

***Musa serpentina* (Musaceae): a new banana species from western border of Thailand**

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ABSTRACT. *Musa serpentina* Swangpol & Somana, a new species from Thailand in areas bordering Myanmar is described and illustrated. A key is given to the wild bananas of the area.

KEY WORDS: *Musa laterita*, *Musa acuminata*, Thailand, wild banana.

INTRODUCTION

Though Simmonds (1956) cited clearly in his report on the results of his expedition during 1954–5 that Thailand is one of the hotspots of banana diversification, taxonomic study of the banana genus, *Musa* L., in this country has been neglected for more than 50 years. Since then, there has only been another preliminary survey of wild banana species diversity in northern Thailand (De Langhe et al. 2002). In this latter document, apart from four widespread *Musa* species in northern Thailand (*M. balbisiana*, *M. acuminata*, *M. itinerans*, and *M. laterita*), there were two other uncommon species mentioned, *M. nagensium* Prain and *M. sikkimensis* Kurz. The first was collected by Simmonds (1956) in one location only (near Chiang Dao, Chiang Mai) who even noted a vernacular name ('Klue Khem'). However, its distribution areas documented by Cheesman (1948) were in Nagaland and Assam of India and Myitkina District of Burma (now Myanmar) and despite extensive surveys by De Langhe et al (2002) and our team (2005–2011) *M. nagensium* was not found, suggesting that it may not exist in Thailand or has become extinct in the wild here.. Another species mentioned in the same report as "putative *M. sikkimensis* variety" was not clearly described. However, its distinctive

determinate inflorescence was definitely not the main characters found in our sp. nov. reported here.

One accession (SS & JS 246) of our new taxon, first collected as a variant of *M. laterita*, was found growing vigorously along with *M. acuminata* and *M. laterita* at the border of Thailand–Myanmar in Sangkhla Buri, Kanchanaburi. Later, while searching for wild *M. balbisiana* in Mae Hong Son, a population of this variant *M. serpentina* (SS & JS 353) was also found growing robustly among individuals of *M. balbisiana* and *M. laterita* on a stream bank. The taxon was subsequently located independently elsewhere along the western border of Thailand in Mae Hong Son, Tak, and Kanchanaburi. Morphological study revealed it to be a new species based on the characters given in the key and notes and thus it is described below.

A special term 'TS ratio' used in this paper requires explanation. The term was introduced by Argent (1976) as "the vertical depth of the petiole canal divided by the vertical depth of petiole tissue beneath, as seen in transverse section of the mid-point of the petiole". This character is used to distinguish the new species from *M. laterita*, see "Key to the species".

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KEY TO THE *MUSA* SPECIES OF NORTHERN AND CENTRAL THAILAND

1. Petiole canal margins overlapping. Bracts lift but do not roll back. Four rows of ovules in each loculus **M. balbisiana**
1. Petiole canal margins not overlapping, but curved inward, erect or spreading. Bracts lift and roll back. Two rows of ovules in each loculus.
 2. Suckering to 0.5–2 m from parent plant, male bract yellow inside, fruit pedicel ca. 2.5–4.5 cm long, fruit peel light green or red purple at maturity, do not become yellow when ripe **M. itinerans**
 2. Suckering less than 0.5 m from parent plant, male bract pale orange-red or red purple to dull red inside, fruit pedicel less than 2 cm long, fruit peel medium green at maturity, become yellow when ripe.
 3. Inflorescence horizontal or pendulous at anthesis. Male inflorescence bracts dull red on both sides **M. acuminata**
 3. Inflorescence erect or upwardly slanting at first anthesis. Male inflorescence bract pale orange-red to pink-purple to purple-brown outside, pale orange-red to red purple inside
 4. Pseudostem less than 1.5 m tall, less than 20 cm circumference. Petiole canal wide with erect margins, TS ratio (see Introduction) more than 1. Male bract orange-red on both sides. Fruits in one row **M. laterita**
 4. Pseudostem 2–4 m tall, 20–40 cm circumference. Petiole canal margins curved inward, TS ratio less than 1. Male bract pink-purple to purple-brown outside, red-purple with or without purple streaks inside. Fruits in two rows **M. serpentina**

DESCRIPTION

Musa serpentina Swangpol & Somana *sp. nov.*
Musae lateratae Cheesman similis sed pseudocaulibus 2–4 m elatus et 20–40 cm circumdatus et bracteis inflorescentio roeis et fructibus in quoque aggrigatibus serialibus duobus differt. Typus: Northern Thailand, Mae Hong Son, Amphoe Khun Yuam, Tambon Muang Pon. Stream bank near bridge on Road 108, 11 May 2008, *Swangpol & Somana 353* (holotype **BKF**; isotype: Suan Luang Rama IX Herbarium), Map 1 and Fig. 1–2.

