



## *Nymphanthus namkadingensis*, a new species of Phyllanthaceae from Laos

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### Abstract

A new species of *Nymphanthus* (Phyllanthaceae), *N. namkadingensis* from Bolikhamxai Province, central Laos, is described and illustrated, along with its vernacular name and preliminary conservation status. The new species is similar to *N. rubescens*, but distinguished by having larger stipules, longer pedicels, and connate annular disc glands (vs. free disc glands) of pistillate flowers.

**Key words:** flora, Indochina, Malpighiales, Phyllanthaceae, taxonomy

### Introduction

*Nymphanthus* Loureiro (1790: 543) is a genus of subshrubs to shrubs of Phyllanthaceae comprising ca. 86 species, distributed mainly in South to Southeast Asia (Bouman *et al.* 2022). The genus had traditionally been placed in the large, pantropical genus *Phyllanthus* Linnaeus (1753: 981) *s.l.*, comprising ca. 900 species, classified into no less than ca. 18 subgenera due to its high morphological heterogeneity (reviewed by Bouman *et al.* 2018, 2022). Recent molecular analyses demonstrated that some of the subgenera and even *Phyllanthus s.l.* itself are paraphyletic (e.g. Hoffmann *et al.* 2006; van Welzen *et al.* 2014; Bouman *et al.* 2021), and thus later the genus was segregated into multiple monophyletic genera (Bouman *et al.* 2022). The genus *Nymphanthus* is one of the segregates of *Phyllanthus s.l.*, distinguished from the rest of the genera in having the combination of features such as habit of subshrubs to shrubs; staminate flowers of 4 sepals, 4 alternisepalous free disc glands, and 2 or 4 stamens with connate filaments and horizontally dehiscing anthers; fruit of dehiscent capsules; and distribution range of Asia to Australia (Bouman *et al.* 2022). Of the 24 species of *Phyllanthus s.l.* known to occur in Laos (Newman *et al.* 2007, 2017–present), seven are now placed in *Nymphanthus* (Bouman *et al.* 2022).

During our floristic inventories in Nam Kading National Protected Area and its adjoining areas, central Laos in 2023, we collected interesting specimens which should belong to a species of *Nymphanthus*. Further comparisons with related taxa, based on the literature and herbarium specimens, revealed it morphologically differs from any other previously known taxa of the genus. Here, we describe and illustrate it as a new species, *Nymphanthus namkadingensis* Tk.Yamam., Tagane & Soulad., along with its vernacular name and preliminary conservation assessment.

## Materials and Methods

To assess the nobility of the new species, we consulted the taxonomic literature (Gagnepain & Beille 1931; Li 1987; Pham 2003; Chantaranonthai 2005, 2007; Newman *et al.* 2007, 2017–present; Thin 2007; Li & Gilbert 2008; Kantachot & Chantaranonthai 2013; Pornpongrueng *et al.* 2017, 2019; Bouman *et al.* 2018, 2022) and herbarium specimens housed in BKF, FOF, KAG, and VNM (the herbarium acronyms follow Thiers 2024), and those digitized images available at JSTOR Global Plants (<https://plants.jstor.org>), AAU Herbarium Database (<https://sciencemuseumne.dk/herbariet>), Botanical Collections of Meise Botanic Garden (<https://www.botanicalcollections.be>), Catalogue des herbiers de Genève (<https://www.ville-ge.ch/musinfo/bd/cjb/chg>), Chinese Virtual Herbarium (<https://www.cvh.ac.cn>), Department of Botany Collections of Smithsonian National Museum of Natural History (<https://collections.nmnh.si.edu/search/botany>), Indian Virtual Herbarium (<https://ivh.bsi.gov.in>), Kew Data Portal (<https://data.kew.org>), Muséum National d'Histoire Naturelle (<https://www.mnhn.fr>), Natural History Museum Data Portal (<https://data.nhm.ac.uk>), and Naturalis Biportal (<https://bioportal.naturalis.nl>).

