

BEGONIA IN SOUTHERN LAOS, WITH ONE NEW COUNTRY AND TWO NEW REGIONAL RECORDS

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ABSTRACT

Ten species of *Begonia* are recorded from southern Laos, including a new record of *B. rubrosetosa* based on specimens collected recently from Dak Cheung Plateau, Sekong Province, in southern Laos, and two new provincial records of *B. hymenophylla*, and *B. palmata*. A checklist of *Begonia* species found in southern Laos is provided.

Keywords: angiosperm, Begoniaceae, Dak Cheung Plateau, Indochina, Sekong

INTRODUCTION

Southern Laos consists of four provinces with two main plateaus, Bolaven and Dak Cheung. Bolaven Plateau is located in Salavan, Sekong, Attapeu and Champasak provinces, while Dak Cheung Plateau is located in Sekong Province. These two plateaus in portions of the Annamite Range between Laos and Vietnam are characterized by high rainfall, fog and mists from monsoon winds (RUNDEL, 1999; AVERYANOV *ET AL.*, 2003). Therefore, floristic elements are shared between the two countries. For example, *Begonia poilanei* Kiew (Begoniaceae), and *Dendrobium daklakense* Tich, Schuit. & J.J.Verm. (Orchidaceae), which were described in Vietnam and recently reported from Bolaven and Dak Cheung Plateaus of southern Laos (PHONEPASEUTH *ET AL.*, 2021, 2023).

Dak Cheung Plateau is considered one of the least botanically surveyed locations, with limited specimen collection in Laos. This region is mostly covered by montane forest with altitudes reaching 1,600 m above sea level; lack of road access in the past has made the areas difficult to reach. Currently, the Monsoon Wind Farm Power development project is under construction. Recent biodiversity surveys have reported a total of 23 globally threatened species (14 mammal, 6 reptile, 1 amphibian and 2 plant species), along with several potentially undescribed species and new records for the country (PHIAPALATH *ET AL.*, 2022).

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Received 15 February 2024; accepted 31 May 2024.

Begonia is a mega-diverse genus with more than 2,100 accepted species (HUGHES ET AL., 2015–Present). In Indochina (Cambodia, Laos and Vietnam), HUGHES (2008), documented 39 species, and the number of reported species has recently increased to over 130 (HUGHES ET AL., 2015–Present; PHONEPASEUTH ET AL., 2024). Indochinese *Begonia* are currently being studied and revised by the first author. This genus is considered to have high endemism because of the low dispersal ability of pollen and seeds in most species (THOMAS ET AL., 2012; AVERYANOV ET AL., 2021), and it is likely that numerous species are waiting to be discovered in Laos.

A field survey was conducted in Sekong Province, Dak Cheung Plateau, on the Laos and Vietnam border in August 2023. The second author encountered one *Begonia* species with a caulescent, cane-like stem ca. 50 cm tall. Monoecious with red inflorescences and 4 tepals in the staminate flower, abaxially covered with long dark reddish-purple hairs, and 5 tepals in the pistillate flowers, with 3-locular sub-equally winged fruit. Voucher specimens were deposited at the herbarium of the Faculty of Forestry (FOF) of Laos and the Vietnam Forestry Herbarium (VNF). After carefully examining and comparing it to similar species (see Table 1), this beautiful *Begonia* was identified as *B. rubrosetosa* Aver., which has not yet been reported from Laos (LIN ET AL., 2022). Therefore, we are reporting it here as new to Laos, and a distribution map of related species is also provided. In addition, two species of *Begonia*, *B. palmata* D.Don, and *B. hymenophylla* Gagnep., with their new localities are also presented along with a list of *Begonia* species found in southern Laos.

