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Glycosmis suberosa (Rutaceae), a new species from Khao Luang National Park, Peninsular Thailand

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ABSTRACT

A new species, *Glycosmis suberosa* H.Toyama & Rueangr. is described from Khao Luang National Park, Nakhon Si Thammarat Province, Thailand. This species is distinguished from the other *Glycosmis* species by its characteristic corky branches.

KEYWORDS: *Glycosmis*, Khao Luang National Park, new species, Rutaceae, Thailand.

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INTRODUCTION

The genus *Glycosmis* Corrêa (Rutaceae) comprises about 50 species of unarmed small trees or shrubs mainly distributed in the tropical and subtropical regions of Indomalaya (Kubitzki *et al.* 2011). The genus is easily distinguished from its nearest relatives by a rust-coloured indumentum on young twigs, leaves and inflorescences (Jones, 1995; Zhang *et al.*, 2008, Kubitzki *et al.*, 2011), and exhibits a remarkable diversity in foliage (e.g., simple, unifoliolate and imparipinnate leaves) that has been used for constructing infrageneric classification (Hooker, 1875; Kurz, 1877; Guillaumin, 1946; Stone, 1972, 1985a, 1985b; Jones, 1995; Zhang *et al.*, 2008). In Thailand, 18 species and seven varieties were reported by Guillaumin (1946), Stone (1985a, 1985b), Jones (1995), Zhang *et al.* (2008) and Pooma & Suddee (2014), in which eight taxa (five species and three varieties) have predominantly simple or unifoliolate leaves: *Glycosmis cochinchinensis* Pierre ex Engl., *G. cyanocarpa* var. *cymosa* Kurz, *G. cyanocarpa* var. *simplicifolia* Kurz, *G. dinhensis* Pierre ex Guillaumin, *G. longipes* Tanaka, *G. parkinsonii* Tanaka, *G. parva* Craib, and *G. puberula* var. *subsessilis* (Craib) B.C.Stone.

During our botanical survey of Khao Luang National Park, Nakhon Si Thammarat Province, Thailand in 2015, we found an undescribed species of *Glycosmis* having unifoliolate leaves and characteristic corky branches. Here, we describe this plant as a new species, *Glycosmis suberosa* H.Toyama & Rueangr. The morphological comparisons were performed using relevant literature (Hooker, 1875; Kurz, 1877; Guillaumin, 1911, 1946; Stone, 1972, 1985a, 1985b; Grierson,1991; Jones, 1995; Hô, 2003; Newman *et al.*, 2007; Zhang *et al.*, 2008; Chong *et al.*, 2009, Pooma & Suddee, 2014), specimens in the herbaria BKF, BM, E, FU, HN, K, KYO, L, P, and digitized specimen images available on the website of JSTOR Global Plants (http://plants.jstor.org), and of the Muséum National d'Histoire Naturelle, Paris (https://science.mnhn.fr/institution/mnhn/collection/p/item/search).

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In addition to the morphological examination, DNA sequences are extremely helpful for delimiting species (Hebert & Gregory, 2005; Dick & Webb, 2012). Here, we sequenced two DNA barcode regions, the partial genes for the large subunit ribulose-1,5-bisphosphate carboxylase oxygenase (*rbcL*) and maturase K (*matK*) (CBOL Plant Working Group, 2009) according to published protocols (Kress *et al.*, 2009; Dunning & Savolainen, 2010).

DESCRIPTION

Glycosmis suberosa H.Toyama & Rueangr., **sp. nov.**

This new species is distinguished from the other species of *Glycosmis* by its characteristic corky branches. This species is most similar to *G. parva* Craib (distributed in Laos, NE, E, and SE Thailand) in having simple/unifoliolate subcoriaceous lanceolate leaves and short inflorescences, but differs in relatively larger leaves, 7–23.5 × 2.5–8.5 cm (vs. 3.5–11.4 × 1–2.9 cm), corky (vs. smooth) branches, dorsally puberulent (vs. glabrous) petals, and 4-locular (vs. 3-locular) ovaries. Typus: Thailand, Nakhon Si Thammarat, Khao Luang National Park, in evergreen forest near stream, 8°28’30”N, 99°45’13”E, alt. 838 m, 15 Feb. 2015 (fl. & immat. fr.), *Tagane et al. T4165* (holotypus **KYO!**, isotypus **BKF!**, **FU!**). Figs. 1 & 2.

