (leafy shoots 5–8 m long) with a hemiglobose spike covered by carmine–rose red bracts, but he emphasised that the labellum was red and smaller than that of *Etilingera cevuga*. Even though the type collected by Rechinger in Savaii Island and deposited at W was lost in the Second World War, the red hemiglobose spike he described seems not to differ from what we have observed in descriptions of *Etilingera cevuga*. Even if *Amomum vigneaui*, after more detailed future fieldwork, were to be considered a good species to be combined in *Etilingera*, *E. frederikii* differs in the spike (narrowly ovoid to cylindrical with creamish brown bracts) and much

longer and differently coloured labellum. New collections with pickled flowers (or dissections made in the field) of *Etilingera* from both Fiji and Samoa are much needed to understand the floral morphology fully.

We deposited live rhizomes of *Etilingera frederikii* at Lae Botanic Gardens for cultivation, where the plant apparently thrived in a completely open area, and after a few years dominated several square metres. During a visit in 2013, this clump produced numerous inflorescences, and measurements of this exceptionally informative material were in accordance with those made in the field except that the largest leaf was slightly larger (96×19 cm versus 83×18 cm).

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REFERENCES

- GISEKE, P. D. (1792). *Praelectiones in Ordines Naturales Plantarum*. Hamburg: B. G. Hoffmann.
- IUCN (2001). *IUCN Red List Categories and Criteria*, version 3.1. IUCN Species Survival Commission. Gland, Switzerland and Cambridge: International Union for Conservation of Nature.
- KRESS, W. J., NEWMAN, M. F., POULSEN, A. D. & SPECHT, C. (2007). An analysis of generic circumscriptions in tribe Alpinieae (Alpinoideae: Zingiberaceae). *Gard. Bull. Singapore* 59(1 and 2): 113–128.
- PEDERSEN, L. B. (2004). Phylogenetic analysis of the subfamily Alpinioideae (Zingiberaceae), particularly *Etilingera* Giseke, based on nuclear and plastid DNA. *Pl. Syst. Evol.* 245(3): 239–258.
- POULSEN, A. D. (2006). *Etilingera of Borneo*. Kota Kinabalu: Natural History Publications (Borneo).
- POULSEN, A. D. (2012). *Etilingera of Sulawesi*. Kota Kinabalu: Natural History Publications (Borneo).
- RECHINGER, K. (1907). *Plantae novae pacificae. Repert. Spec. Nov. Regni Veg.* 4: 228–233.
- SCHUMANN, K. (1904). Zingiberaceae. In: ENGLER, A. (ed.) *Das Pflanzenreich: Regni Vegetabilis Conspectus*, vol. IV, 46 (Heft 20): 1–458. Leipzig: W. Engelmann.
- SEEMANN, B. (1868). *Flora Vitiensis: a Description of the Plants of the Viti or Fiji Islands, With an Account of Their History, Uses, and Properties*, part 8. London: L. Reeve & Co.
- SMITH, A. C. (1979). Zingiberaceae. In: SMITH, A. C. *Flora Vitiensis Nova: a New Flora of Fiji (Spermatophytes Only)*, vol. 1, pp. 192–216. Lawai: Pacific Tropical Botanical Garden.

- VALETON, T. (1913). Zingiberaceae. In: LORENTZ, H. A. (ed.) *Nova Guinea. Résultats de l'expédition scientifique Néerlandaise à la Nouvelle-Guinée en 1907–1909*, vol. 8, pp. 923–988. Leiden: E. J. Brill.
- VALETON, T. (1914). Die Zingiberaceen Deutsch-Neu-Guineas. *Bot. Jahrb. Syst.* 52: 40–100.

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