METHODS

We present a checklist of *Begonia* species in southern Laos compiled from examination of specimens in various herbaria (FOF, HNL, KAG, KUN, LE, MW, P, QBG, SING, VNF, VNMN) comprising a total of 46 sheets, along with data collected from recent field surveys conducted during 2022–2023 (Table 2). The checklist is based primarily on existing literature (HUGHES ET AL., 2015–Present; NEWMAN ET AL., 2017–Onwards; PHUTTHAI ET AL., 2019; LIN ET AL., 2022). Measurements and morphological character assessments of the specimens are based on both fresh material and dried specimens, and are compared with published descriptions of morphologically similar species (*Begonia bachmaensis* Y. M. Shui & T.T.D. Pham, *B. gracilifolia* Y. M. Shui, Nuraliev & Aver., *B. rubrosetosa* Aver., *B. saolaensis* Y.M. Shui, T. A. Le & C. T. Vu (AVERYANOV & NGUYEN, 2012; SHUI ET AL., 2019, AVERYANOV ET AL., 2021) (Table 1). The phenological states of the specimens are indicated as fl. (= flower), fr. (= fruit), or ster. (= sterile).

Table 1. Morphological comparison between *Begonia rubrosetosa* Aver. and related species, *B. bachmaensis* Y. M. Shui & T. T. D. Pham, *B. gracitifolia* Y. M. Shui, Nuraliev & Aver., and *B. saolaensis* Y. M. Shui, T. A. Le & C. T. Vu.

	<i>B. rubrosetosa</i> *	<i>B. bachmaensis</i> ¹	<i>B. gracitifolia</i> ²	<i>B. rubrosetosa</i> ³	<i>B. saolaensis</i> ¹
Stem	glabrous	glabrous	glabrous	glabrous	sparsely strigose
Internodes length	1.9–7 cm long	1.5–2.7 cm long	0.5–3.7 cm long	(2–)2.5–7(–10) cm long	1–3.5 cm long
Leaf petiole	dark red, 0.9–2.1 cm, covered with long dark reddish-purple hairs near leaf base	red to reddish-green 1.0–2.0 cm, glabrous	dark red, 0.3–3.1 cm, bunch of 1 to several hairs 0.5–1 mm long below leaf base	dark purple, (1–)2–5 (–7) cm long, densely long dark hairy at apex	reddish-brown, 0.1–0.3 × 1.7–4.0 cm, strigose
Leaf blade	narrowly ovate, 9–12 × 2.5–3.1 cm	ovate to lanceolate, asymmetric, 3.0–5.0 × 5.0–8.0 cm	narrowly oblong-lanceolate, 4.9–11 × 0.8–2.1 cm	narrowly ovate, (6–)10–18(–22) × (1.5–)2–6(–8) cm	ovate to broadly ovate, 8–13 × 2.5–5.5 cm
Lamina ratio (length/width)	3.55–3.60	1.60–1.66	5.24–6.12	2.75–5.0	2.6–3.2
Leaf base	strongly obliquely cordate	cuneate or rounded	strongly obliquely cordate	oblique cordate	cuneate
Staminate flower	tepals 4, reddish-white, abaxially covered with long dark reddish-purple hairs	tepals 2, white, glabrous on both sides	tepals 4, outer tepals 2, with numerous bright red subulate protuberance-like hairs, inner pair white, glabrous	tepals 4, purple-red, pink or light pink toward the margin, tepals with dense tufts of long setaceous purple hairs outside.	tepals 4, outer pair reddish-white, abaxially red setose, inner pair white, glabrous

Table 1 (continued).

	<i>B. rubrosetosa</i> *	<i>B. bachmaensis</i> ¹	<i>B. gracilifolia</i> ²	<i>B. rubrosetosa</i> ³	<i>B. saolaensis</i> ¹
Pistillate flower	tepals 5, reddish-white, glabrous	tepals 2, whitish-pink, glabrous on both sides	tepals 5, white with more or less prominent reddish areas, hairy abaxially	tepals 5, outside glabrous to sparsely pubescent with long cetaceous purple hairs	tepals 5, white-reddish, glabrous on both sides
Fruit	3-winged, wings sub-unequal, glabrous	3-winged, wings unequal, glabrous	3-winged, wings prominent, equal or subequal, covered with sparse scales	3-winged, wings subequal falcate-lunate roundish	3-winged, wings slightly equal, glabrous
Flowering period	August	April–October	April–May	Late March to May	June–July

* This study based on Lao specimens.

