THAI FOREST BULL., BOT. 51(2): 164–172. 2023.
DOI https://doi.org/10.20531/tfb.2023.51.2.15

Validation of three Indo-Chinese *Clerodendrum* (Lamiaceae)

JIRATTHI SATTHAPHORN[1], ALAN J. PATON[2] & CHARAN LEERATIWONG[3,*]

ABSTRACT

Re-examination of nomenclature of three Indo-Chinese species, *Clerodendrum adenocalyx*, *C. nhatrangense* and *C. palmatolobatum* reveals that their names are invalidly published according to Article 39.1. in the International Code of Nomenclature for Algae, Fungi, and Plants (ICN): all these species published in 1935 were described without a Latin diagnosis. Our study validates these species names and, in addition, *C. adenocalyx* is formally reported as a new record from Vietnam. Species description, distribution, ecological information and IUCN conservation status are provided.

KEYWORDS: Cambodia, Laos, new species, nomenclature, Thailand, Vietnam.

Accepted for publication: 1 October 2023. Published online: 18 December 2023

INTRODUCTION

Clerodendrum L. (Lamiaceae, Ajugoideae) has approximately 250 species distributed mainly in the tropics and subtropics in Africa, Asia and Australia (Yuan *et al.*, 2010; Wearn *et al.*, 2019; POWO, 2023). The taxonomy of the genus from Thailand, Laos, Cambodia and Vietnam (or Indo-China) has been recently revised, including a taxonomic account, new species and new records (Leeratiwong & Chantaranothai, 2003; Leeratiwong *et al.*, 2011; Satthaphorn *et al.*, 2021, 2022) which updated the previous accounts of Dop (1920, 1935). Currently approximately 40 species from Thailand and Indo-China are recognized.

In the Flore Générale de l'Indo-Chine, Dop (1935) established several new species of Lamiaceae from Indo-China by providing a French diagnosis. The publication of these names, unfortunately, lacks a Latin diagnosis and description in the protologues, and these are therefore invalid names in accordance with the Article 39.1 of the International Code of Nomenclature for Algae, Fungi, and Plants (ICN). This article states: a name of a new taxon must be accompanied by a Latin description or diagnosis or by a reference (see Article 38.13) to a previously and effectively published Latin description or diagnosis (Turland *et al.*, 2018). For this reason, several Lamiaceae names from Indo-China have been validated by subsequent taxonomic studies (e.g., Suddee *et al.*, 2004a, 2004b, 2005; Suddee & Paton, 2006).

During the revision of *Clerodendrum* for Indo-China, it became apparent that *C. adenocalyx* Dop, *C. nhatrangense* Dop and *C. palmatolobatum* Dop are to be considered as invalidly published due to the lack of a Latin diagnosis in the protologues. As there is no need of a Latin diagnosis following current ICN rules, the English description is provided to describe the species. This taxonomic note aims to validate these names by recognizing the taxa as new species with the indication of previously invalid names, but their specific epithets remain the existing names established by Dop (1935). In the protologues, *C. adenocalyx* and *C. nhatrangense* had only one collection cited as type of the species, but more than

[1] School of Science, Walailak University, Nakhon Si Thammarat 80161, Thailand.

[2] Royal Botanic Gardens, Kew, Richmond, TW9 3AE, UK.

[3] Division of Biological Science, Faculty of Science, Prince of Songkla University, Hatyai, Songkhla 90112, Thailand.

* Corresponding author: charan.leeratiwong@gmail.com

one duplicate of each collection was traced, so that a lectotype should be designated. However, as the names were invalidly published, the designation of the lectotype is unnecessary. Of these, *C. adenocalyx*, a species that was thought to be restricted to Laos, is now reported for Vietnam based on herbarium specimens. This species is formally reported as a new record for Vietnam here.

