

## *Thottea tapanuliensis* (Aristolochiaceae): A new species from Sumatra, Indonesia

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### Abstract

*Thottea tapanuliensis* Mustaqim (Aristolochiaceae) is described here based on a plant collected from the west coast of northern Sumatra. This species is only known from the type collection and its threat ranking is assessed here as Critically Endangered. Morphological descriptions, photographs, a distribution map, and discussions are provided, as is a key to all *Thottea* species in Sumatra.

**Keywords:** cauliflorous, endemic, taxonomy, *Thottea*, West Malesia

### Introduction

*Thottea* Rottb. (Aristolochiaceae) is a genus of about 45 species found in southern Asia, extending from China to the east as far as Central Malesia. In Malesia, this genus is found in Sumatra, Peninsular Malaysia, Java (western), Borneo, Philippines, and Sulawesi (Hou 1984; Yao 2013). The monophyly of *Thottea* has been confirmed by a molecular phylogenetic study using three chloroplast genes (*trnK*, *matK*, *psbA*) (Oelschlägel *et al.* 2011). In Malesia, the publication of the *Thottea* treatment in the *Flora Malesiana* (Hou 1984) was the first account published for the region and is still the most comprehensive. Later, a new combination was made by Mabberley (1999). More recently, regional studies have been published by Yao (2013, 2015) who described nine species new to science from Peninsular Malaysia and Singapore. This suggests that it is highly likely that many more species new to science await discovery in the Malesian phytogeographical region, especially in Sumatra, which is the most under-sampled area in the region (Middleton *et al.* 2019). Botanical explorations in under-explored areas often discover species new to science as has occurred in the neighbouring Peninsular Malaysia region (Yao 2013).

We collected a set of specimens belonging to the genus *Thottea* during recent botanical explorations on the west coast of Northern Sumatra. Among these was one collection morphologically similar to *Thottea papilionis* T.L.Yao from Peninsular Malaysia, but differing from that species in a range of morphological characters (Hou 1981, 1984; Mabberley 1999; Yao 2013, 2015). We concluded that this recently collected specimen belongs to a taxon new to science, and we formally described it here. This current discovery increases the number of *Thottea* in Sumatra from nine (Hou 1984) to ten species.

## Material and Methods

The explorations were carried out in two forest fragments in Tapanuli Selatan regency, named Muara Upu (143 ha) that consists of lowland swamp and riverine forest, and at Simulak Anjing Hill (73 ha) that consists of mixed dipterocarp forests marked by the abundant number of *Dryobalanops sumatrensis* and *Dipterocarpus caudatus* subsp. *penangianus*. The specimen was collected during an extensive one week survey of Simulak Anjing Hill. Only two plants of the species were observed, and collections were made from one plant only. For comparison, digital type material and other herbaria specimens of *Thottea* housed in ANDA, K, and L (acronyms follow Thiers 2020) were examined as well as the type images at JSTOR Global Plants (<https://plants.jstor.org>). Relevant literature was consulted (Hou 1981, 1984; Mabberley 1999; Yao 2013, 2015).

## Taxonomic treatment

*Thottea tapanuliensis* Mustaqim, sp. nov.

**Type:** INDONESIA: Sumatra: Sumatra Utara Province, Tapanuli Selatan Regency, Batang Toru Subdistrict, Simulak Anjing Hill, 1.38903°N, 98.86979°E, 70 m, 12 Jan 2020, *Mustaqim 2322 & Putra* (holo: BO; iso: FIPIA).

