

Dalbergia calcarea, a new species of *Dalbergia* (Fabaceae: Dalbergieae) from Lao PDR

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ABSTRACT

Dalbergia calcarea, a new species currently only known from the limestone mountains of Khammouan Province, central Laos, is described and illustrated. The key characters such as habit, colour and limb of standard, and number of ovules of the new species are discussed and compared with its closest relatives. A detailed description along with etymology, conservation status, illustrations and colour photographs are provided for a new species. This discovery increases the number of Laotian species in the genus *Dalbergia* to seventeen taxa.

KEYWORDS: Faboideae, Indo-China, Laos, new taxon, taxonomy.

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INTRODUCTION

Dalbergia L.f., belonging to the tribe Dalbergieae of the family Fabaceae, is a large genus of about 250 species of trees, shrubs, scandent and woody climbers, widely distributed across the old and new world tropics ranging from South America, Africa, Madagascar to Asia (Klitgaard *et al.*, 2005; Cardoso *et al.*, 2013; Vatanparast *et al.*, 2013; Adema *et al.*, 2016). Based on nuclear and chloroplast evidence, recent studies have proven that the monophyletic *Dalbergia* possibly originated in the New World (Lavin *et al.*, 2001; Vatanparast *et al.*, 2013), from where it migrated to other areas in the Old World. In general morphology, the genus is easily distinguished by its imparipinnate leaves with alternating leaflets, lack of stipels and indehiscent pods that are typically relatively thin and likely wind-dispersed.

Over recent decades, sixteen taxa have been recorded for the Lao People's Democratic Republic (Lao PDR), as outlined in relevant taxonomic accounts of the genus *Dalbergia* in the Indo-Chinese and adjacent regions (Lock & Heald, 1994; Newman *et al.*, 2007; Niyomdham *et al.*, 1997; Niyomdham, 2002, 2018; Chen *et al.*, 2010; Adema *et al.*, 2016).

During expeditions in 2019 to Khammouan Province, central Laos, we came across an unknown species of *Dalbergia* from limestone hills. After a detailed investigation of its morphological traits, consultation of the regional taxonomic literature and type examinations of resembling relatives as following herbaria: BK, BKF, QBG, HNL (the National Herbarium of Laos), FOF (the Herbarium of Faculty of Forestry Science), KKH, PSU and using online searches, namely BM (<https://www.nhm.ac.uk/>), L (<https://bioportal.naturalis.nl/>), Paris herbarium (https://science.mnhn.fr/institution/mnhn/collection/p/item/search/form?lang=en_US) and the Plants of the World database (<http://www.plantsoftheworldonline.org/>), we found that the unknown *Dalbergia* did not match any described species. Therefore, here we present a new species of *Dalbergia* from Lao PDR, to be named *D. calcarea* Lanors., Mattapha & Lamxay.

A complete morphological description of the new species is provided, in comparison with the most resembling species, while other relevant information, illustrations including line drawings and colour images photographed in the field are added.

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TAXONOMIC TREATMENT

Dalbergia calcarea Lanors., Mattapha & Lamxay, **sp. nov.**

This species is characterised by being a tree, leaves with 9–33 leaflets with equal-sided lateral bases, the limb of the standard petal 7–8 mm long, monadelphous stamens (5+5), a pubescent ovary with 3–6 ovules and glabrous fruits. It resembles *Dalbergia pinnata* (Lour.) Prain in having a similar shape and size of the leaflets, however, it is distinct by the equal-sided bases of the lateral leaflets (vs strongly unequal-sided in *D. pinnata*), leaflets pubescent on both sides (pubescent only on lower surface in *D. pinnata*), longer inflorescences (4–6.5 cm long vs 2–3 cm long in *D. pinnata*), larger bracts (2–)4–6 × 2–2.5 mm vs ca 0.5 × 0.2 mm in *D. pinnata*), the limb of the standard petal broadly obovate, 7–8 mm long (vs orbicular, 1–2 mm long in *D. pinnata*) and ten stamens (vs 9 stamens in *D. pinnata*). Type: Lao PDR, Khammouan Province, Khounkham Distr., Phou Pha Man Hill, mixed deciduous forests on limestone mountains, ca 325 m, 26 Apr. 2019, S. Lanorsavanh & V. Lamxay SL1641 (holotype HNL; isotypes FOF!, KKH!). Figs. 1–2.