¹ SHUI ET AL. (2019)

² AVERYANOV ET AL. (2021)

³ AVERYANOV & NGUYEN (2012)

Table 2. Checklist of *Begonia* species recorded in southern Laos (Salavan, Sekong, Attapeu and Champasak Provinces). All specimens have been seen, either in the herbarium or as digitized images.

<i>Begonia</i> species	Endemic to Laos	Life form	Province	Specimens cited
<i>B. adscendens</i> C. B. Clarke	No	Terrestrial	Champasak	<i>J. Munzinger 250</i> (L, P)
<i>B. hemsleyana</i> Hook. f.	No	Terrestrial	Champasak	<i>P. Souladeth et al. L2494</i> (FOF, KAG); <i>S. Tagane et al. L1868</i> (FOF, KAG); <i>P. Souladeth et al. L3326</i> (FOF, KAG); <i>S. Phonesack & L. Sengvilai 806</i> (HNL).
<i>B. hymenophylla</i> Gagnep.	No	Lithophyte	Salavan* Champasak	<i>A. Phaxay</i> (Fig. 4A) <i>C. Thorel 2358 & 2958</i> (P)
<i>B. integrifolia</i> Dalzell	No	Terrestrial	Champasak	<i>J. F. Maxwell 97-1150</i> (CMU, L); <i>C. Thorel 2226</i> (P).
<i>B. modestiflora</i> Kurz	No	Terrestrial	Champasak	<i>J. F. Maxwell 97-1081</i> (L); <i>C. Thorel 2239</i> (BM, P).
<i>B. palmata</i> D. Don	No	Terrestrial	Sekong*	<i>S. Xayyasith et al.</i> (photographs)
<i>B. poilanei</i> Kiew	No	Lithophyte	Champasak	<i>P. Souladeth et al. L3949</i> (FOF, KAG).
<i>B. rubrosetosa</i> Aver.**	No	Terrestrial	Sekong	<i>C. H. Nguyen NHC 20230802002</i> (FOF, VNF)
<i>B. siamensis</i> Gagnep.	No	Terrestrial	Attapeu Champasak	<i>J. F. Harmand 1387</i> (P). <i>P. Souladeth et al. L3461</i> (FOF, KAG), <i>P. Souladeth et al. 3879</i> (FOF).
<i>B. vivipara</i> Aver., Nuraliev & Y. M. Shui	Yes	Lithophyte	Champasak	<i>E. Konstantinov & T. Vongsa K418</i> (LE).

* new provincial record

** new record for Laos

NEW RECORD FOR LAOS

Begonia rubrosetosa Aver. [Begoniaceae] — Figs. 1 and 2.

Turczaninowia 15(2): 20 (2012).

Begonia rubrosetosa, with red flowers, was described from Thua Thien Hue Province of Vietnam and was considered endemic to this area (AVERYANOV & NGUYEN, 2012). This research extends its distribution westward into Laos. This species has leaf petioles covered with long, dark reddish-purple hairs near the base of leaves (Fig. 2D) and on the abaxial side of staminate flowers (Fig. 2E, F) distinguishing it from related species (see Table 1). This species may have originated in Laos and spread to Vietnam, since in Laos it occurs in mountainous areas around 1,400 m a.s.l., whereas in Vietnam it is reported only from 100–950 m. This hypothesis may be supported by recent observations of west-to-east dispersal of *Begonia* in the Malesian archipelago (THOMAS *ET AL.*, 2012). This species has the potential to be cultivated as an ornamental plant.



Figure 1. *Begonia rubrosetosa* Aver. A, Habitat. B, Flowering plants. C, Leaf blade (abaxial side). Photographs by Cuong Huu Nguyen (taken on 2 August 2023).