Perennial herb with rhizome ca. 20 cm long, pseudostems clumped, 2–4 m tall, 20–40 cm in circumference, light green, green yellow to medium green, sap ivory, young sucker leaves without blotches. *Petiole* 56–70 cm, base with sparse small brown blotches, petiole canal narrowly open with short winged margins curving inward, medium green or sometimes pink to purple, lower side medium green. *Leaf blades* oblong, 135–220 by 40–70 cm, underside slightly waxy, base cuneate to oblique with left side cuneate and right side cuneate or rounded to cordate, apex prominently blunt. Inflorescence erect, rachis 30–45 cm long, slightly hairy; basal flowers male, sterile; terminal flowers female, sterile. *Female inflorescence* narrowly lanceolate, bract lanceolate, 25 by 12 cm, pink-purple to purple-brown outside, slightly waxy, red-purple with purple streaks inside; female flowers with compound tepal ivory, lobe orange, free tepal slightly longer than 1/2 length of compound tepal, ivory, stigma 1, ivory, locules 3, ovules in 2 rows, anthers 5, infertile. *Male inflorescence* rachis 40–120 cm long, first upwardly slanting, then curving

downwards, finally curving up slightly and turning like a crawling serpent, male inflorescence lanceolate, bracts ovate to narrowly ovate, 11–17 by 5–12 cm, pink-purple to purple brown outside, slightly waxy, sometimes with yellow streaks, red to red purple inside, rolling up before falling; male flowers with compound tepal cream, lobe orange, free tepal narrowly ovate, cream, translucent, with a few wrinkles at the base of the apex, ca. 1/2 length of compound tepal, stigma 1, orange, infertile, anthers 5, cream. *Infructescence* bunch horizontal or slightly angled upward. *Fruits* 4–7 hands per bunch, lax, 8–18 per hand, in two rows, 4–6 cm long, 1 cm wide, straight to curved, angular with prominent ridges at maturity, pedicel 0.5 cm long, apex blunt. *Seeds* depressed, irregular, rounded angular, ca. 5–7 mm by 4–6 mm by 2–3 mm, relatively smooth surface, brown to black, chalaza round to oval, convex.

Thailand.— NORTHERN: Mae Hong Son [Mae La Noi, Tambon Mae Tho, Road 108, 11 May 2008, *Swangpol & Somana 355*], Tak [Tha Song Yang, Mae La, Road 105, 26 Jan 2007, *Swangpol & Somana 278*; Mae Ramat, Khane Chue, Road 105, 30 April 2010, *Swangpol & Somana 432*]; CENTRAL: Kanchanaburi [Sangkhla Buri, Nong Lu, Road 323, 14 Aug. 2006, *Swangpol & Somana 246*, and 25 April 2009, *Swangpol & Somana 387*; Sangkhla Buri, Nong Lu, low slope on roadside to Namtok Takhian Thong, 26 April 2009, *Swangpol & Somana 393*], all specimens were deposited at Suan Luang Rama IX Herbarium, a duplicate of *Swangpol & Somana 246* was deposited at **BKF**.

Distribution.— Endemic to the west of northern and central Thailand, the floristic regions

recently described by van Welzen et al. (2011), but expected to be found across the border in Myanmar.

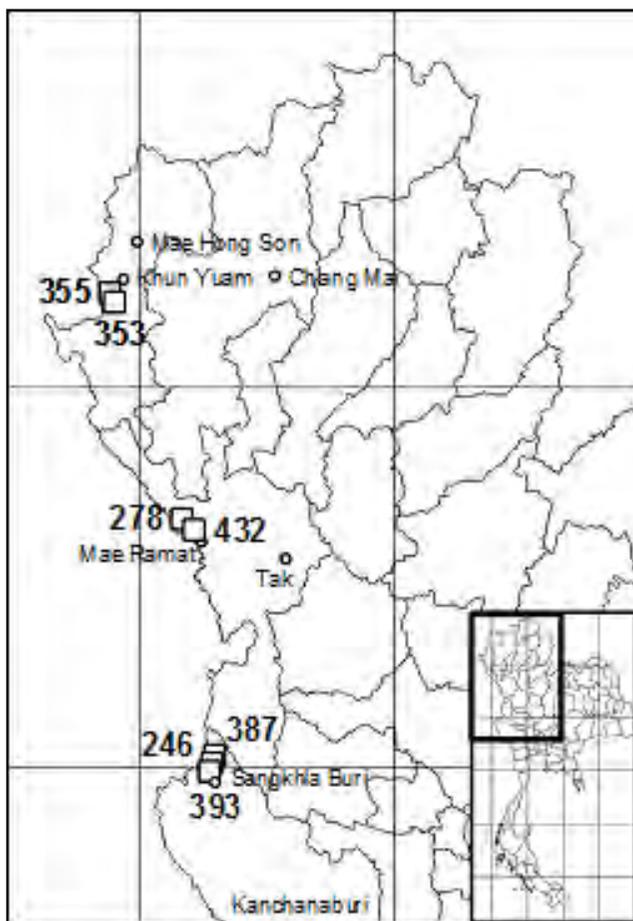
Ecology.— In highly disturbed habitats of open mixed deciduous forest by stream banks or low slopes by roadsides; altitude 240–570 m.