Trees, 5–10 m tall; outer bark grey, rough to verrucous, inner bark pale yellow; young shoots pubescent. *Leaves* imparipinnate, spiral; stipules oblong, 7–9 mm long, base pubescent, apex acute, caducous; rachis 10–20 cm long; petioles 1.2–2.1 cm long, pubescent; leaflets 9–33, alternate; lamina oblong, ovate or obovate in terminal leaflet, (1.1–)2.3–3.6 × (0.8–)1.2–2 cm, base rounded, equally-sided, margin entire, apex rounded, retuse to emarginate, chartaceous, both surfaces pubescent; secondary veins 8–10 pairs; petiolules 2–3 mm long, pubescent; stipels absent. *Inflorescences* panicles, terminal and in leaf axils of young shoots and old branches, 4–6.5 cm long, densely puberulent; peduncle 1–2.2 cm long; bracts obovate, (2–)4–6 × 2–2.5 mm, outside pubescent, glabrous on inner side, apex truncate or obtuse, caducous; bracteoles linear, 1.3–1.4 × 0.2–0.3 mm, pubescent, apex truncate, caducous. *Pedicel* 1.5–2 mm long, pubescent. *Calyx* campanulate; tube ca 2 mm long, yellowish; lobes 5, ovate to lanceolate, 1–1.5 × ca 1 mm, pubescent; middle lobe (longest) 1.5–2 × ca 1.5 mm. *Corolla* 5 petals, blue; limb of standard petal broadly obovate to reniform, with yellow patch at base, 7–8 × 6–7.5 mm, claw ca 1 mm long; wing petals oblong, 6.5–7.5

× 2.5–3.5 mm, claw 1–1.2 mm long; keel petals 4–4.2 × 2.5–2.8 mm, claw 1–1.2 mm long. *Stamens* 10, monadelphous (5+5); staminal tube 4–4.5 mm long, free filament part 1–2 mm long; anthers ca 0.3 × 0.3–0.4 mm. *Ovary* pubescent, 3–6-ovuled; stipe glabrous, ca 1.5 mm long; style ca 1.5 mm long; stigma small. *Fruits* oblong to elliptic, green, glabrous, 5.7–9.8 × 1.2–1.6 cm, indehiscent, 1–4-seeded. *Seeds* reniform, 7.5–8.5 × 4.5–5 mm, dark brown or black.

Distribution.— Endemic to Laos.

Ecology.— Foot hills of limestone mountains in mixed deciduous forests, altitude ca 325 m. Flowering and fruiting: April to August.

Additional specimen examined (Paratype).— Khammouan Province, Khounkham Distr., Phou Pha Man Hill, mixed deciduous forests on limestone mountains, ca 325 m, 20 July 2019, S. Lanorsavanh & K. Souvannakhommmane SL1721 (FOF!).

Etymology.— The specific epithet refers to the habitat of the species where it grows on the range of karst.

Vernacular.— ຄຳພີເຫຼືອງ (Kham pee lueang).

Conservation status.— *Dalbergia calcarea* is only known from a single locality, where more than 50 mature individuals were observed. According to the Red-List Guidelines (IUCN, 2022), the species seems to meet the criterion Least Concern. The species was discovered near protected areas, which appear to be relatively well conserved, however, it grows close to a village, which could entail at risk of deforestation. Therefore, it is provisionally assessed here as Endangered (EN): En C2a (ii)D, without inference of population size, Extent Of Occurrence (EOO) and Area Of Occupancy (AOO) recorded.

Notes.— 1. The leaves and the obvious bracts of *Dalbergia calcarea* resemble those of *D. stipulacea* Roxb., but both taxa differ in the following characters: tree (vs scandent in *D. stipulacea*), corolla blue (vs pinkish, blue to violet in *D. stipulacea*) and limb of the standard 7–8 mm long (vs ca 5.5–7 mm long in *D. stipulacea*) and ovary with 3–6 (vs ovules 1–2 in *D. stipulacea*). Other distinguishing characteristics among resembling species are shown in Table 1.

2. *Dalbergia calcarea* was discovered growing along the road to Phou Pha Man Hill in mixed