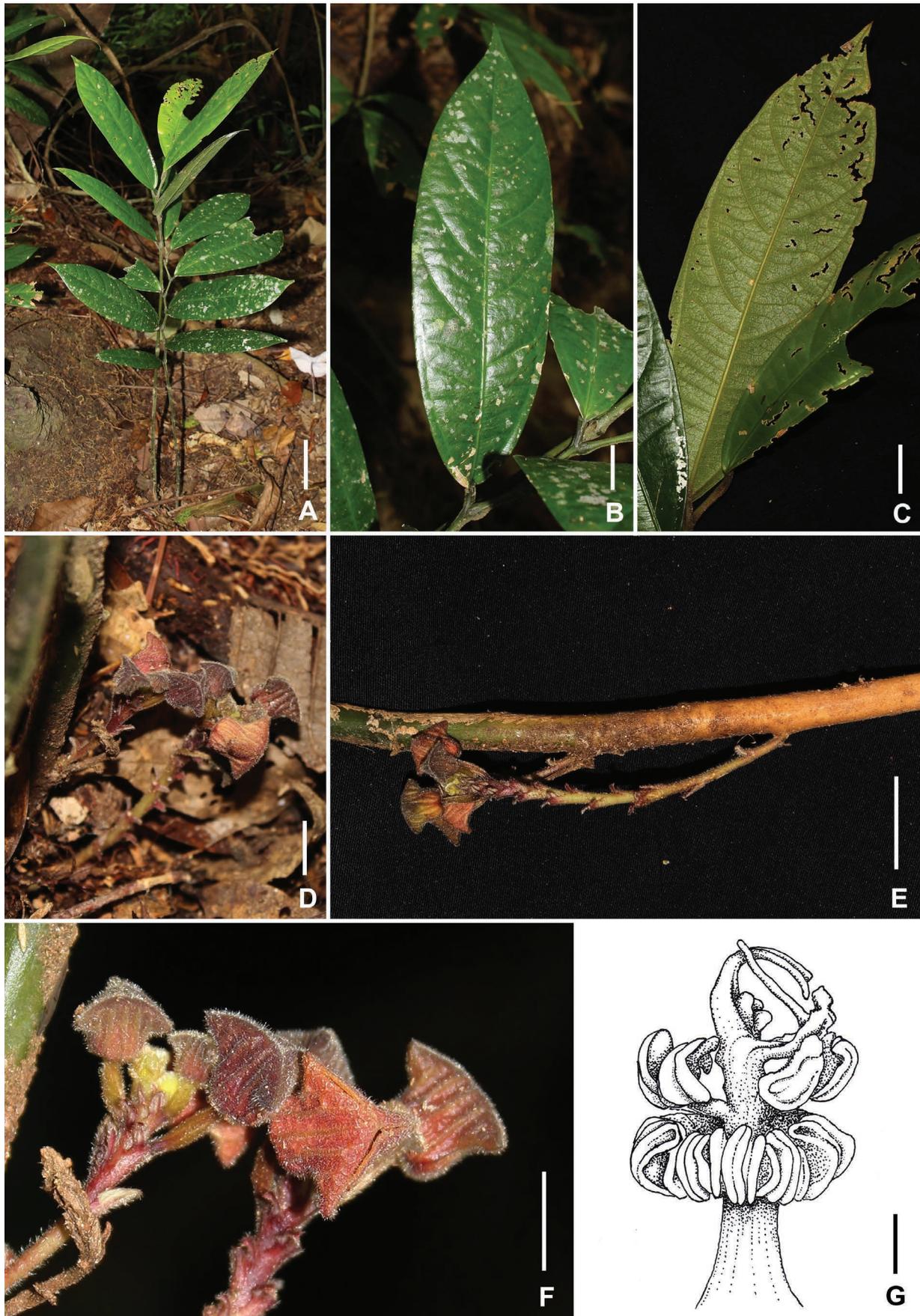
**Diagnosis:** Similar to *Thottea papilionis* T.L.Yao but differs by having fewer foliage leaves per stem (up to 9 *versus* (8–)12–19), acutely acuminate leaf apex (versus obtusely acuminate, though sometimes acute), shorter peduncle (up to 3.5 cm long *versus* 7.5–9 cm long), shorter floral bracts (3–3.5 mm long *versus* 6–7 mm), shorter pedicel including ovary (6 mm *versus* 10–12 mm long), smaller perianth (8.5 × 10 mm *versus* 13–16 × 13–20 mm) with glabrous inner surfaces (versus pubescent), fewer stamens (13 *versus* 20–24; 6 upper and 9 lower whorl *versus* 7–9 upper and 13–15 lower whorl), and shorter anthers (0.5–0.7 *versus* 1.2 mm long). *Thottea tapanuliensis* is also similar to *Thottea celebica* Ding Hou but differs in having smaller leaves (15–20 × 4.5–6.5 cm *versus* 22.5–32 × 6.5–9 cm) with a longer petiole (7–11 mm *versus* 5 mm long), shorter pedicels and ovary together (6 mm *versus* c. 12.5 mm long), smaller perianth (8.5 × 12 mm *versus* 25 × 30 mm across), the glabrous inner side of the perianth (versus glandular-hairy), broadly triangular perianth lobes that are 3 × 7 mm (versus suborbicular and 10 × 15 mm), stamens with upper whorls 6 (versus 10–12) while the lower whorl 9 (versus 12–15), shorter anthers (0.5–0.7 mm *versus* 1–1.7 mm long), and fewer style lobes (4 *versus* 12).

