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**Paraboea (Gesneriaceae) in Sabah, Borneo, including a new species.**

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**Paraboea, Sabah, Borneo, conservation**

***Paraboea* (Gesneriaceae) in Sabah, Borneo,  
Including a New Species**

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A key is provided for the three *Paraboea* species in Sabah, Borneo. *Paraboea pungulensis* Kiew is described as a new species and *P. madaiensis* Xu & B.L.Burt is reduced to synonymy under *P. sabahensis* Xu & B.L.Burt.

**Key words:** *Paraboea*, Gesneriaceae, Sabah, Borneo, conservation.

INTRODUCTION

Compared with Sarawak, where 11 species of *Paraboea* (C.B.Clarke) Ridl. have been described, the first as early as 1883 (*Didymocarpus paraboea* C.B.Clarke, now known as *Paraboea clarkei* B.L.Burt), *Paraboea* is poorly represented in Sabah with three species (Kiew *et al.*, 2011) and the first was only described in 1991 (Xu & Burt, 1991). Of these species one, *P. leopoldii* K.M.Wong *et al.*, grows on exposed igneous rocks on Bodgaya Island, Semporna District (Wong *et al.*, 1999), while the other two are confined to the summits of tower karst limestone hills. The new species, *P. pungulensis* Kiew, is confined to a single hill, Batu Punggul, Pensiangan District, while *P. sabahensis* Z.R.Xu & B.L.Burt is known from five hills in the east of Sabah (Figure 1). There are likely to be other novelties but the specimens currently available are not sufficient for their description as new species.

In general, the limestone taxa of Gesneriaceae both at generic and species levels are more poorly represented in Sabah compared with Sarawak (Kiew, 2001), the most striking example being *Monophyllaea* R.Br. with 14 species described from Sarawak but with only 2 known from Sabah (Kiew, 2002).

A key is provided here to distinguish between the *Paraboea* species and, besides the description of the new species, an amended description for *P. sabahensis* is given.

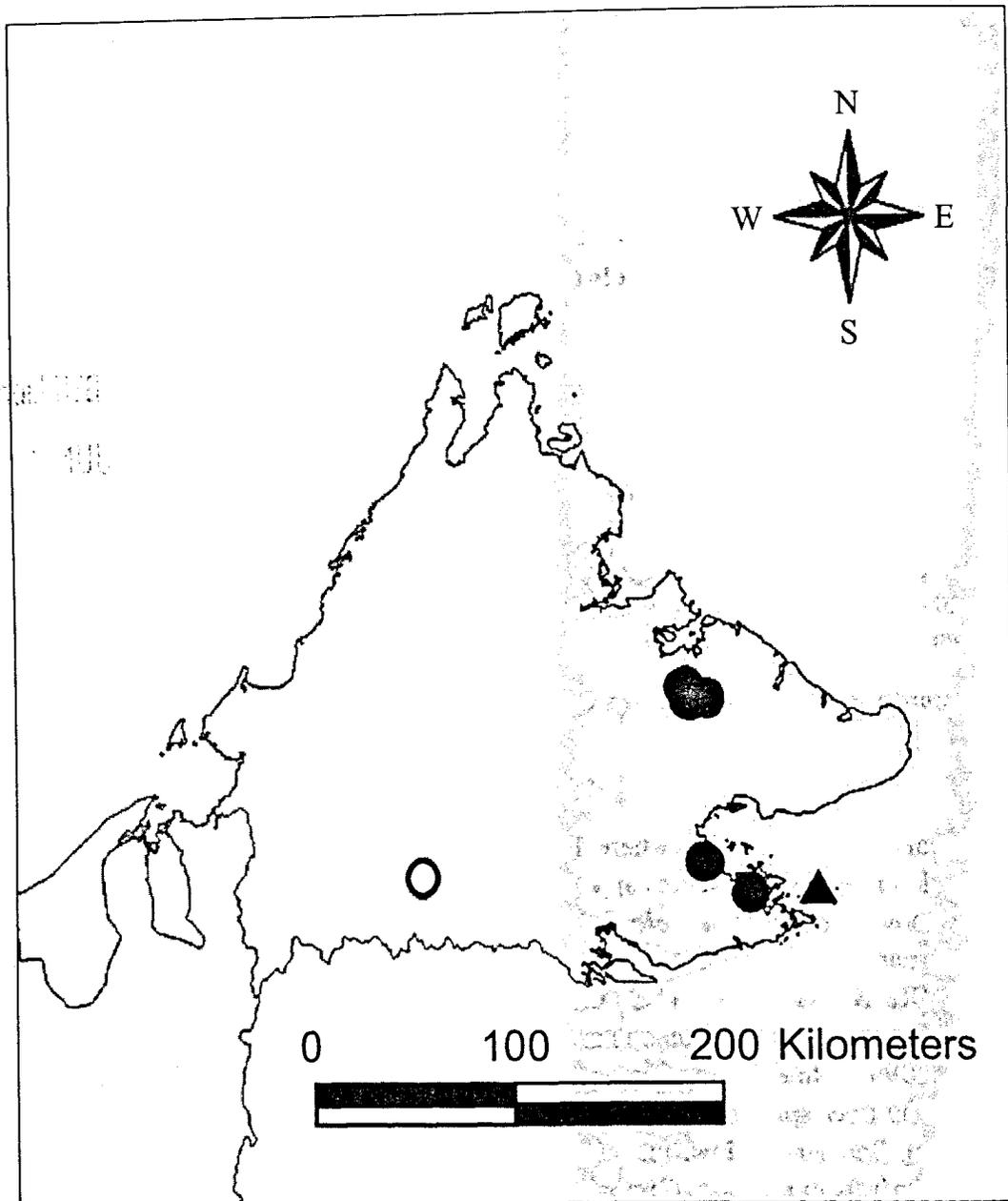
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**Figure 1.** Distribution of *Paraboea leopoldii* (▲), *P. pungulensis* (○) and *P. sabahensis* (●) in Sabah, Borneo.