Vernacular.— We named the new taxon, Kluai Nakkharat (กล้วยนาคราช), which ‘Nakkharat’ or ‘Naga’ literarily means the serpent king.

Notes.— *Musa serpentina* possesses an erect inflorescence at first later lengthening in a unique curling habit as snake-like from which it takes its name. The inflorescences are covered with bracts of a distinctive pink or rose colour (pink-purple, based on standard colour chart for bananas and plantains, IPGRI-INIBAP/CIRAD, 1996). *M.*

serpentina differs additionally in characters of the underground stem and can be easily distinguished from the other wild bananas: *M. laterita* Cheesman, *M. acuminata* Colla and *M. balbisiana* Colla, growing in the same area.

Conservation status.— It should be noted that seed set in *Musa serpentina* is poor and no more than 10 seeds per fruit were found. In addition, due to drastic fragmentation of its mixed deciduous forest habitat and the fact that observed population size was estimated in all seven populations combined to number fewer than 250 mature individuals, the new species is considered ‘Endangered’ (EN) based on IUCN Red List Categories and Criteria: Version 3.1 (Criteria D in Section V; IUCN, 2001).



Map 1. Distribution areas of *Musa serpentina* S. Swangpol & J. Somana in the west side of northern and central regions of Thailand. Accession numbers and detail were according to text. Map was provided by Dr R. Boonprasert, Mahidol University, Thailand.



Figure 1. *Musa serpentina* Swangpol & Somana: A. clump; B. petiole shoulder; C. leaf base and cross-section of petiole canal; D. female inflorescence; E. male bract; F. male flower; G. male inflorescence; H. seeds (bar = 5 mm); I. rhizomes. Photos by S. Swangpol – A, B, F, G and I SS&JS 246; C and E SS&JS 278; D SS&JS 353; H SS&JS 387.