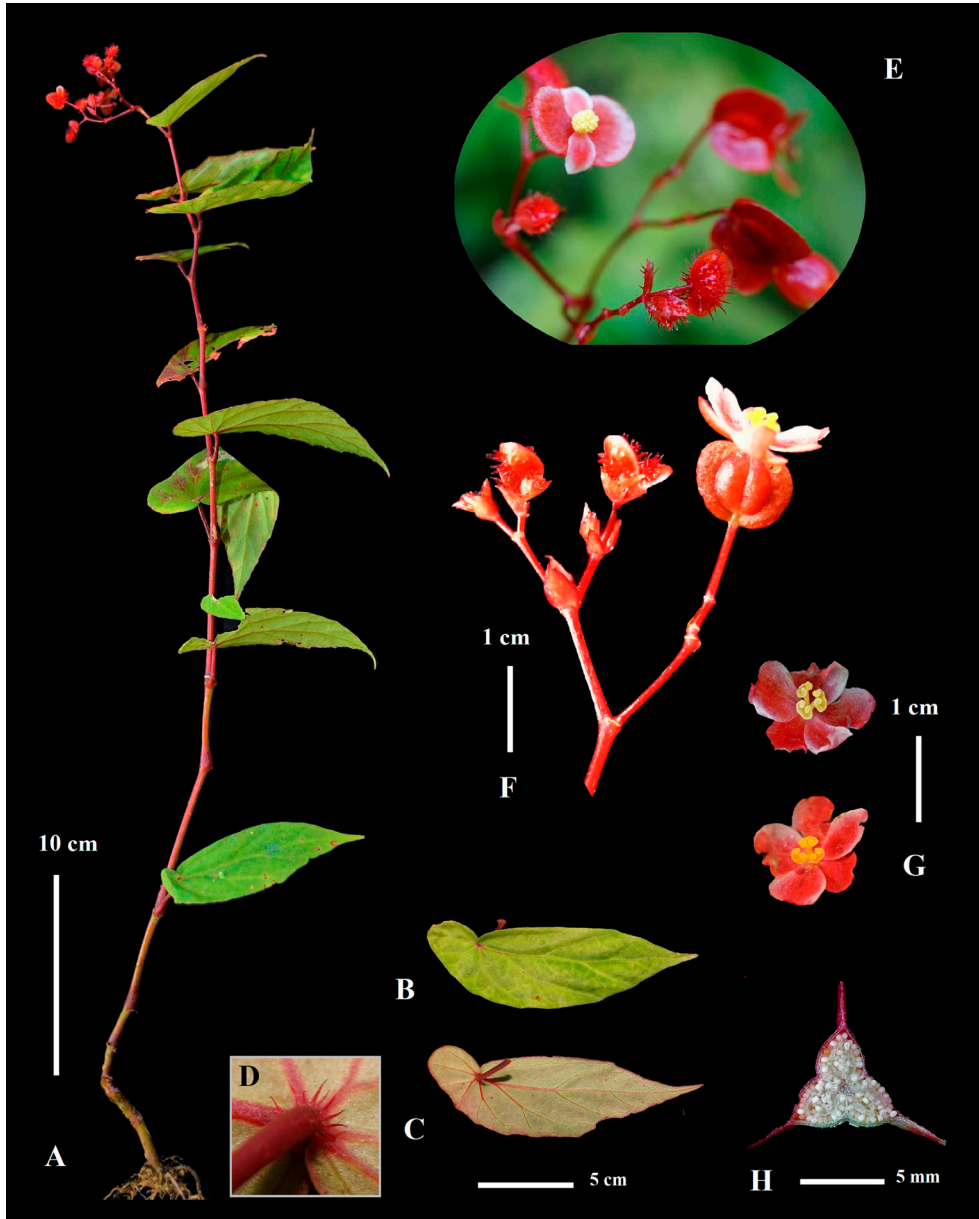


Figure 2. *Begonia rubrosetosa* Aver. A, Habit (C. H. Nguyen NHC 20230802002). B, Leaf (adaxial surface). C, Leaf (abaxial surface). D, Abaxial side of leaf at base showing long dark reddish-purple hairs. E, inflorescence with staminate and pistillate flowers. F, inflorescence with staminate and pistillate flower in lateral view. G, pistillate flowers in frontal view. H, cross-sections of capsule. Photographs by Cuong Huu Nguyen (taken on 2 August 2023 in Dak Cheung Plateau).

