

Fruit Description and Re-evaluation of the Conservation Status of *Chilocarpus sarawakensis* (Apocynaceae), a Liana Endemic to Sarawak in Borneo Island

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The description of *Chilocarpus sarawakensis* D. J. Middleton (Apocynaceae), previously based only on flowering specimens, is updated. A full description, including of fruit and seeds based on newly collected materials, as well as the vernacular name and photographs of living plants, are provided and its IUCN conservation status has been re-assessed.

Key words: Gentianales, Malaysia, morphology, Rauvolfioideae, Southeast Asia, tropical rainforest

Chilocarpus sarawakensis D. J. Middleton (Apocynaceae-Rauvolfioideae) is a woody climber endemic to northern and central Sarawak, Borneo (Middleton 2006). It is characterized by prominent venation on the abaxial surface of the lamina, cymose inflorescences 4.6–8.5 cm long with pubescent axes, abaxially pubescent sepals, a corolla tube *ca.* 8.4 mm long, and an exposed corolla lobe and upper part of the corolla tube in bud (Middleton 2006). It was described based on three collections from primary forest at an altitude of 1,020–1,340 m.

During our field survey at Pulong Tau National Park in August 2023, we encountered a flowering

and fruiting individual of *C. sarawakensis* and collected voucher specimens. The original description by Middleton (2006) was based on floral and vegetative parts, but no collections including fruits had been documented. Here we provide an updated description of *C. sarawakensis*, including details of the fruit and seeds, based on our newly collected material and an additional specimen, both of which were gathered after it was described by Middleton (2006). Additionally, we re-evaluated its conservation status, considering the increased number of records since the initial assessment in 2006 and concerns regarding the ongoing decline of its potential habitats.



Chilocarpus sarawakensis D. J. Middleton in Edinburgh J. Bot. 63: 204 (2006). (Fig. 1)—Type: MALAYSIA, Sarawak, 5th Division, Route from Bakelalan to Gunung Murud, above S. Kumap ('Konap' on the label), 24 Sep. 1967, *ca.* 4°N, 115°38'E, *ca.* 4,400 feet (*ca.* 1,340 m), *B. L. Burt & A. M. Martin B.5183* (holo- E [E00151549 image!]).

Climber, woody, to 27 m long. Branchlets glabrous, terete. Leaves opposite; petiole 12–21 mm long; blade obovate, elliptic to elliptic-ovate, (4–)7.4–17.6 × (2–)3.4–8.7 cm, 1.5–2.5 times as long as wide, glabrous on both surfaces, punctate abaxially, base acute to cuneate, apex acute, shortly acuminate, apiculate, obtuse or rounded, midrib sunken adaxially, prominent abaxially, secondary veins 13–24 pairs, strongly prominent abaxially, intercalated tertiary veins weaker, parallel and branched, all anastomosing into an intramarginal vein, intramarginal vein 1, 1–2 mm from margin. Inflorescences terminal and axillary, 4.6–15 cm long; peduncle 1.6–4.2 cm long, sparsely puberulent; pedicels 1–6 mm long, sparsely puberulent, with one or two bracteoles, bracteoles ovate-triangular, 2–2.6 mm long, sparsely puberulent on both surfaces, margin ciliate, apex acute. Calyx 1.5–2 mm long, connate at base, lobes 5, hemispherical to broadly ovate, 0.7–1 × 1.2–1.3 mm, 0.5–0.8 times as long as wide, puberulent, apex obtuse. Corolla yellow, salverform; tube 8.4–9 mm long, 4.2–6 times as long as calyx, 1.1–1.3 times as long as lobes, puberulent or glabrous outside except at very distal portion of tube, densely pubescent inside beneath stamens; lobes 5, falcate, 6.9–7.6 × 2–2.2 mm, 3.1–3.8 times as long as wide, apex acute, pubescent on part exposed in bud outside, glabrous inside. Stamens 5, inserted 3.6–3.8 mm from corolla base, which is *ca.* 0.5 of tube length; filaments 0.5–0.7 mm long; anthers *ca.* 1.3 × 0.6 mm. Ovary obovoid 1.2–1.9 × 1.5–1.6 mm, glabrous, style and style head *ca.* 2.8 mm long. Fruit narrowly oblong-ovoid, 12–13.5 cm long, 3.7–5 cm in diameter, base obtuse, truncate, slightly cordate, apex obtuse to rounded, surface pale brown or reddish brown, finely verrucose, asperous; fruit-

ing pedicel woody, terete, 8 mm long, 10–12 mm in diameter, pale brown. Seeds *ca.* 80, irregularly angled, globose, 5–8 mm in diameter, dark red, translucent, with white arils.