**Etymology:** This species is named after Tapanuli, the region in which it was collected.

Erect, *subshrub*, 80 cm in height. *Stems* arising from rhizome, simple, terete, leafy part terete, longitudinally ribbed when dry, 0.7 cm across at the base, ascending, non-leafy part quite straight, leafy part flexuous; densely short pubescent, most hairs persistent. *Leaves:* foliage leaves up to 9 per stem, subcoriaceous, lanceolate, the upper leaves subobovate, the second and other upper leaves slightly asymmetric, 15–20 × 4.5–6.5 cm, 3.2–4.7 times as long as wide, first foliage leaves smaller, narrowly elliptic-lanceolate, 10.5–15.9 × 2.8–3.4 cm, base rounded, obtuse, or broadly cuneate, margin narrowly incurved, apex acutely acuminate, acumen rarely rather short, or subacute; glabrous above, pubescent beneath at nerves, otherwise glabrous or nearly so; basal nerves 2, inner pairs arising at 1.5–3.5 mm distance from the base, ascending to 1/3–1/2 of the leaf blade, lower ones rather weaker, close to the margin, extending to 1/3–1/2 of the length of the blade, pinnate nerves 7–9, veins transverse and loosely reticulate, nerves and veins raised and prominent beneath, rather obscure above; petiole 7–11 mm long, densely pubescent especially in the younger leaves. *Inflorescence* at the basal part of the stem, near the ground, 1 or 3 in the axil of reduced leaves, up to 6.75 cm long, peduncle up to 3.5 cm long, spiciform, moderately pubescent; bracts usually persistent after anthesis, sublanceolate, 3–3.5 mm long, densely pubescent. *Pedicels*, including ovary, 6 mm long, moderately hairy. *Perianth* cupular, 8.5 mm long in total, limb 10 mm wide, base sub truncate, tube 5.5 mm long, shallowly lobed, outside with several prominent longitudinal veins, obscure inside, pubescent outside, glabrous inside; lobes broadly triangular, 3 × 7 mm, apex apiculate. *Stamens* in 2 whorls; upper whorl 6, lower whorl 9, filament glabrous, anthers oblong, 0.5–7 mm long. *Style* column c. 1.25 mm long, lobes 4, c. 1.4 mm long, glabrous. *Capsule* and *seed* unknown. Fig. 1.

**Distribution:** Sumatra: Endemic to the Northern Region (Batang Toru watershed area), where known only from the type locality (Fig. 2).

**Ecology:** Growing on slopes in a hilly area clothed by mixed dipterocarp forest dominated by *Dryobalanops sumatrensis* or kapur tree, on shaded forest floor at c. 80 m asl. Found in flower in January.



**Fig. 1.** Morphology of *Thottea tapanuliensis*. A, living plant; B, upper leaf surface; C, lower leaf surface; D, inflorescence near the ground; E, position of inflorescence on cut stem; F, close-up of the flowers (not fully blooming); G, stamens and style (from herbarium specimen). Scale bars: A = 10 cm; B & C = 1 cm; D = 5 mm; E = 2 cm; F = 5 mm; G = 0.5 mm. Photographs and illustration by W.A. Mustaqim.

**Preliminary conservation status assessment:** During our field explorations we surveyed around 73 ha of forest in Simulak Anjing Hill, Batang Toru area. We only found two plants growing close together. Using standard  $2 \times 2$  grid from the IUCN Red List, this species has an area of occupancy (AOO) of 4 km<sup>2</sup>, a value that falls within the Critically Endangered category. The habitat of this species is currently threatened by the presence of palm oil plantations. Habitat conversions are likely to occur since the plants were collected from the edge of the forests near the border to palm oil plantation, and the habitat of this species is not under protection from the Indonesian government. Using categories and criteria in IUCN (2012) and guideline (IUCN Standards and Petitions Committee 2019), this species is assigned as Critically Endangered (CR) since only known from a single and threatened location.