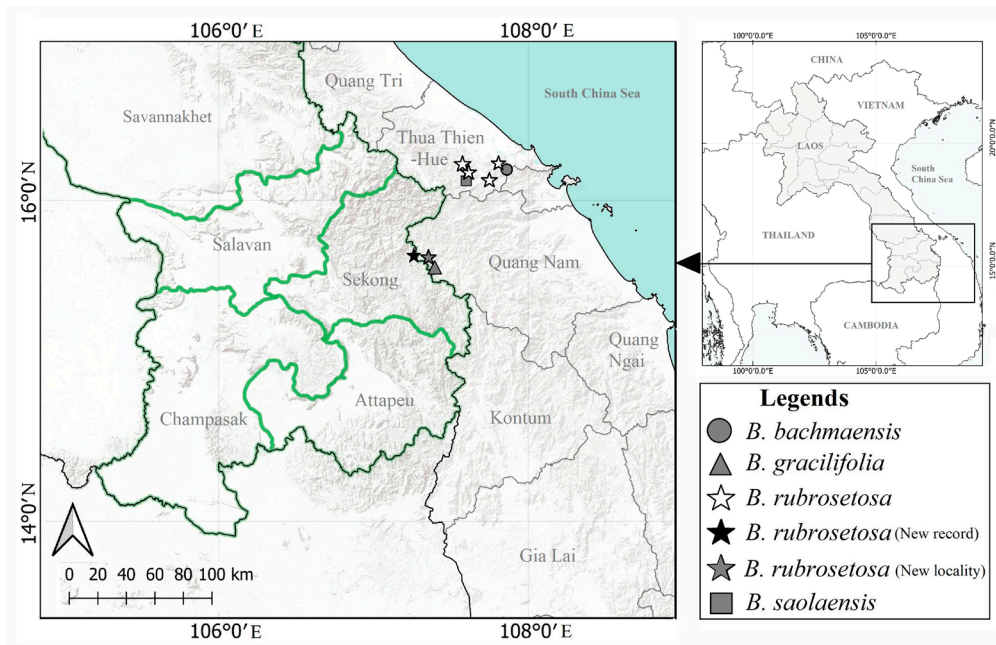


Figure 3. Distribution map of *Begonia rubrosetosa* Aver., and its related species in Laos and Vietnam (AVERYANOV & NGUYEN, 2012; SHUI ET AL. 2019; AVERYANOV ET AL. 2021).

Habitat and ecology in Laos: Terrestrial in semi-shade in montane evergreen forest, it shares habitat with *Dicranopteris* sp. (Gleicheniaceae), *Selaginella* sp. (Selaginellaceae). Flowering and fruiting occur in August (based on field observation and specimen collections).

Specimens examined: LAOS (new record). Sekong Province: Dak Cheung Plateau, around point, 15°39'26.8"N, 107°15'52.1"E, ca. 1,400 m a.s.l., 02 August 2023, fl., C. H. Nguyen NHC 20230802002 (FOF, VNF). VIETNAM. Quang Nam Province (new locality), Nam Giang District, Cho Chun Commune, around point, 15°37'08.6"N 107°20'17.9"E, ca. 950 m a.s.l., 15 July 2023, fl., C. H. Nguyen NHC 20230715010 (VNF). Thua Thien Hue Province, Nam Dong District, Thuong Lo Municipality, along Cha Mang stream, 4 April 2007, fl., L. Averyanov et al. HAL 10883 (LE [LE01049442], digital image!, holotype).

Other specimens examined of related species: *Begonia bachmaensis* Y. M. Shui & T.T.D. Pham: *E. Poilane* 27768 (P [P06844269, digital image!]); *D. S. Penneys* et al. 2156 (P [P00991648, digital image!]). *B. gracilifolia* Y. M. Shui, Nuraliev & Aver.: *Nuraliev M.S.* 2425 (MW [MW0595740, digital image!], holotype). *B. saolaensis* Y.M. Shui, T.A. Le & C.T.Vu: *Le et al. LTA* 346 (VNMN)

Distribution: Laos (Dak Cheung Plateau, Sekong Province), and Vietnam (Thua Thien Hue Province). (AVERYANOV & NGUYEN, 2012) and Quang Nam Province (new locality). — Fig. 3.