**Key to *Paraboea* Species in Sabah**

- 1a. Rosette plant; leaves in pairs, petioles 3–6 cm long; inflorescences axillary; capsules straight ..... *P. leopoldii*
- 1b. Shrubby, erect plants; leaves in whorls, petioles to 4 cm long or lacking; inflorescences terminal; capsules twisted ..... 2
- 2a. Leaves in whorls of 4, base decurrent, petiole lacking, lamina at least 5 times longer than wide, veins 8–10 pairs ..... *P. pungulensis*
- 2b. Leaves in whorls of 3, base not decurrent, petiole 1.5–4 cm long, lamina c. 2.5 times longer than wide, veins 6–8 pairs ..... *P. sabahensis*

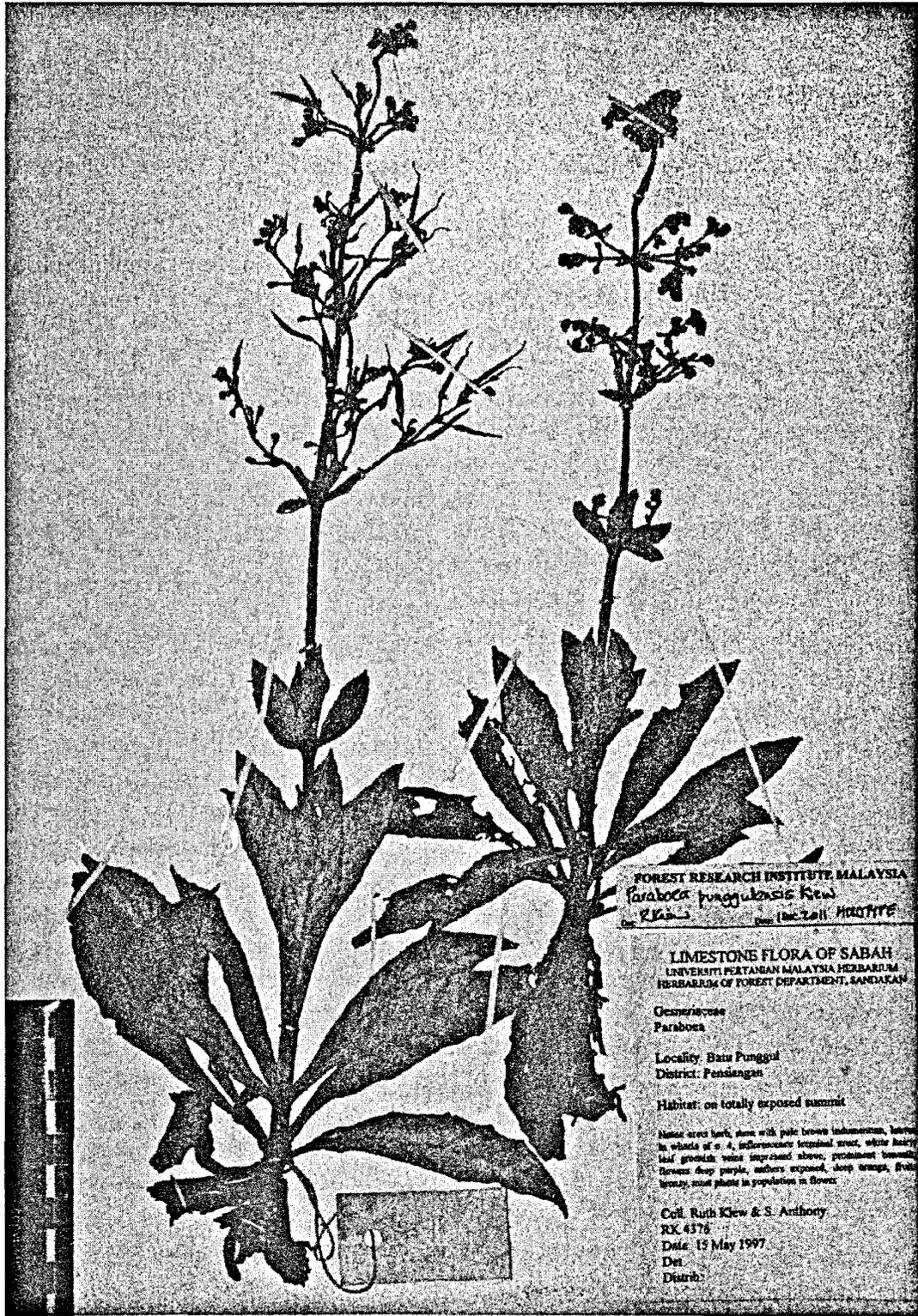


Figure 2. Holotype of *Paraboea pungulensis* Kiew (Kiew & Anthonysamy RK 4376).

***Paraboea punggulensis* Kiew, sp. nov.**

A *Paraboea sabahensis* Xu & B.L.Burt foliis angustioribus (5-plo longioribus nec 2.5-plo), basi decurrentibus (nec petiolatis) et inflorescentiis longioribus (18-30 cm longis nec 13-17 cm) differt. **Typus:** Borneo, Sabah, Pensiangan District, Batu Punggul Kiew & *Anthony*samy RK 4376, 15 May 1997 (holo SAN; iso E, K, KEP, SAR).

Shrubby perennial, stem woody, to 8 mm diam., with a felty pale brown indumentum, internodes 7–9 mm apart. **Leaves** in whorls of 4; petioles lacking; lamina narrowly lanceolate to narrow and slightly obovate, 7.5–11.2 × 1.3–2.2 cm, 5–5.7 times longer than wide, decurrent and *c.* 3 mm wide in the basal 0.5–1 cm of lamina, margin slightly undulate and recurved upwards, apex acute, above greenish in life, indumentum of arachnoid hairs, on upper surface greyish felted when dry, beneath white and more thickly felted, on upper surface with a dense layer of short unbranched hairs *c.* 0.25 mm long beneath the layer of arachnoid hairs; veins and midrib slightly impressed above, slightly prominent beneath; lateral veins 8-10 pairs, veinlets obscured by the indumentum.