MATERIALS AND METHODS

The nomenclatural literature, floras and taxonomic articles of the genus *Clerodendrum* in Indo-China and adjacent floristic regions were carefully reviewed, including Notulae Systematicae (Dop, 1920), Flore Générale de l'Indo-Chine (Dop, 1935), Cây cỏ Việtnam, an illustrated Flora of Vietnam (Hô, 1993), Flora of China (Liang & Gilbert, 1994), A Checklist of the Vascular Plants of Lao PDR (Newman *et al.*, 2007, 2017–present), Flora of Vietnam (Phoung *et al.*, 2007), Lao Flora: a checklist of plants found in Lao PDR with scientific and vernacular names (Inthakoun & Delang, 2008) and Flora Malesiana (Wearn *et al.*, 2019). The herbarium specimens of *Clerodendrum* curated in A, B, BK, BKF, BM, E, GH, K, KKU, L, MW, P, PSU and QBG (herbarium acronyms follow Thiers (continuously updated)) were examined. Morphological descriptions, ecological and distributional data were obtained from herbarium collections. The conservation status is assessed following IUCN Guidelines for using the IUCN Red List Categories and Criteria version 15.1 (IUCN Standards and Petitions Committee, 2022) and the online platform GeoCAT (Bachman *et al.*, 2011).

TAXONOMIC TREATMENT

1. Clerodendrum adenocalyx Dop ex Satthaphorn, **sp. nov.**— *C. adenocalyx* Dop in Lecomte, Fl. Indo-Chine 4(7): 883. 1935, **nom. inval.**

This species is most similar to *Clerodendrum tonkinense* Dop in being glabrous on the upper leaf surface, overlapping corolla tube lengths (2.5–3.3 cm long in *C. adenocalyx* vs 2.3–3 cm long in *C. tonkinense*), and the white to creamy-white flowers on the upright inflorescences. However, the new species exhibits the calyx tube being longer than the calyx lobes (3–4.5 mm long calyx tube and 2–2.5 mm long calyx lobes), whilst the calyx tube of *C. tonkinense* is much shorter than the calyx lobes (0.8–1.2 mm long calyx tube and 3–3.5 mm long calyx lobes). Type: Laos, Vientiane, Pak Munung, 22 Apr. 1932, *Kerr 21204* (holotype **P** [P00689666!]); isotypes **A** [A00099791!], **BM!**, **K** [K001052573!]). Fig. 1 & Map 1.

Shrub to tree 2–7 m tall. *Stem* slender, much branched, ±quadrangular in cross-section, grooved, light brown, pubescent, without dense long hairs at nodes. *Leaves* subcoriaceous, elliptic, 3–13.5 cm by 1.5–4.6 cm, apex acute to acuminate, base cuneate, margin entire; upper surface green, glabrous, veins pubescent; lower surface pale green, glabrous, veins pubescent; lateral veins 4–8 on each side; petioles 4–10 mm or sessile, pubescent. *Inflorescence* a thyrse, spike-like to pyramidal, terminal, upright, 4–7 cm long, slender, pubescent, peduncle 4–10 mm long; cymes condensed, many-flowered, opposite, pubescent, with peduncle 3–10 mm long; lower bracts leaf-like, 5–7 mm long; upper bracts linear, 2–3 mm long; bracteoles linear, up to 1 mm long. *Flowers* ±actinomorphic, spreading; pedicels 4–7 mm long, pubescent. *Calyx* green to reddish-green, campanulate, pubescent, densely on midveins, and capitate glandular trichomes; tube 3–4.5 mm long; lobes triangular, 2–2.5 mm by 1–2 mm; fruiting calyx reflexed, red, lobes 5–6 mm by 2.5–4 mm. *Corolla* salverform, white to creamy-white, glabrous; tube 2.5–3.3 cm long; lobes oblong, 4–5 mm by 1.5–2 mm, undulate. *Stamens* 1.5–2.5 cm long; anthers oblong, 1.2–2 mm by 0.4–0.8 mm, yellow. *Ovary* subglobose; style 3.5–5 cm long, white; stigma bilobed. *Fruit* subglobose, 4–5 mm in diam, unlobed to 2–4-lobed, green, ripening black.