Note: *Begonia rubrosetosa* is somewhat similar to *B. gracilifolia* in morphology and distribution range. Further molecular study is needed to clarify their relationship. Plants of *B. rubrosetosa* in Laos have minor differences from the Vietnamese type specimen, including smaller deciduous stipules (vs. large and persistent), and flowering in August (vs. March to May). However, specimens from Laos closely resemble those of *B. rubrosetosa* collected in Quang Nam Province (new locality), which is closer geographically and flowering in July.

NOTE ON NEW PROVINCIAL RECORDS

B. hymenophylla Gagnep. [Begoniaceae] — Fig. 4.

Bull. Mus. Natl. Hist. Nat. 25: 200 (1919).

This species is one of the tiniest in Asia with large pink flowers *Begonia* compared to the small leaves, and was the earliest species described from southern Laos (GAGNEPAIN, 1919) and has been known only from the type locality. This new locality record was photographed by a forestry officer in a large sandstone habitat near the river in Xe Bang Nouan National Protected Area, Salavan Province, representing the first record of *Begonia* species reported in this province (Fig. 4B).

Distribution: Myanmar (Shan State, eastern), Thailand (eastern), Laos (southern) and Cambodia (North along Dangrek Mts. near the Thailand border, and south of Cardamom Mts.) (HUGHES *ET AL.*, 2015–Present; PHUTTHAI *ET AL.*, 2019; PHONEPASEUTH *ET AL.*, 2024).

Specimens examined: LAOS. Salavan Province: Xe Bang Nouan National Protected Area, 25 September 2022, A. *Phaxay* (Photograph record, Fig. 4A). Champasak Province (Bassac): 1866/1868, C. *Thorel* 2358 (P [P00341533, digital image], holotype).

B. palmata D.Don [Begoniaceae] — Fig. 5.

Prodr. Fl. Nepal: 223. (1825).

This species is widespread in mainland Asia, extending from Nepal in the west to Vietnam in the east (HUGHES, 2008). In Laos, it has been reported from northern and central regions; Houaphan, Xiengkhoang, Xaisomboun, Bolikhamxai, and Khammouan provinces (NEWMAN *ET AL.*, 2017–Onwards; LAMXAY *ET AL.*, 2021; LANORSAVANH *ET AL.*, 2021). The new locality is recorded in Sekong Province, representing the first distribution record in southern Laos and marking the second species of *Begonia* reported in this province. Additionally, specimens collected during a field survey in northern Laos in August 2023 from Luangnamtha Province, and existing herbarium specimens (HNL, QBG), give new records for three other provinces; Phongsaly, Oudomxai and Luangprabang. A distribution map of *B. palmata* in Laos is presented (see Fig. 5E). This species is predominantly found in semi-shaded and humid areas of montane forests at elevation ranging from 988 to 2,300 m a.s.l. Flowering has been observed in two seasons: rainy season from August to September, and dry season from April to May.

Distribution: India, China, Nepal, Bhutan, Bangladesh, Myanmar, Thailand, Laos, and Vietnam (CAMFIELD & HUGHES, 2018; PHUTTHAI *ET AL.*, 2019).

Specimens examined: LAOS. Phongsali Province: Phu fa, 21°41'18"N, 102°06'29"E, 1,600 m a.s.l., 14 September 2019, fl., *W. Thammarong et al. L19-363* (QBG [QBG123369, digital image!]). Oudomxai Province: Namai, Namor Village, 988 m a.s.l., 23 August 2004, Ster., *Y. Ochaili*, & *S. Yokoyama* 230804-25 (QBG [QBG28339, digital image!]); Xai District, Namkat Village, 27 October 2012, fl. & fr., *S. Khantheo* & *X. Phonesavanh OX0622* (HNL [HNL0004438, digital image!]), Nadee Village, 1 November 2012, fl., *S. Khantheo*, *S.* & *X. Phonesavanh LNT0662* (HNL [HNL0004470, digital image!]). Luangnamtha Province: Pha Ngeuang waterfall, Nam Ha National Protected Area, 21°07'30.3"N, 101°14'37.6"E, 1,071 m a.s.l., 14 August 2023, fl., *P. Phonepaseuth et al. LNT23007* (FOF). Luangprabang Province: Phonxay District, Huay King Village, 11 August 2017, fl. & fr., *C. Maknoi et al. L9-206* (QBG [QBG111258, digital image!]). Houaphan Province: Viengthong District, Ban Phon Sa-at, walking along road, 18 October 2002, *K. Homsombath* & *M. F. Newman*