Vernacular name. Gerip Sarawak, proposed here.

Notes. In the original description of *C. sarawakensis*, the inflorescence was described as 'axillary' (Middleton 2006). However, we observed several specimens, including our collection (Komada *et al.* P853; Fig. 1A & B) and the paratype (Paie S.25889), with a terminal inflorescence. Other characteristics and measurements of the flowers and vegetative parts from recent collections, Komada *et al.* P853 and Ching & Asah S.64912, which were not examined by Middleton (2006), generally aligned with previously documented variation, except for fewer secondary veins (13–17 pairs in Komada *et al.* P853 and 16–19 pairs in Ching & Asah S.64912 vs. 19–24 pairs in the protologue) and longer inflorescence (9–15 cm long in Komada *et al.* P853 vs. 4.6–8.5 cm long).

During our survey at Pulong Tau National Park, we found a flowering and fruiting individual near a primary evergreen forest at an altitude of 1,115 m. The vigorous individual was approximately 10 m tall and reached the upper crown of a nearby tree, which was *ca.* 30 m from the main primary forest.

The fruit morphology varies greatly among species of *Chilocarpus* and serves as a useful identification key (Markgraf 1971). *Chilocarpus sarawakensis* differs from the two closely related species, *C. beccarianus* Pierre and *C. costatus* Miq., as noted by Middleton (2006), in having larger, narrowly oblong-ovoid fruits (12–13.5 cm long) with a verrucose pericarp surface. In contrast, *C. beccarianus* has shorter cylindric fruits (5.5–12 cm long) with two constrictions and a smooth pericarp surface (Markgraf 1971, Middleton 2007); *C. costatus* has shorter ellipsoid or subglobose fruits (6–8 cm long) with a smooth pericarp surface [King & Gamble (1905) and based on our observation of the specimen, J. F. Maxwell 85-949 (A)].