Specimens examined.— Laos: Vientiane [Pak Munung, 22 Apr. 1922, *Kerr 21204* (**A**, **BM**, **K**, **P**)], Khammoune [Na Kai, 24 May 2006, *Nanthavong BT22* (**P**); ibid., 26 May 2006, *Nanthavong BT540* (**P**)]. Vietnam: Lai Chau [12 Apr. 1936, *Poilane 25711* (**P**); Pou Nam Cau, 12 Apr. 1936, *Poilane 25713* (**P**)]; Lao Cai [Sa Pa, 31 Mar. 1936, *Poilane 25449* (**P**)]; Tuyen Quang [Hui La, reserved forest, 1 May 1918, *Fleury 37443* (**P**)]; Binh Duong [Binh Hoa, June 1909, *d'Alleizette s.n.* (**L**)]; unknown location [4 May 1892, *Orléans s.n.* (**P**); ibid., *Wilson 2770* (**K**)].

Distribution.— Laos (type), Vietnam.

Ecology.— Evergreen forest; alt. 300–1,200 m. Flowering and fruiting April to May.

Figure 1. Holotype of *Clerodendrum adenocalyx* Dop ex Satthaphorn (*Kerr 21204*, **P**). (Source: http://mediaphoto.mnhn.fr/media/1443485321046Ng0H4e8fQdtM8lCL).

Etymology.— The species name was derived from Greek word '*adeno*' which means of having glands and '*calyx*' refers to calyx. This specific epithet means having glandular trichomes on the calyx.

IUCN conservation status.— Several collections were made from Laos and Vietnam with many localities across a wide geographical range. The area of occupancy (AOO) and the extent of occurrence (EOO) are more than 2,000 km^2 and 20,000 km^2, respectively, and above the threshold of risk categories (IUCN Standards and Petitions Committee, 2022) using GeoCAT (Bachman *et al.*, 2011). This species is assessed as Least Concern (LC).

Notes.— This species was previously reported to be restricted to Laos (Dop, 1935; Newman *et al.*, 2007; POWO, 2023). However, several specimens collected from Vietnam, which can be referred to *Clerodendrum adenocalyx*, were found in the herbaria of Muséum National d'Histoire Naturelle (P) and National Herbarium of the Netherlands (L), e.g., *Poilane 25711* (**P**), *Poilane 25713* (**P**), *Poilane 25449* (**P**), *Fleury 37443* (**P**), *d'Alleizette s.n.* (**L**). Therefore, this species is reported as a new record for Vietnam.

2. Clerodendrum nhatrangense Dop ex Satthaphorn, **sp. nov.**— *C. nhatrangense* Dop in Lecomte, Fl. Indo-Chine 4(7): 882. 1935, **nom. inval.**

This species shares common characters with *Clerodendrum smitinandii* Moldenke in being glabrous on both leaf surfaces, having upright inflorescences, urceolate calyx shape and white to creamy-white corolla colour. It obviously differs from *C. smitinandii* by having shorter calyx lobes being 5–5.5 mm long (vs 8.5–13.8 (–18) mm in *C. smitinandii*) and a shorter corolla tube being 2.8–3.2 cm long (as opposed 3.4–4 cm long). Type: Vietnam, Khanh Hoa, Nhatrang, 29 June 1922, *Poilane 4199* (holotype **P** [P00689724!]; isotypes **A** [A00094549!, A00094550!], **P** [P00689725!, P00689726!, P03432715!]). Fig. 2 & Map 1.