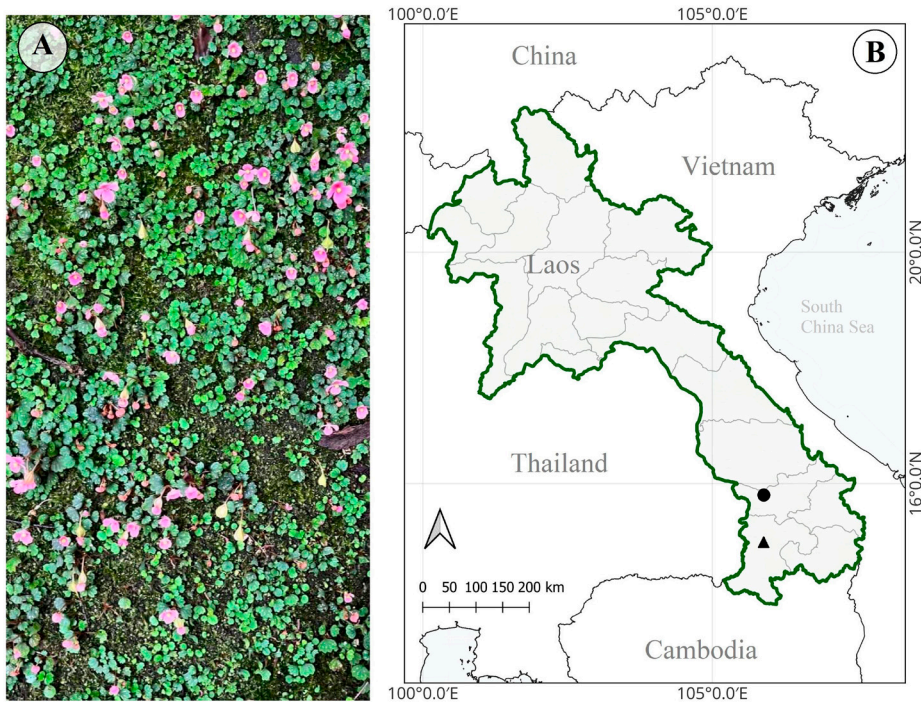


Figure 4. *Begonia hymenophylla* Gagnep. A, habitat at the new locality (photograph by Athit Phaxay, on 25 September 2022, Salavan Province, Xe Bang Nouan National Protected Area). B, Distribution in Laos; type specimen (▲) and new locality in the country (●).