Shrubs ca 3.5 m tall; young branches smooth, red-brown, densely covered with rust-coloured indumentum; old branches corky, with longitudinal cracks, cracked parts whitish brown to greyish brown, almost glabrous. *Leaves* alternate, unifoliolate, densely covered with rust-coloured indumentum when young, glabrous when old; petiole 3–17 mm long; petiolule 2–5 mm long; blade narrowly ovate or narrowly elliptic, 7–23.5 × 2.5–8.5 cm, length/width ratio 2.7–4.2, subcoriaceous, upper surfaces green, slightly lustrous, lower surface pale green, base acute, margin entire, recurved, apex acute to acuminate, occasionally rounded; midrib sunken or almost flat above, prominent below; secondary veins 8–12 pairs, arising at angle of ca 60° from midrib, brochidodromous, slightly prominent above, prominent below; tertiary veins faintly visible, slightly prominent on both surfaces. *Inflorescence* axillary, 5–7 mm long, 1–5 flowers conglomerate or forming a short raceme; peduncle often corky, sessile to 3 mm long, densely covered with rust-coloured indumentum; bracts ovate, ca 1.5 × 1 mm wide, densely covered with rust-coloured indumentum on both surfaces, caducous. *Flowers* bisexual, pentamerous; pedicels sessile to 1 mm long, densely covered with rust-coloured indumentum; sepals ovate-triangular, 1–1.5 × 1–1.8 mm, white, densely covered with rust-coloured indumentum on outer surfaces, glabrous on inner surfaces; petals ovate-elliptic, 3–4.2 × 1.5–2.2 mm, apex acute to obtuse, white, densely or sparsely covered with rust-coloured indumentum at upper part on outer surface, glabrous on inner surface; stamens 10 in two whorls of 5, incurved, shorter antepetalous, 2–2.8 mm long, longer antesepalous, 2.5–3.3 mm long; shorter filaments 1.2–2 mm long, longer filaments 1.7–2.5 mm long; anther dorsifixed, with a few oil glands on the dorsal surface, a prominent connective appendage at apex; gynophore ca 0.5 mm long, surface verrucose, glabrous; pistil ca 2 mm long, with oil glands on the surface; ovary ca 0.8 mm long, ca 0.5 mm in diam., 4-locular; style ca 0.8 mm long; stigma capitate, ca 0.3 mm long, ca 0.5 mm in diam. *Immature fruits* ovoid, ca 6 mm long, ca 4 mm in diam., green, glabrous, stigma persistent at apex. *Seeds* not seen.

Thailand.— PENINSULAR: Nakhon Si Thammarat [Khao Luang National Park, alt. 750 m, 27 Jan. 1966 (fl.), *Hansen & Smitinand 12119* (**BKF** 39936**!**); ibid., 8°28’54.7”N, 99°45’01.5”E, alt. 884 m, 14 Feb. 2015 (ster.), *Tagane et al. T4141* (**BKF!**, **FU!**); ibid., 8°28’30”N, 99°45’13”E, alt. 838 m, 15 Feb. 2015 (fl. & immat. fr.), *Tagane et al. T4165* (holotype **KYO!**, isotypes **BKF!**, **FU!**); ibid., 8°43’01.0”N, 99°40’43.1”E, alt. 261 m, 14 Dec. 2015 (ster.), *Toyama et al. T4793* (**BKF!**, **FU!**); ibid., 8°28’36.2”N, 99°45’08.9”E, alt. 812 m, 18 Dec. 2015 (ster.), *Tagane et al. T5219* (**BKF!**)]

Distribution. — Endemic (only known from Khao Luang National Park).

Ecology. — Scattered in hill evergreen forests near streams, at 261–884 m of altitude. Flowering specimen was collected in January, and flowering and immature fruiting specimen was collected in February.