Shrub up to 6 m tall. *Stem* slender, much branched, distinctly quadrangular in cross-section in upper branches, dark brown, glabrous, without dense long hairs at nodes. *Leaves* chartaceous, elliptic to oblong-elliptic, 4.5–7 cm by 1.5–2 cm, apex acute, base cuneate, margin entire; upper surface dark green, glabrous; lower surface light green, glabrous; lateral veins 4–6 on each side; petioles 1–8 mm long, glabrous. *Inflorescence* a thyrse, spike-like to pyramidal, terminal, upright, 4–8 cm long, slender, glabrous, peduncle 0.5–4 cm long; cymes condensed, many-flowered, opposite or alternate, glabrous, with peduncle 5–13 mm long; lower bracts leaf-like, 10–20 mm by 3–4.5 mm; upper bracts caducous; bracteoles linear, 5–8 mm long. *Flowers* ±actinomorphic, spreading; pedicels 4–12 mm long, glabrous. *Calyx* red, urceolate, glabrous; tube 4–5 mm long; lobes triangular, 5–5.5 mm by 2–3 mm; fruiting calyx not seen. *Corolla* salverform, white to creamy-white, slightly pubescent; tube 2.8–3.2 cm long; lobes oblong-obovate, 4.5–7 mm by 2.5–3.5 mm, margin entire. *Stamens* 1.5–1.7 cm long, white; anthers oblong, 1.8–2 mm by 0.5–0.6 mm, dark brown to black. *Ovary* subglobose; style 4–4.5 cm long, white; stigma slightly bilobed. *Fruit* not seen.

Specimens examined.— Vietnam: Khanh Hoa [Nhatrang, 29 June 1922, *Poilane 4199* (**A**, **P**)].

Distribution.— Vietnam (type, endemic).

Ecology.— High elevation in West Nhatrang.

Etymology.— The species name was derived from the Vietnamese city '*Nhatrang*', the capital city of Khanh Hoa Province, where the species was first collected.

Vernacular name.— Vietnamese: Ngọcnữ Nhatrang.

IUCN conservation status.— Data Deficient (DD). This species is only known from the type species collected from Nhatrang, central Vietnam. This single occurrence can be referred to the Critically Endangered (CR) category (IUCN Standards and Petitions Committee, 2022), but the size and fluctuation in population or possible threat cannot be estimated in this study. As the imprecise location is the only evidence, this uncertainty needs to be addressed by field observation in a further study. Therefore, Data Deficient is assigned here for this species.

Notes.— The flowering specimens of *Clerodendrum nhatrangense* were initially recognized as *C. smitinandii* because of the urceolate calyx, but the floral measurements are different from each other, as outlined in the diagnosis above. There is no fruit observed in the specimens. Therefore, the fruit and seed description need further study to further clarify the separation between *C. nhatrangense* and *C. smitinandii*.

Figure 2. Holotype of *Clerodendrum nhatrangense* Dop ex Satthaphorn (*Poilane 4199*, **P**). (Source: http://mediaphoto.mnhn.fr/media/14434855922230ORkDfQYSV3cyOJ6Q)..

3. Clerodendrum palmatolobatum Dop ex Satthaphorn, **sp. nov.**— *C. palmatolobatum* Dop in Lecomte, Fl. Indo-Chine 4: 866. 1935; Satthaphorn *et al.*, Kew Bull. 77: 93–103. 2022, **nom. inval.**

Clerodendrum palmatolobatum is most similar to *C. paniculatum* L. in its hairy nodes, peltate glandular trichomes on the lower leaf surface and red, upright inflorescences, but *C. palmatolobatum* is different in its lobed leaf (deeply 7–9-palmate-lobed vs unlobed to shallowly 3–7-lobed in *C. paniculatum*), longer calyx tube (1.5–2.5 mm long vs 0.8–1 mm long), longer calyx lobes (3.5–5 mm long vs 1.5–2 mm long), wider corolla lobes (3–4.2 mm vs 1–2.8 mm) and longer style (4.5–5 mm vs 3.8–4 mm). Type: Cambodia, entre La-Khang-Choeung et Po-Bang province de Sre-Imbel, 13 May 1928, *Poilane 15302* (holotype **P** [P00689727!]; isotypes **A** [A 00106901!], **GH** [GH00106902!], **P** [P00689728!], **K** [K000910184!]). Fig. 3 & Map 1.