The measurements for the description of the new species are based on the herbarium specimens collected in our field surveys. To compare significant characters of the new species with those of similar taxa: *Nymphanthus chantaranonthaii* (Pornpongrueng, Parnell & Hodkinson in Pornpongrueng *et al.* 2019: 39) R.W.Bouman (in Bouman *et al.* 2022: 22), *N. glaucescens* (Baillon ex Miquel 1859: 374) R.W.Bouman (in Bouman *et al.* 2022: 22), and *N. rubescens* (Beille 1927: 602) R.W.Bouman (in Bouman *et al.* 2022: 23), five characters (size of stipules, number of lateral nerves on laminae, length of pedicels, presence/absence of fimbriation at sepal margins, and connation/freeness of disc glands on pistillate flowers) are selected and summarized in Table 1, based on the previously published literatures (Beille 1927; Pham 2003; Chantaranonthai 2007; Li & Gilbert 2008; Pornpongrueng *et al.* 2019) and digitized herbarium specimens listed in Appendix 1.

**TABLE 1.** Morphological comparisons of *Nymphanthus namkadingensis* with *N. chantaranonthaii*, *N. glaucescens*, and *N. rubescens*. The characteristics are derived from Beille (1927) and Pham (2003) (*N. glaucescens* & *N. rubescens*), Chantaranonthai (2007), and Li & Gilbert (2008) (*N. glaucescens*), and Pornpongrueng *et al.* (2019) (*N. chantaranonthaii*). Size of stipules of *N. rubescens* is measured on digitized herbarium specimens listed in Appendix 1.

Characters	<i>N. namkadingensis</i>	<i>N. chantaranonthaii</i>	<i>N. glaucescens</i>	<i>N. rubescens</i>
Size of stipule (mm)	3–9 × 1–2	1.4–2 × 0.1–0.4	1.3–4 × 1.5–2	0.5–1 × 0.5–0.7
Number of lateral nerves of lamina	8–12 pairs	4–7 pairs	4–6 pairs	NA (barely visible)
Length of pedicel (mm)	♂: 4–8, ♀: 10–16	♂: 5–11, ♀: 8–11	♂: 5–15, ♀: 14–25	♂: 1.5, ♀: 2.5
Sepal of staminate and pistillate flowers	apex not fimbriate, margin undulate, almost entire	apex and margin fimbriate	apex and margin fimbriate	apex not fimbriate, margin entire
Disc of pistillate flower	connate, annular	free, obovate	connate, annular	free, rectangular

## Taxonomy

*Nymphanthus namkadingensis* Tk.Yamam., Tagane & Soulad., *sp. nov.*

Type:—LAOS. Bolikhamxai Province: Pakkading District, Nam Aan River, Nam Kading National Protected Area, 18.3460167°N, 104.279817°E, 325 m elev., 2 September 2023, S. Tagane, P. Souladeth, T. Vongthavone, P. Phonepaseuth, T.B. Vuong, T. Yamamoto, D. Kongxaisavath, P.Q. Trong, S. Lorvanhkhham Z74 [fl. & fr.] (holotype FOF!, isotypes KAG!, VNM!). Figures 1 & 2.