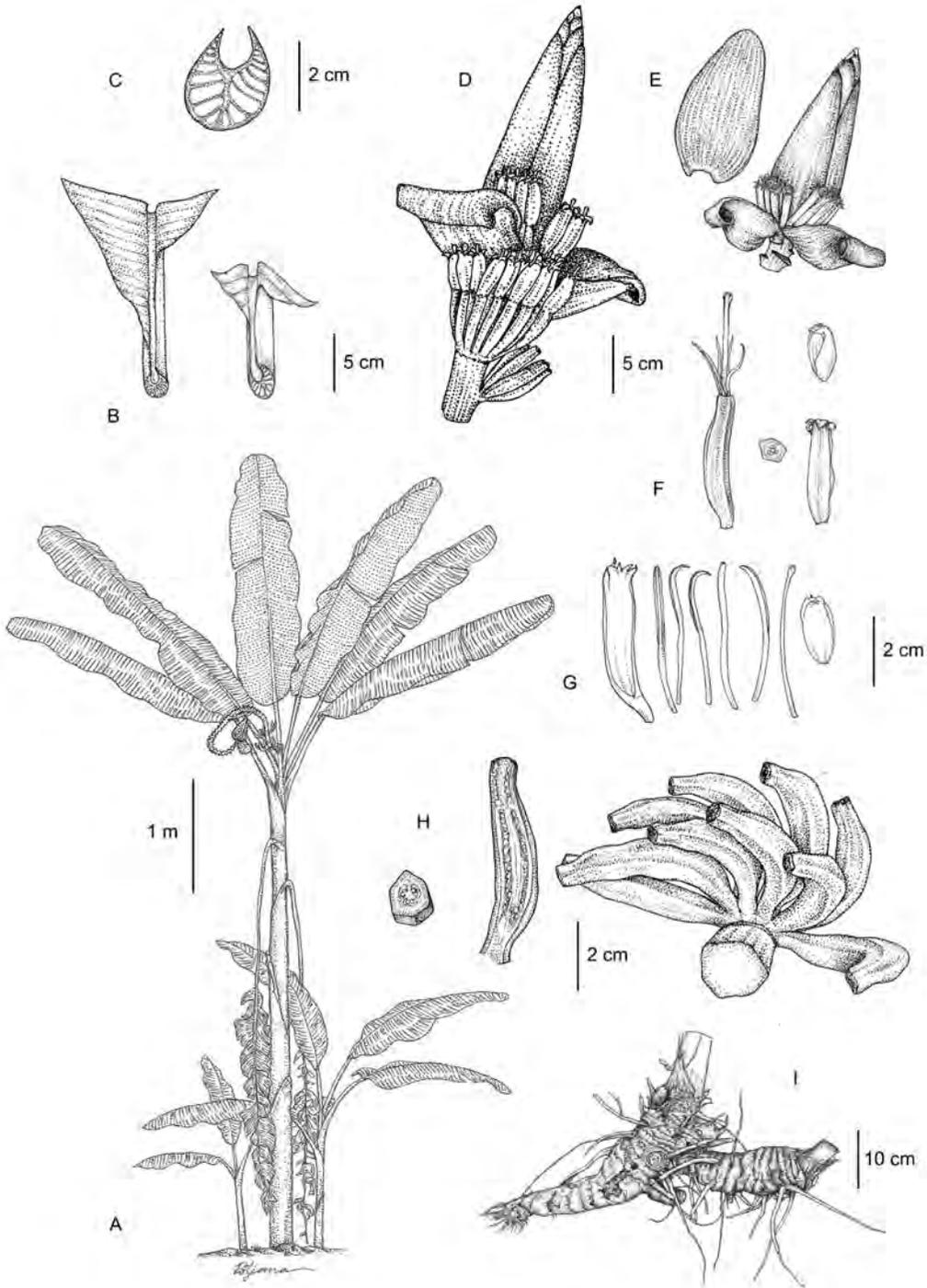


Figure 2. *Musa serpentina* Swangpol & Somana: A. clump; B. leaf bases from two accessions; C. cross-section of petiole canal; D. female inflorescence; E. male bract and male inflorescence; F. female flowers with cross section of ovary, free tepal (upper) and compound tepal (lower); G. male flower; H. fruits, i.e. cross section, long section, and hand (J) rhizome. Drawings by P. Keiatprapai. – A, B-left, F, G and J *SS&JS* 246; C and E *SS&JS* 278; B-right, D, F. *SS&JS* 353; H. *SS&JS* 355. Drawn by Potjana Kiattiprapai.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the Mahidol University banana collecting team including K. Atawongsa, S. Wongniam, N. Sukkaewmanee, T. Rotchanapreeda, P. Pothavorn, and K. Kitdamrongsont. Thanks are extended to Dr Kitichate Sridith for the Latin diagnosis and Dr Thaya Jenjittikul for suggestions on the manuscript. The project has partially been funded by Mahidol University and by the Thailand Research Fund (TRF) in collaborating with the Commission on Higher Education (CHE) of Thailand to SS (MRG52_80100) and JS (MRG53_80133).

REFERENCES

- Argent, G.C.G. (1976). The Wild Bananas of Papua New Guinea. Notes from the Royal Botanic Garden of Edinburgh 35 (1): 77–114.
- Cheesman, E.E. (1948). Classification of the Bananas III. Critical notes on Species: f. *Musa nagensium*, Allied species. Kew Bulletin 3: 326–7.
- De Langhe, E., Wattanachaiyingcharoen, D., Volkaert, H., and Piyapitchard, S. (2002). Biodiversity of wild Musaceae in Northern Thailand. In: A.B. Molina and V.N. Roa (eds), Advancing banana and plantain R & D in Asia and the Pacific. INIBAP, Montpellier, France. pp. 71–83.
- IPGRI-INIBAP/CIRAD. (1996). Descriptors for Banana (*Musa* spp.). International Plant Genetic Resources. Rome, Italy: Institute Press.
- IUCN (2001). IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.
- Simmonds N.W. (1956). Botanical results of the Banana Collecting Expedition. 1954–5. Kew Bulletin 3: 478–479.
- _____. (1962). The Evolution of the Bananas. London, Longmans.
- van Welzen, P.C., Madern, A., Raes, N., Parnell, J.A.N., Simpson, D.A., Byrne, C., Curtis, T., Macklin, J., Trias-Blasi, A., Prajaksood, A., Bygrave, P., Dransfield, S., Kirkup, D.W., Moat, J., Wilkin, P., Couch, C., Boyce, P.C., Chayamarit, K., Chantaranonthai, P., Esser, H-J., Jebb, M.H.P., Larsen, K., Larsen, S.S., Nielsen, I., Meade, C., Middleton, D.J., Pendry, C.A., Muasya, A.M., Pattharahirantricin, N., Pooma, R., Suddee, S., Staples, G.W., Sungkaew, S., and Teerawatananon, A. (2011). The Current and Future Status of Floristic Provinces in Thailand. In: Y. Trisurat, R.P. Shrestha & R. Alkemade (eds), Land Use, Climate Change and Biodiversity Modeling: Perspectives and Applications, pp. 219–247. Information Science Reference, Hershey, PA., U.S.A.