IUCN Conservation Status. — Data Deficient (DD). *Glycosmis suberosa* was collected from the narrow range of elevation in hill evergreen forests of Khao Luang National Park. Thus, this species is

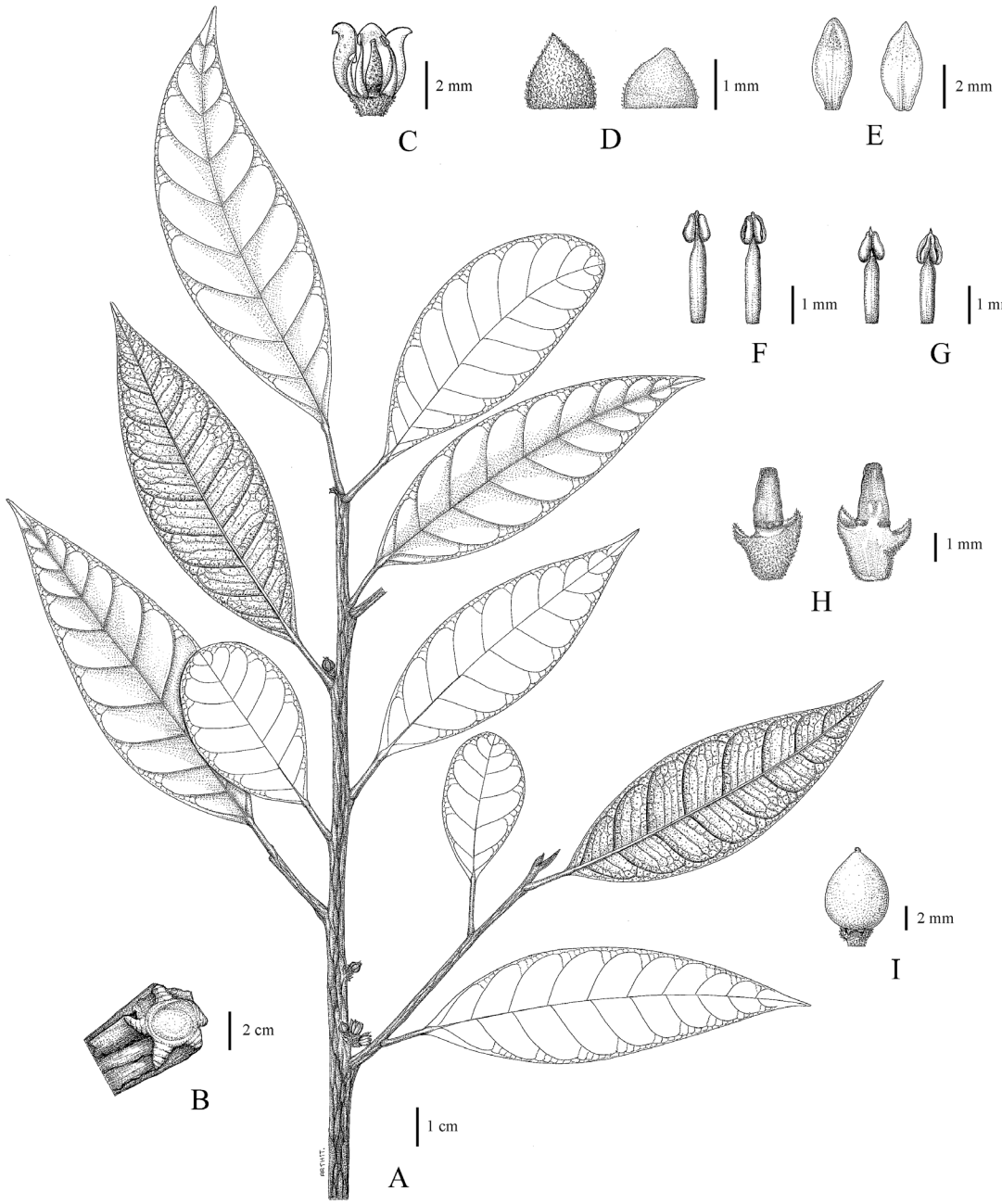

Figure 1. *Glycosmis suberosa* H.Toyama & Rueangr. A. flowering branchlet; B. transverse section of stem; C. flower, a part of perianth and stamens removed; D. sepals (outer and inner surfaces from left); E. petals (outer and inner surfaces from left); F. antesepalous stamen (outer and inner surfaces from left); G. antepetalous stamen (outer and inner surfaces from left); H. pistil (left) and its longitudinal section (right); I. young fruit (A from *Tagane et al. T4165* (BKF), D–H from *Tagane et al. T4165* (KYO); B, C & I from photographs taken on 15 Feb. 2015). Drawn by Arthit Kumkamnerd.