**Note:** In Sumatra, this species is morphologically similar to *Thottea reniloba* Ding Hou in having the stamens arranged in 2-whorls, perianth base not distinctly cordate, abaxial sides of the leaves not entirely covered by hairs, the lobed perianth, and cupular perianth tube. For differences between *T. tapanuliensis*, *T. papilionis*, and *T. celebica* see Table 1.

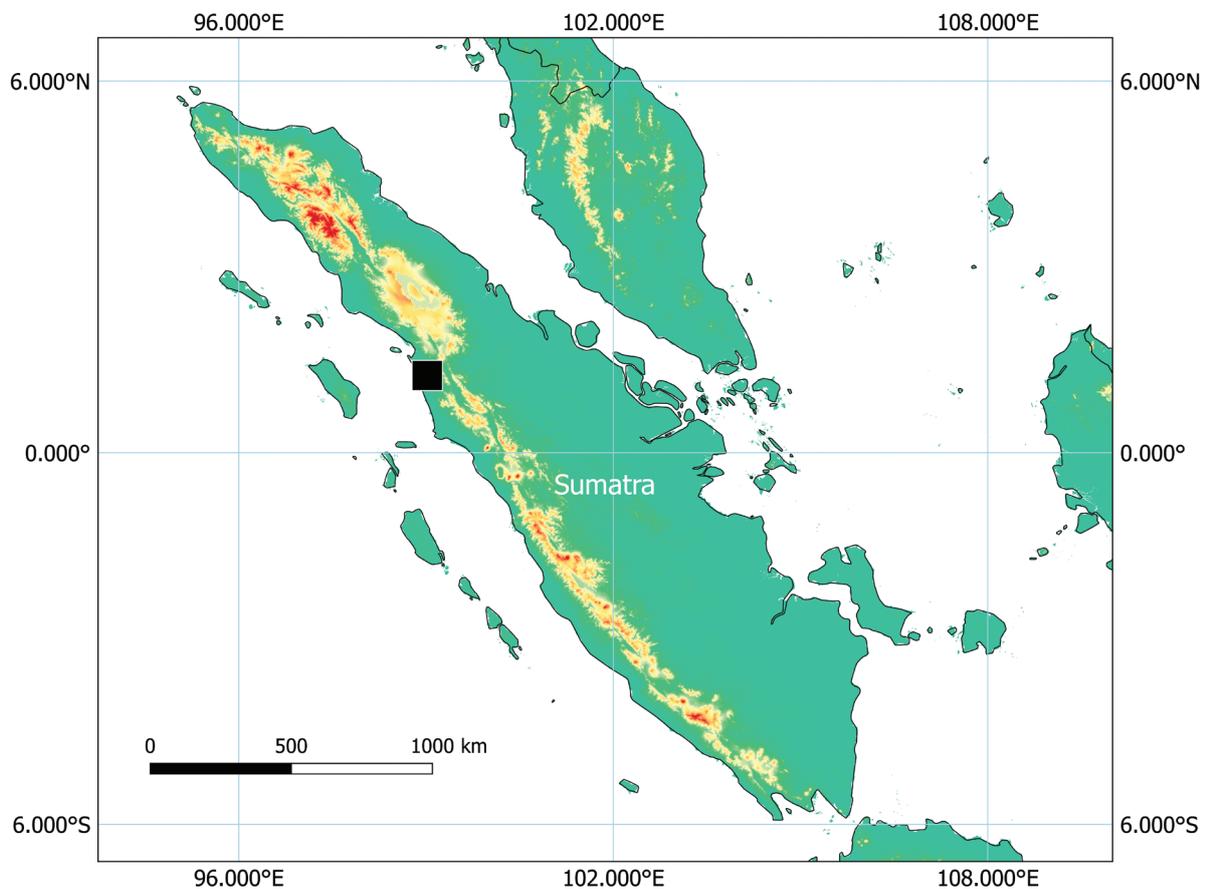


Fig. 2. Geographic distribution of *Thottea tapanuliensis* (■).