**Inflorescences** terminal, paniculate, 18.5–30 cm long, indumentum same as stem but denser on the cymules, pedicels and calyx; peduncle 2.5–4 cm long, cymes 3–5 per node, basal cymes 4–5 cm long, few flowered with *c.* 5–8 flowers, first internode of flowering stem 7–8.5 cm long, floral leaves smaller but similar to the cauline ones, bracts obovate, 8–14 × 2–4.5 mm, apex rounded, pedicels 2.5–5 mm. **Flowers** dark purple, anthers white to deep orange; *calyx* 5-lobed, lobes narrowly ovate, *c.* 2.5 × 0.5–0.75 mm long; *corolla* glabrous, tube 1–1.5 mm long, upper lip 2-lobed, lobes broadly rounded, *c.* 4.5 × 3–3.5 mm, lower lip 3-lobed, lobes broadly oval, centre lobe slightly longer, *c.* 3.5 × 1.5 mm; lateral lobes *c.* 2.5 × 2 mm; *stamens* 2, filaments *c.* 1.5 mm long, attached at top of corolla tube, anthers broadly oblong, *c.* 3 × 1.5 mm, coherent in centre, free at apex and base, dehiscent laterally; *ovary* ovoid, glabrous, *c.* 1.5 × 0.75 mm, style 4–5 mm long, protruding between the apices of anthers, broadening to capitate stigma *c.* 0.3 mm across. **Capsules** cylindrical twisted, 14–22 mm long, 1.5–2 mm wide, glabrous, style persistent.

**Distribution:** Borneo, endemic in Sabah, known only from the type locality.

**Conservation status:** Endangered EN B2ab(iii).

It is known from a single locality, which at present is surrounded by forest in the Sapulut Commercial Forest Reserve that can be logged in future. In addition, Batu Punggul is a tourist site where adventurous visitors can climb to its summit resulting in trampling of this *Paraboea* population.

**Ecology:** Summit of limestone karst hill, growing totally exposed on jagged rocks, locally common. The old dried leaves persist as a prominent skirt below the new leaves.

*Notes:* This new species takes its name from Batu Punggul, an isolated tower karst limestone hill that rises above the surrounding tree canopy. Besides this new *Paraboea* species, it is home to several other endemic species, such as *Begonia amphioxus* M.J.Sands and *B. anthonyi* Kiew (Begoniaceae) and *Aina ponggolensis* A.Lamb (Orchidaceae).

*Paraboea punggulensis* is very different from *P. sabahensis*, with which it was previously confused (Xu *et al.*, 2008), in its short internodes (7–9 mm apart not 20–30 mm as in *P. sabahensis*), its leaves being arranged in whorls of 4 (not 3), in its narrow leaves that are five times longer than wide (not 2.5 times) with 8–10 pairs of lateral veins (not 6–8 pairs) and in its the decurrent leaf base without a distinct petiole. In addition, it differs in the upper leaf surface being as woolly as the lower so giving the leaf a silvery appearance on both surfaces when dry (unlike *P. sabahensis* that has a darker upper leaf surface). The inflorescence is also longer (18–30 cm not 13–17 cm) and the basal cymes are noticeably shorter (to 5 cm long not *c.* 7 cm long) as are the pedicels (to 5 mm not 7–11 mm long as in *P. sabahensis*). *Other specimens examined:* Borneo, Sabah, Pensiangan District, Batu Punggul, Kiew & Anthonysamy RK 4351 (KEP, SAN); Fidilis & Sumbing SAN 135773 (E, KEP, SAN).

## 2. *Paraboea sabahensis* Xu & B.L.Burtt

Edinb. J. Bot 48 (1991) 12; Xu *et al.*, Edinb. J. Bot. 65 (2008) 303 *p.p.* **Type:** Borneo, Sabah, Kinabatangan District, Sopiloring Hill, *Ampuria* SAN 35269 (holo E; iso K, L, SAN, SAR). **Synonym nova:** *Paraboea madaiensis* Xu & Burtt, Edinb. J. Bot 48 (1991) 4; Xu *et al.*, Edinb. J. Bot. 65 (2008) 261, fig. 28. **Type:** Borneo, Sabah, Lahad Datu District, Madai Caves *Tamura & Hotta* 722 (holo E, iso KYO).