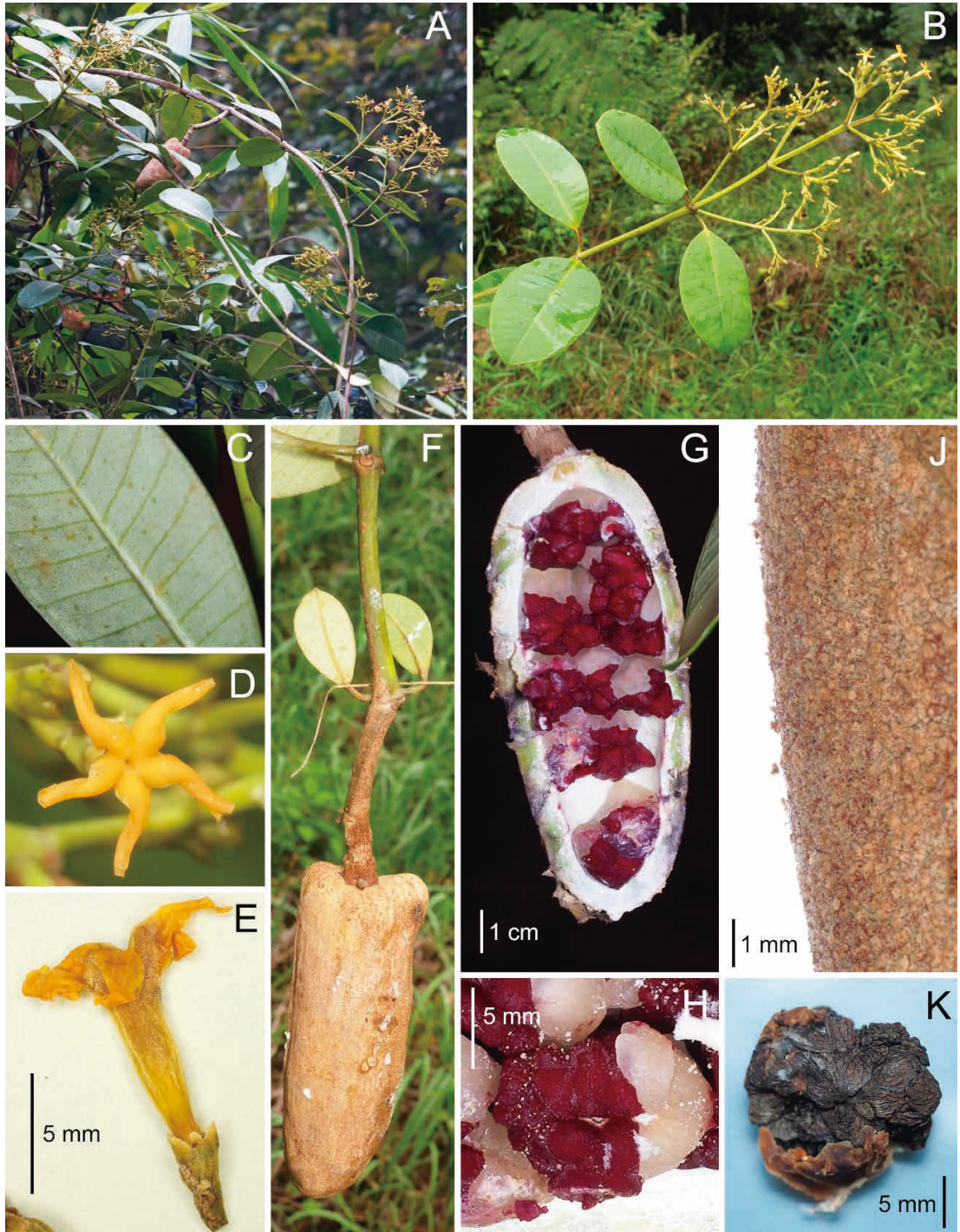


FIG. 1. *Chilocarpus sarawakensis* D. J. Middleton. **A**, Flowering and fruiting branches. **B**, Flowering branch. **C**, Portion of lower leaf surface. **D**, Flower, top view. **E**, Flower, side view. **F**, Fruit. **G**, Longitudinally dissected fruit. **H**, Fresh seed with aril. **J**, Outer surface of fruit. **K**, Dried seed with aril. Materials B–K from Komada *et al.* P853 (SAR). Photograph A by S. Sakaguchi; B, D, and F by S. Tagane; C, E, and G–K by N. Komada.

IUCN conservation status. Endangered (EN). Middleton (2006) proposed the IUCN conservation status of *Chilocarpus sarawakensis* as vulnerable due to its fragmented and declining distribution (VU B1). However, this status might have been provisional, as it was based on only three specimens. Since then, two additional localities have been identified, one at an altitude of 700 m, which has expanded the potential habitat range. Following our re-evaluation, we propose its conservation status as endangered (EN), according to IUCN criteria B2a, b(iii) (IUCN 2024). The area of occupancy (AOO) and extent of occurrence (EOO) of *C. sarawakensis* were estimated at 20 km² and 16,303 km², respectively, using GeoCAT (Bachman *et al.* 2011). Over the past 30 years, approximately 80% of primary forest of Sarawak has been cleared or degraded (Bryan *et al.* 2013).

Additional specimens examined. MALAYSIA. Sarawak: Tatau, Ulu Sg. Sangan, Bukit Kana, alt. 700 m, 6 Oct. 1994, *Y. P. Ching & Asah S.64912* (K [K000227699], SAR); Kapit, Melinau, U. Sampurau, Bkt. Salong, alt. 4,000 ft. (1,220 m), 20 Aug. 1967, *I. Paie S.25889* (E [E00100179], L [L.2712551]); Limbang, G. Pagon, G. Pagon Periuk, lower slope of G. Pagon Periuk, alt. 1,020 m, 13 Aug. 1984, *D. Awa & B. Lee S.47857* (SAR); Bario, Pulong Tau National Park, Pa Merario ('Pa Malario' on the Label), 3.76393°N, 115.44916°E, alt. 1,115 m, 19 Aug. 2023, *Komada et al. P853* (herbarium of Sarawak Forestry Corporation, SAR).

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