**Table 1. Comparison of *T. tapanuliensis*, *T. papilionis* and *T. celebica***

| Characters                                 | <i>T. tapanuliensis</i>               | <i>T. papilionis</i> *              | <i>T. celebica</i> ** |
|--|---------------------------------------|-------------------------------------|-----------------------|
| Number of foliage leaves                   | up to 9                               | (8–) 12–19                          | n/a                   |
| Lamina length                              | 15–20 cm                              | 16–18 cm long                       | 22.5–32 cm            |
| Leaf apex                                  | acutely acuminate, sometimes subacute | obtusely acuminate, sometimes acute | acutely acuminate     |
| Lateral pinnate nerves pairs               | 7–9 pairs                             | 5–7 pairs                           | c. 10 pairs           |
| Peduncle length                            | up to 3.5 cm long                     | 7.5–9 cm long                       | c. 3.4 cm long        |
| Floral bracts length                       | 3–3.5 mm                              | 6–7 mm                              | 4–8 mm long           |
| Pedicle length, including ovary            | 6 mm long                             | 10–12 mm long                       | c. 12.5 mm long       |
| Perianth size                              | 8.5 × 10 mm                           | 13–16 × 13–20 mm                    | c. 25 × 30 mm         |
| Hairs on the inner surface of the perianth | absent                                | pubescent                           | glandular hairy       |
| Stamens total                              | 13                                    | 20–24                               | 22–27                 |
| Upper row of stamens                       | 6                                     | 7–9                                 | 10–12                 |
| Lower row of stamens                       | 9                                     | 13–15                               | 12–15                 |
| Anthers length                             | 0.5–0.7 mm                            | 1.2 mm long                         | 1–1.7 mm long         |
| Style lobes                                | 4                                     | 4–6                                 | 12                    |

Notes: \* mostly adopted from Yao (2013, 2015), \*\* mostly adopted from Sleumer (1984) and also inferred from the drawing available in that account.

**A key to species of *Thottea* in Sumatra (modified from Hou 1984).**

- 1a. Stamens arranged in 2 whorls ..... 2
- 1b. Stamens arranged in 1 whorl ..... 7
- 2a. The lateral view of flowers showing perianth base distinctly cordate ..... *T. straatmanii*
- 2b. The lateral view of flowers showing perianth base obtuse, rounded, or sub truncate ..... 3
- 3a. Lower surfaces of the leaves hidden by dense hairs ..... *T. borneensis*
- 3b. Lower surfaces of the leaves, at least in part, not covered by hairs ..... 4
- 4a. Perianth obscurely lobed ..... *T. beccarii*
- 4b. Perianth distinctly lobed, divided halfway or deeper ..... 5
- 5a. Perianth tube cylindrical ..... *T. rhizantha*
- 5b. Perianth tube either absent, cupular, or campanulate ..... 6
- 6a. Inflorescence arising from the apical part of the stem, from the axil of well-developed leaves; inner basal pair of the lateral nerves originating from the base ..... *T. reniloba*
- 6b. Inflorescence arising from near the ground level or basal part of the stem, subtended by reduced leaves; inner basal pair of the lateral nerves not from the base, sometimes a few mm from it ..... *T. tapanuliensis*
- 7a. Flowers arranged in a corymbose or paniculate inflorescence; inner pair of basal lateral nerves of the leaves extending to the apex ..... *T. piperiformis*
- 7b. Flowers arranged in spikes or racemes; inner pair of basal lateral nerves reaching the half length of the leaf lamina, rarely more ..... 8
- 8a. Inflorescence from the stem base; foliage leaves (1–) 2–3 (–5) per stem; lower surfaces tomentose or villous ..... *T. tomentosa*
- 8b. Inflorescence from the upper part of the stem; foliage leaves many per stem; lower surfaces puberulous to pubescent ..... 9
- 9a. The apex of the perianth lobes acute or acuminate; lobes ovate to lanceolate; stamens 6 ..... *T. sumatrana*
- 9b. The apex of the perianth lobes emarginate; lobes broadly rounded; stamens 9–12 ..... *T. macrantha*

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