Shrubby perennial with a woody stem to *c.* 75 cm tall, to 1 cm diam., internodes 2–3 cm long, upper parts thickly woolly, tawny, glabrescent when old. **Leaves** usually in whorls of 3, sometimes opposite; petioles 1.5–2.5(–4) cm long, matted with short white hairs; laminae narrowly or sometimes broadly elliptic or slightly obovate, 4.5–9 × 1.75–3.5 cm, *c.* 2.5 times as long as wide, upper surface dark green in life, densely pubescent with a layer of arachnoid hairs, beneath thickly white woolly, narrowed to a rounded or sometimes truncate base, margin entire, apex obtuse to acute, lateral veins 6–8 pairs, obscure above, prominent beneath, intercostal veins completely obscured by the indumentum.

**Inflorescences** terminal, paniculate, thinly white woolly except for the flowers; flowering stem 13–17 cm long, first internodes *c.* 6 cm long, floral leaves sessile and much shorter than the cauline leaves, 3 cymes from each node; basal cymes *c.* 7 cm long, many-flowered, peduncle and pedicel bracts 2–4 mm long, densely woolly, pedicels slender, 7–11 mm long. **Flowers** pale purple, anthers pale cream to yellow, glabrous except the calyx. *Calyx* *c.* 3 mm long, lobes 5, narrow, white

woolly outside. *Corolla* 7–8 mm long, tube *c.* 3 mm long, upper two lobes ovoid, *c.* 2.5 × 2.25 mm, lower two lateral lobes ovoid, *c.* 3–4 × 3 mm, lower centre one slightly smaller, *c.* 3–3.5 × 3 mm. *Stamens* 2, anthers ellipsoid, *c.* 2.5 × 1.75 mm, dorsifixed, filaments *c.* 3 mm long. *Ovary* glabrous, *c.* 3 mm long; style 4–6 mm and persistent in the fruit; stigma minutely capitate. **Capsules** spirally twisted, narrowly cylindrical, glabrous, 12–18 mm long, 1.5–2.5 mm wide.

*Distribution:* Borneo, endemic in East Sabah (Kinabatangan, Sandakan, Lahad Datu and Semporna Districts).

*Conservation status:* Endangered EN B2ab(iii).

All the limestone hills where this species is found are vulnerable to fire, either because the hills are no longer protected by being surrounded by forest or by the activities of the bird-nest collectors (Kiew *et al.*, in press). Bukit Dulong Lambu and G. Madai are home to the largest swiftlet colonies and both hills have permanent settlements associated with the collection of bird nests. Indeed there is a permanent settlement on the summit of Bk. Dulong Lambu. This, combined with the increasing frequency and severity of drought in El Niño years, makes these hills particularly vulnerable to fire. For example, the summit vegetation on Bk. Dulong Lambu was burned during the Great Burn of 1982/83 (Kiew, 2001).

*Ecology:* Exposed summits of limestone hills. In drought the leaves roll up and are presumably protected from water loss by the thick woolly hairs. On Bk. Dulong Lambu after the Great Burn of 1982/83, this species began to invade the bare burnt rock faces on the summit.

*Notes:* The original description was based on just the type specimen and it was noted to be similar to *P. madaiensis* but to differ in its attenuated leaf base and indistinct petiole (Xu & Burtt, 1991). However, re-examination of the type specimen shows the leaves to have distinct petioles. Botanical exploration of limestone hills in Sabah (Kiew, 2001) has discovered that this species is widespread in East Sabah (Map 1) and with a wider range of specimens available confirms that *P. madaiensis* is not distinct from *P. sabahensis*. The above description is amended to reflect the variation in this species.

It is one of the few *Paraboea* species that is reported to be used medicinally. For example, in the Semporna area it is used to reduce fever, clear cloudy eyes and the smoke from burning leaves is even used to quieten crying babies (Kiew, 1998).

*Other specimens examined:* Kinabatangan District – Sukau, Batu Batangan Kiew & Lim RK 4289 (KEP, SAN); Sandakan District - Bk. Dulong Lambu, Lim *et al.* LSP 617 (SAN); Lahad Datu District - G. Madai Ding Hou 166 (K, L); Mansus *et al.* SAN 117482 (SAN), Meijer SAN 37962 (K, SAN); Semporna District - Gua Segarong Kiew *et al.* RK 4318 (KEP, SAN).