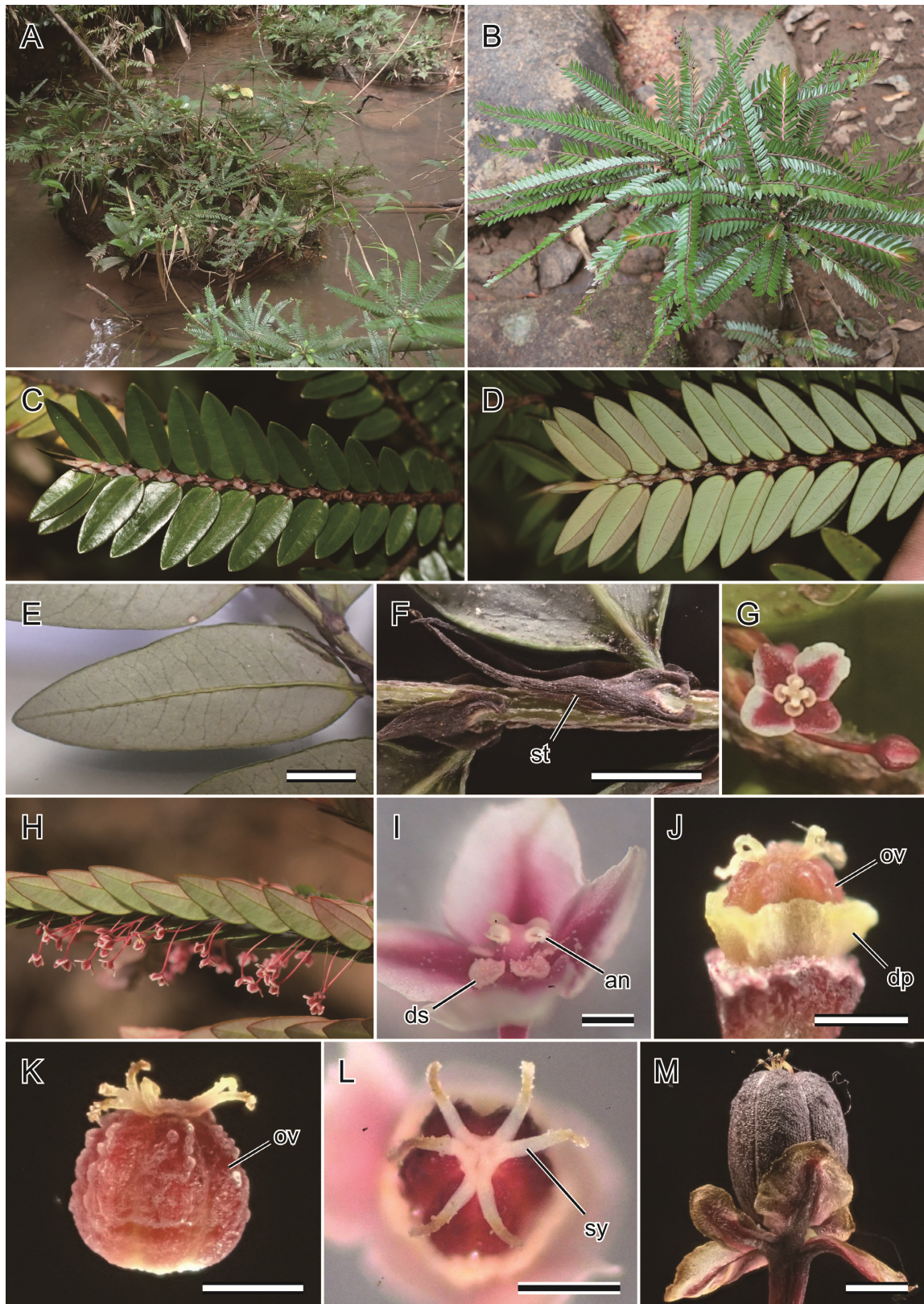
*Nymphanthus namkadingensis* is distinguished from the other members of *Nymphanthus* by having combination of following features: branches and branchlets glabrous, stipules of 3–9 × 1–2 mm, ovate-lanceolate laminae of 14–25 × 5–8 mm with 8–12 pairs of lateral veins, reddish purple sepals with slightly undulate (non-fimbriate) margins, annular disc glands of pistillate flowers, and glabrous ovaries. Among *Nymphanthus* species distributed in Laos and its adjoining countries, the new species is most similar to *N. rubescens* distributed in Laos and Vietnam in having floriferous branchlets rather congested near the top of main branches, ovate-lanceolate laminae 1–2.5 cm long, reddish purple sepals with non-fimbriate margins in staminate and pistillate flowers, and glabrous ovaries, but clearly distinguished by its larger stipules (3–9 × 1–2 mm in *N. namkadingensis* vs. 0.5–1 × 0.5–0.7 mm in *N. rubescens*), longer pedicels

(staminate flowers 4–8 mm long and pistillate flowers 10–16 mm long vs. ca. 1.5 mm and ca. 2.5 mm, respectively), and connate and annular disc glands of pistillate flowers (vs. free, in the form of rectangular tongues) (Table 1).



FIGURE 1. Holotype of *Nymphanthus namkadingensis* Tk.Yamam., Tagane & Soulad. (*Tagane et al.* Z74, FOF).