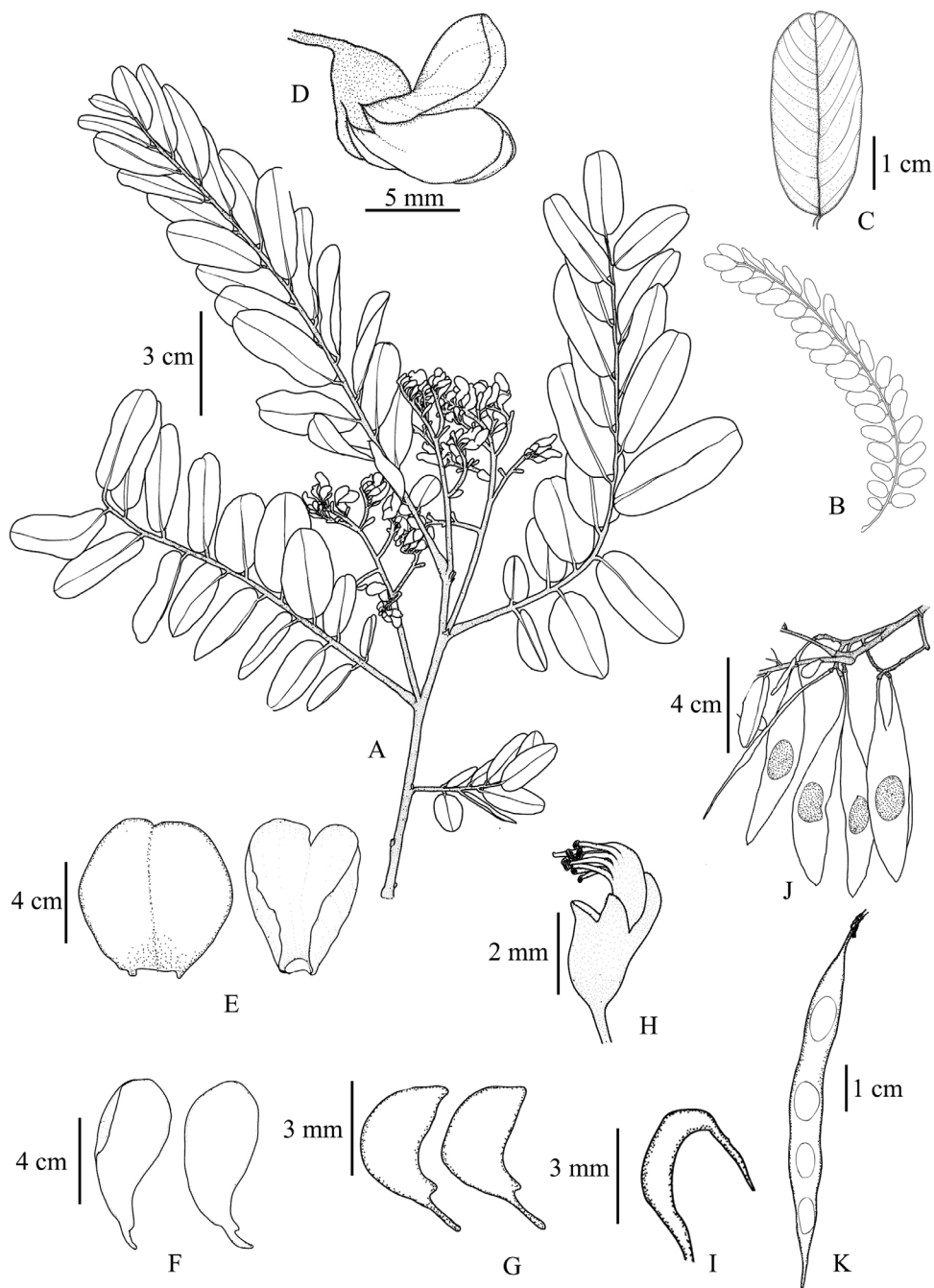


Figure 1. *Dalbergia calcarea* Lanors., Mattapha & Lamxay: A. Leaves and inflorescences; B. Leaf; C. Leaflet; D. Flower; E. Standard, outer surface (left) & inner surface (right); F. Wing petals; G. Keel petals; H. Stamens & calyx; I. Ovary; J. Fruits bearing one seed; K. Fruit bearing 4 seeds. A–I: *S. Lanorsavanh* & *V. Lamxay* SL1641; J & K: *S. Lanorsavanh* & *K. Souvannakhoummane* SL1721. Drawn by Keooudone Souvannakhoummane.



Figure 2. *Dalbergia calcarea* Lanors., Mattapha & Lamxay: A. Leaves and inflorescences; B. Close up of flowers; C. Flowers (front view, left; side view, right); D. Wing petals; E. Keel petals; F. Stamens enclosing the ovary, inside the calyx; G. Fruits. Photos by Soulivanh Lanorsavanh.

Table 1. Morphological comparison between *Dalbergia calcarea*, *D. pinnata* and *D. stipulacea*.

Characters	<i>D. calcarea</i>	<i>D. pinnata</i>	<i>D. stipulacea</i>
Habit	tree	scandent	scandent
Number of leaflets	9–33	21–35	5–25
Base of lateral leaflets	equal-sided	strongly unequal-sided	equal-sided
Length of inflorescences (cm)	4–6.5	2–3	5–10
Colour of calyces	yellowish	green	green
Length of calyx tube (mm)	ca 2	ca 4	ca 7
Middle lobe of lower calyx lobes	longer than other lobes	equal to other lobes	longer than other lobes
Limb of standard (mm)	7–8 × 6–7.5	ca 2 × 2	ca 5.5 × 7
Colour of corolla	blue	white	pinkish, blue to violet
Ovary	pubescent	glabrous	pubescent
Number of ovules per ovary	3–6	2	1–2
Size of pods (cm)	5.7–9.8 × 1.2–1.6	5–6 × ca. 1.3	7–12 × 2–4.5

deciduous forest on limestone hills, in association with *Adinobotrys atropurpureus* (Wall.) Dunn (Fabaceae), *Bombax ceiba* L. (Malvaceae), *Clerodendrum paniculatum* L. (Lamiaceae), *Duabanga grandiflora* (Roxb. ex DC.) Walp. (Lythraceae), *Lagerstroemia calyculata* Kurz (Lythraceae) and *Tetrameles nudiflora* R.Br. (Tetramelaceae)

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