Shrub, 1–2.5 m tall. *Stem* robust, laxly branched near top of main stem or unbranched, ±quadrangular in cross-section, green to light brown, pubescent, with dense long hairs at nodes. *Leaves* subcoriaceous, broadly ovate, deeply 7–9-lobed, 12.5–36.5 cm by 33–36 cm; terminal lobe linear-oblong, 11–20 cm by 2–5 cm; other lobes linear-oblong, size decreasing toward base, apex acute, base cuneate, margin entire or sometimes serrate, upper surface dark green, hairy, lower surface light green, pubescent and peltate glandular trichomes, lateral veins palmate, with 7–9 branches; petioles 5.5–19.5 cm long, glabrous to pubescent. *Inflorescence* thyrsoid, spike-like to pyramidal, terminal, upright, 10–27 cm long, robust, pubescent, peduncle 3–10 cm long; cyme condensed, many-flowered, opposite, with peduncle 2–5.5 cm long; lower bracts leaf-like, 3.5–22 cm long; upper bracts lobed to unlobed, 1–1.5 cm long; bracteoles linear, 1.8–2.6 mm long. *Flowers* ±actinomorphic, spreading; pedicels 8–11 mm long, pubescent. *Calyx* red, campanulate, pubescent and capitate glandular trichomes; tube 1.5–2.5 mm long; lobes elliptic to ovate-oblong, 3.5–5 mm by 1.5–3 mm; fruiting calyx reflexed, red, lobes 3–5 mm by 1.8–3.5 mm. *Corolla* salverform, red, pubescent, with capitate glandular trichomes; tube 17–22 mm long; lobes oblong, 5–13 mm by 3–4.2 mm, margin undulate, twisted, abaxial surface ridged, anterior lobe with white bands at base, reflexed. *Stamens* 3.8–4.2 cm long, red; anthers oblong, 3–3.3 mm by 1.2–1.5 mm, reddish-brown. *Ovary* subglobose; style 4.5–5 cm long, red; stigma bilobed. *Fruit* subglobose, 1–4-lobed, 5–10 mm in diam, green, ripening black.

Specimens examined.— As shown in Satthaphorn *et al.* (2022).

Distribution.— Cambodia (type), Vietnam, Laos, Thailand.

Ecology.— Shaded, dipterocarp forest, dry deciduous forest, open disturbed and pine forest, alt. 140–600 m.

Etymology.— The specific epithet refers to palm-like leaf shape.

Vernacular name.— Pha nom sa wan bai cheak (พนมสวรรค์ใบแฉก)(Proposed here).