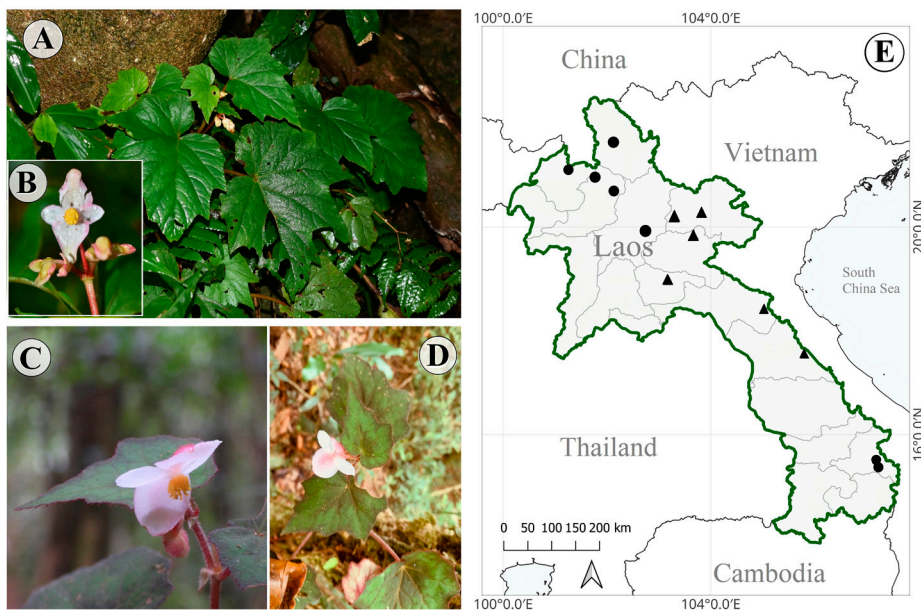


Figure 5. *Begonia palmata* D. Don. A, Habit. B, Staminate flower. C & D, Staminate flower and Habit of variegated plant. E, Distribution map of *B. palmata* in Laos, specimen previously recorded (▲) and new localities confirmed in this study (●). Photographs by Phongphayboun Phonepaseuth, on 14 August 2023 in Luangnamtha Province (A, B), and by Santi Xayyasith, on 10 April 2023 in Sekong Province (C, D).

1357 (E [E00171898]). Houaphan Province: (no exact locality), 20 September 1920, fr. *E. Poilane* 1938 (P [P00341548, digital image!]). Houaphan Province: (no exact locality), 8 October 1920, fr., *E. Poilane* 2002 (P [P00341549, digital image!]); Houameuang District, Nam Et-Phou Leouy National Park, 20°14'07.6"N, 103°47'38.8"E, 1,475 m a.s.l., 6 August 2023, fl., *P. Phonepaseuth et al.* HP23222 (FOF). Xiangkhoang Province: (no exact locality), 28 September 1928. fr., *J. Delacour s.n.* (P); Kham District, 19°49'49.2"N, 103°40'41.9"E, 1,522 m a.s.l., 13 December 2015, fr., *H. Won et al.* 13334 (FOF); Kham District, 19°49'49.2"N, 103°40'42.3"E, 1,532 m a.s.l., 15 August 2016, fl., *H. Won et al.* 14965 (FOF). Xaisomboun Province: Phu Bia, 1,800–2,300 m a.s.l., fl., photo in LAMXAY ET AL. (2021: 48). Bolikhamxai Province: Phu Chomvoy Provincial Protected Area, 1,000–1,300 m a.s.l., fl., photo in LANORSAVANH ET AL. (2021:75). Khammouan Province: (no exact locality), *M. F. Newman LAO1429* (E); Boualapha District, Thongsam Village, Hin Nam No National Protected Area, 17°35'13.2"N, 105°47'49.8"E, 1,100 m a.s.l., 9 March 2013. fr. *Averyanove et al.* LA-VN 270 (LE [LEO1077191, digital image!]). Sekong Province: Dak Cheung Plateau, 15°25'12.70"N, 107°11'16.8"E, 1,621 m a.s.l., 10 April 2023, fl., *S. Xayyasith et al.* (photographs); Dak Cheung Plateau, 15°26'26.25"N, 107°11'20.12"E, 1,452 m a.s.l., 11 Apr. 2023, fl., *S. Xayyasith et al.* (photographs). NEPAL. anno 1821, *Wallich 3678b* K (K001110780, digital image!, lectotype designated by CAMFIELD & HUGHES [2018: 70]).

ACKNOWLEDGEMENTS

We would like to thank the curator and staff of herbarium QBG for providing us with digitized images of all collections of Lao *Begonia* specimens. Also, thanks to curators of herbaria FOF, HNL, VNF, and VNMN for allowing us to examine specimens in their care, and herbaria K, KAG, KUN, LE, MW, P, and SING for access to their online specimen images. We are thankful to Athit Phaxay (national protected area officer) and Dr. Santi Xayyasit (FES) for their kindness in providing photographs of *B. hymenophylla* and *B. palmata*. We gratefully thank Prof. Dr. Warren Y. Brockelman (National Biobank of Thailand) for the English corrections. We sincerely thank two anonymous reviewers for their values and thoughtful comments and helpful suggestions. This work was supported by Tokyo global partner scholarship and is a part of the first author's Ph.D. dissertation.

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