**FIGURE 2.** *Nymphanthus namkadingensis* Tk.Yamam., Tagane & Soulad. (A, E–G, I–M. Tagane *et al.* Z74; B–D. Souladeth *et al.* Z595; H. Tagane *et al.* Z128). A. Habitat; B. Habit; C, D. Portion of floriferous branchlet showing adaxial and abaxial leaf surfaces respectively; E. Abaxial leaf surface; F. Stipule; G. Staminate flower (front view); H. Staminate flowers (lateral view); I. Enlarged view of staminate flower showing stamens and disc glands; J. Pistillate flower (lateral view, sepals detached); K & L. Ovary (lateral view & overhead view, respectively); M. Fruit just before dehiscence. Abbreviations: an, theca of anther; dp, disc gland of pistillate flower; ds, disc gland of staminate flower; ov, ovary, sy, style. Scale bars E = 5 mm, F = 3 mm, I–L = 0.5 mm, and M = 1 mm. Photos: T. Yamamoto (A, E, F, I–M), K. Souvannakhoummane (B), P. Souladeth (C, D), and S. Tagane (G, H).

**Description:**—**Subshrubs** up to 40 cm tall. **Branches and branchlets** reddish light green when young, later becoming brown, glabrous, longitudinally corrugated by outgrowth of superficial tissue; floriferous branchlets congested at upper end of branches. **Stipules** subulate to lanceolate, 3–9 × 1–2 mm, glabrous on both surfaces, reddish brown when young, later becoming dark brown, acute to acuminate at apex, rounded to cordate at base, sessile, peltate, margin entire. **Leaves** alternate, 50–60 per branchlet, glabrous throughout; petioles up to 1.2 mm long; laminae ovate-lanceolate, 14–25 × 5–10 mm, thinly coriaceous, reddish gray when young especially on abaxial surface, later becoming green, lustrous on adaxial surface, slightly glaucous on abaxial surface, acute to acuminate at apex, obtuse to rounded, slightly oblique at base, margin entire, revolute, midveins prominent on abaxial surface, lateral veins 8–12 pairs, not prominent on both surfaces. **Inflorescences** axillary, unisexual; staminate inflorescences 1-flowered or fascicle with 2–3(–4) flowers on proximal to middle axils of branchlets; pistillate inflorescences 1-flowered in distal axils. **Bracts** ovate, 1.2–1.5 × 0.6–0.8 mm, glabrous on both surfaces, acute to acuminate at apex, cuneate at base, margin entire. **Staminate flowers:** pedicels 4–8 mm long, slightly dilated acropetally, glabrous, reddish purple; sepals 4, triangular to rhomboidal, 1.2–1.4 × 1.1–1.3 mm, glabrous, reddish purple, with white banded periphery, obtuse to rounded at apex, margin almost entire, weakly undulate; disc glands 4, elliptic to reniform, alternisepalous; stamens 2, glabrous, filaments united throughout their length, forming a staminal column ca. 0.4 mm long, anthers 0.2 × 0.6 mm, thecae 2 per anther, transversely dehiscent, slightly apart each other by horizontal elongation of connective tissue; pistillode absent. **Pistillate flowers:** pedicels 10–16 mm long, slightly dilated acropetally, glabrous, reddish purple; sepals (5–)6, narrowly elliptic to rhomboidal, 1.5–2 × 0.8–1.2 mm, glabrous, reddish purple, with white banded periphery, obtuse to rounded at apex, margin almost entire, weakly undulate; disc glands connate, annular, forming a ring around lower third to half of ovary, margins undulate to crenate; ovary superior, subglobose, 0.7–0.9 × 0.8–1 mm, 3-locular, glabrous, sparsely verrucose; styles 3, free, up to 0.1 mm long, glabrous; stigmas almost completely bifid to base, 0.2–0.3 mm long, glabrous; staminodes absent. **Capsule** ellipsoid, 1.6–2.8 × 1.2–1.8 mm, glabrous, smooth to verrucose, reddish black. **Seeds** trigonous, 2 per locule, light brown, 1.5 × 0.9 mm, smooth; fruiting pedicels 12–19 mm long.

**Additional specimen examined:**—LAOS. Bolikhamxai Province: Viengthong District, Ban Hin Ngon, Nam Kading National Protected Area, in seasonal broad-leaved evergreen forest mixed with bamboo, on rocks close to a stream, 18.3793833°N, 104.434917°E, 378 m elev., 3 September 2023, *S. Tagane et al.* Z128 [fl. & fr.] (FOF, KAG, VNM); Bolikhan District, Ban Nam Tek, in broad-leaved evergreen forest, 18.485217°N, 104.126761°E, 427 m elev., 4 November 2023, *P. Souladeth et al.* Z595 [fr.] (FOF, KAG, VNM); Khamkeuth District, near Ban Kaengbid, in broad-leaved evergreen forest, on rocks along a stream, 18.22244°N, 104.50158°E, 537 m elev., 15 March 2024, *S. Tagane et al.* Z837 [fl.] (FOF, KAG, VNM).