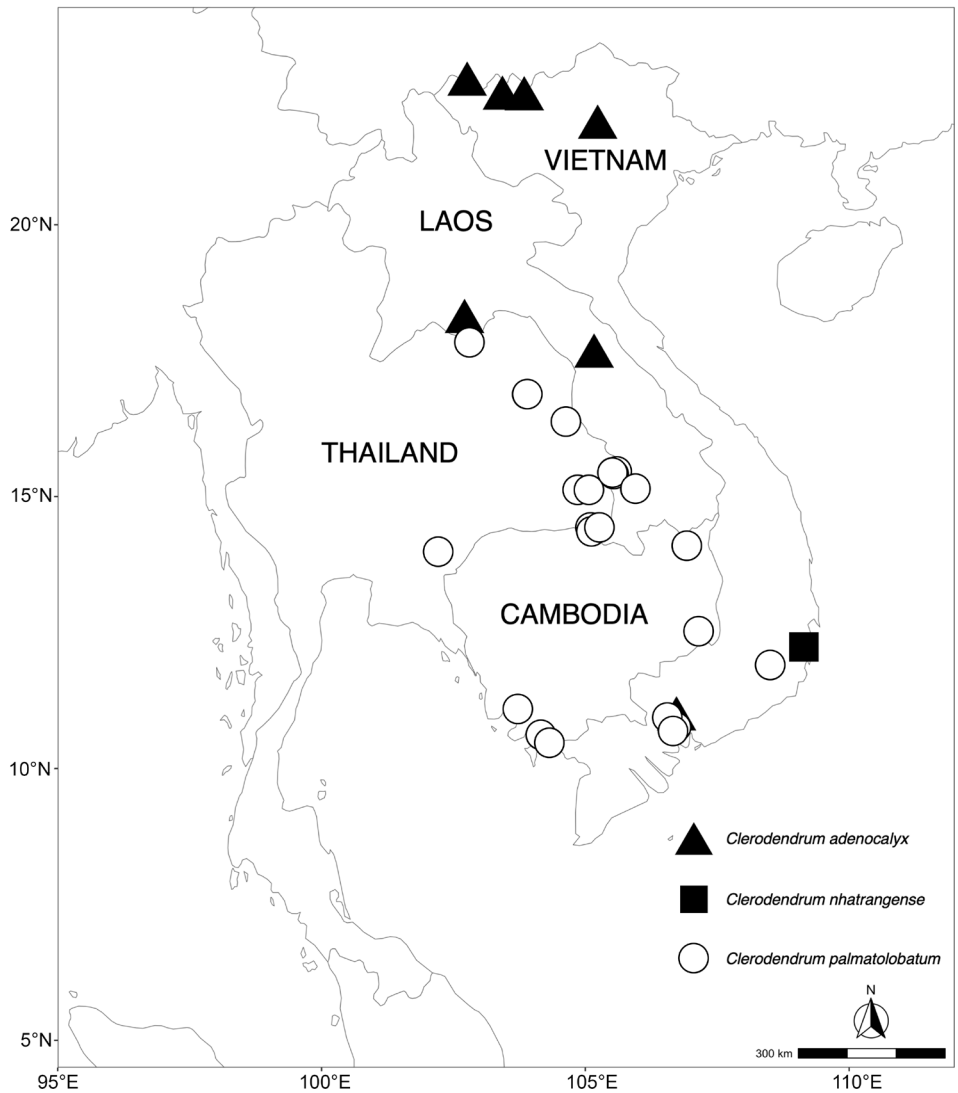
IUCN conservation status.— Distributed in North-Eastern and Eastern Thailand with abundant populations, as well as in Indo-China (area of occupancy > 2,000 km^2). The conservation status is assessed as Least Concern (LC) according to IUCN guidelines (IUCN Standards and Petitions Committee, 2022).

Notes.— This species was described and reported as a new record for Thailand by Satthaphorn *et al.* (2022). However, the previous publication did not validate Dop's (1935) invalid name. Satthaphorn *et al.* (2022) also designated the lectotype *Poilane 15302* [P00689727!] from several cited collections in the protologue. To clarify the nomenclatural rules following ICN (Turland *et al.*, 2018), this species must be reconsidered as a new species and the holotype is chosen based on the cited lectotype. This taxonomic note retains the same specific epithet for the validated *C. palmatolobatum*.

ACKNOWLEDGEMENTS

We would like to thank Dr Somran Suddee (Forest Herbarium, Department of National Parks, Wildlife and Plant Conservation) and Prof. Dr Pranom Chantaranothai (Khon Kaen University) for valuable guidance and discussions. We are grateful to staff of the following herbaria: A, B, BK, BKF, BM, E, GH, K, KKU, L, MW, P, PSU and QBG. Thanks to Dr Peter B. Phillipson for accommodating the first author during working in P herbarium where most Indo-Chinese specimens are curated.

Figure 3. Holotype of *Clerodendrum palmatolobatum* Dop ex Satthaphorn (*Poilane 15302*, **P**). (Source: http://mediaphoto.mnhn.fr/media/1443487778972K1YwIdQ2X5iJIUnK).



Map 1. Distribution map of *Clerodendrum adenocalyx* Dop ex Satthaphorn (▲), *C. nhatrangense* Dop ex Satthaphorn (■) and *C. palmatolobatum* Dop ex Satthaphorn (○).

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