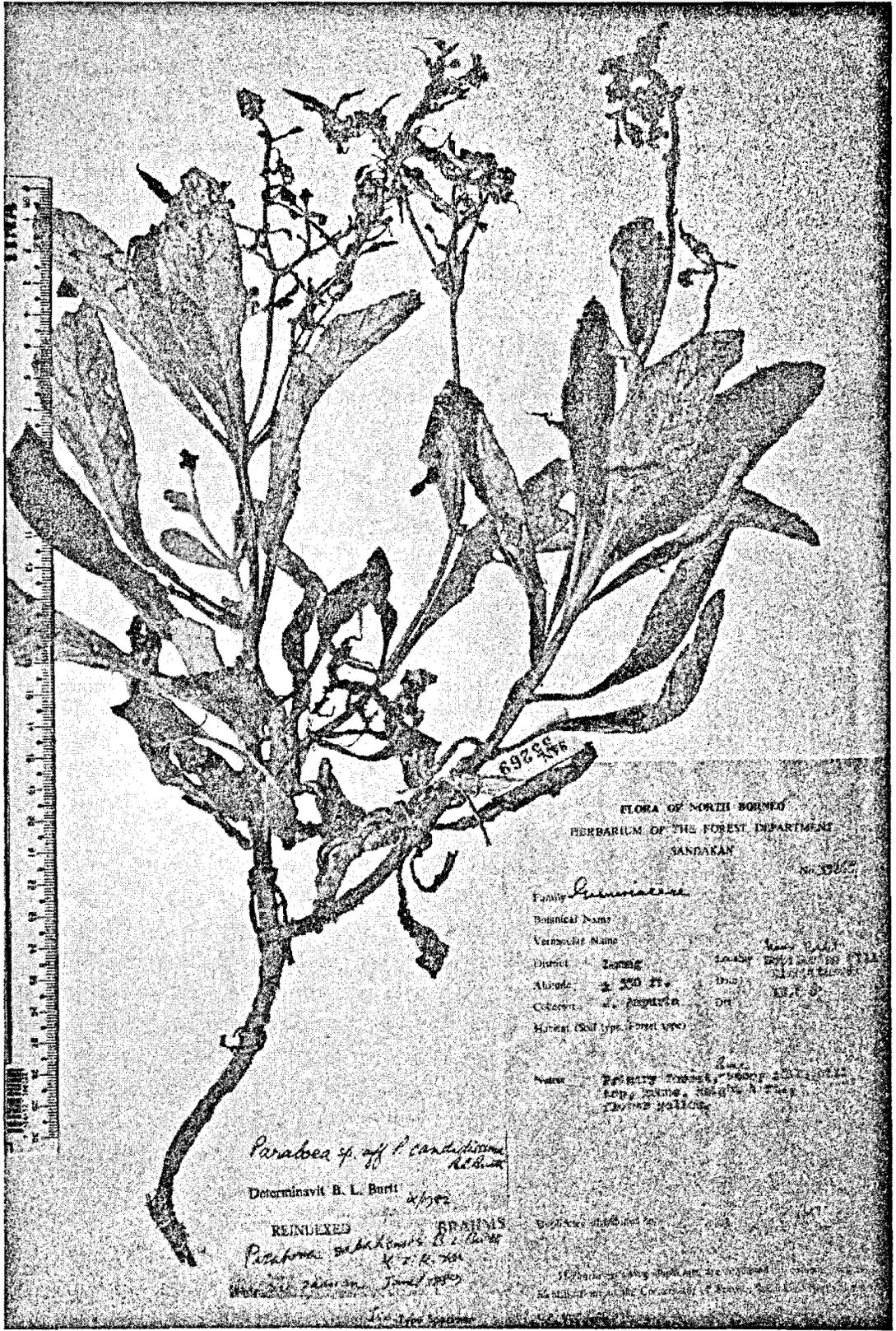


Figure 3. Isoholotype of *Paraboea sabahensis* Z.R.Xu & B.L.Burtt (*Ampuria* SAN 35269).

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