**Distribution:**—LAOS. Bolikhamxai Province (so far four localities from Bolikhan District, Khamkeuth District, Pakkading District, and Viengthong District are known, in Nam Kading National Protected Area).

**Habitat and ecology:**—*Nymphanthus namkadingensis* is rheophytic on rocks along streams (Fig. 2A), in seasonal broad-leaved evergreen forests, at 300–550 m elev. Flowering specimens were collected in March and September, and fruiting specimens in September and November.

**Etymology:**—The specific epithet *namkadingensis* is derived from Nam Kading National Protected Area, in which the species was first discovered.

**Vernacular name:**—ໝາກຍົມນ້ອຍນ້ຳກະດິງ [Mak yom noy namkading (“Mak yom” means *Nymphanthus* species in general in Lao; “noy” means small fruit), suggested here].

**Preliminary conservation assessment:**—Endangered (EN). During a total of 22 days of our field surveys conducted in/around the Nam Kading National Protected Area in 2016, 2023, and 2024, *Nymphanthus namkadingensis* was found in four localities at the streamside of the seasonal broad-leaved evergreen forest at 300–550 m elev., with each 40–60 mature individuals. Based on the four locations, the area of occupancy (AOO, defined in IUCN 2024) is 16 km<sup>2</sup> and the extent of occurrence (EOO) is calculated as 313 km<sup>2</sup> using GeoCAT (Bachman *et al.* 2011). However, given that *N. namkadingensis* grows only open to semi-shaded streamside at elev. 300–550 m, the exact EOO should be more narrowly restricted. Although the area is encompassed with the Nam Kading National Protected Area, several dams have been constructed in the protected area, which must have already lost a large area of the habitat of *N. namkadingensis*. In addition, some of the vicinities are being converted to agricultural fields, which may also endanger the habitat of the species. Thus, we propose Endangered (EN) according to the IUCN criteria of B1a & b (i, ii, iii), B2a & b (i, ii, iii), and D (IUCN 2024).

**Note 1:**—*Nymphanthus namkadingensis* is also similar to *N. chantaranothaii* distributed in Thailand (Pornpongrueng *et al.* 2019), and *N. glaucescens* distributed in India to southern China and western Malesia (Chantaranothai 2007; Li & Gilbert 2008) in having elliptic laminae 1–3 cm long and red to purple sepals, but clearly



distinguished from them by its larger stipules ( $3-9 \times 1-2$  mm in *N. namkadingensis* vs.  $1.4-2 \times 0.1-0.4$  mm in *N. chantaranothaii* and  $1.3-4 \times 1.5-2$  mm in *N. glaucescens*), more lateral nerves on laminae (8–12 pairs vs. 4–7 pairs and 4–6 pairs, respectively), and sepals with non-fimbriate apices and slightly undulate, almost entire margins (vs. apices and margins fimbriate in both species) (Table 1).

**Note 2:**—Bouman *et al.* (2022) divided the genus into two sections: section *Nymphanthus* and section *Scepasma* (Blume 1826: 582) R.W.Bouman (in Bouman *et al.* 2022: 23). *Nymphanthus namkadingensis* is placed in the former because of its pedicellate staminate and pistillate flowers, 3-locular ovaries, and bifid stigmas (in contrast the section *Scepasma* shows sessile or subsessile flowers, [4–]5–8-locular ovaries, and usually entire stigmas). The phylogenetic position of the new species is yet to be clarified, and thus further molecular studies will be needed to implement the phylogenetic relationship within the genus and its evolutionary history.

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#### Appendix 1. Specimens of *Nymphanthus rubescens* measured for the size of stipules.

*N. rubescens*. VIETNAM. Da Nang: J. & M.S. Clemens 3880 (P04828019), J. & M.S. Clemens 4030 (P04828022), M. Poilane 6912 (P04828023, P04828024); Thua Thien-Hue: J.E. Vidal 1022A (P04828025).