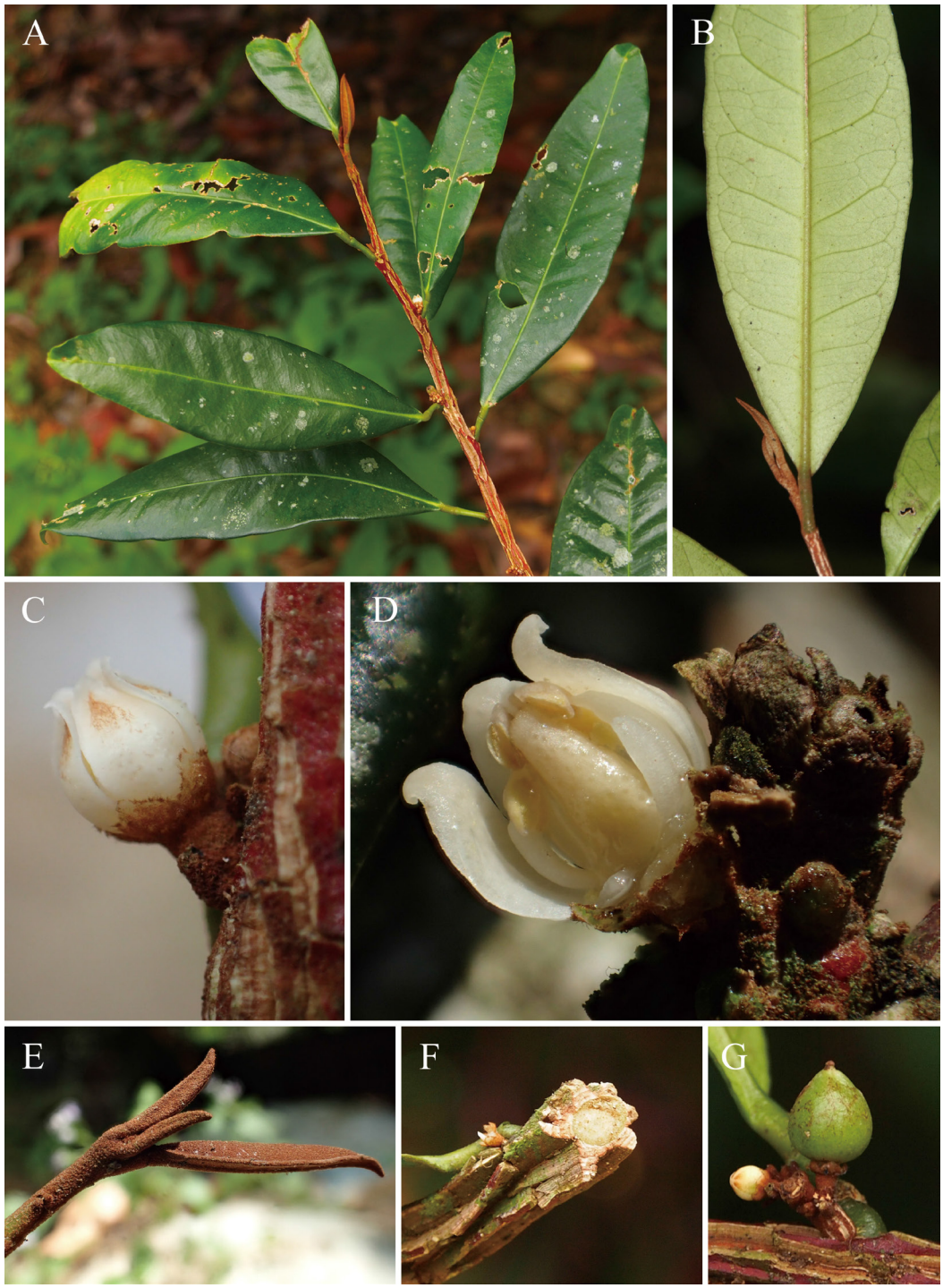

Figure 2. *Glycosmis suberosa* H.Toyama & Rueangr. A. flowering branchlet; B. abaxial leaf surface; C. flower; D. inside of flower, a part of perianth and stamens removed; E. young twig and leaves; F. transverse section of stem; G. young fruit and flower bud. Photographs were taken by the third author on 15 Feb. 2015 at Khao Luang National Park, Thailand.

assumed to be endangered. However, the forest is well-protected, while a larger part of the National Park is still unexplored. To clarify the number of individuals/populations and the distribution range, further studies are needed in Khao Luang and neighbouring areas.

Notes. — We compared specimens and relevant literature of all *Glycosmis* species except for the doubtful species listed in Stone (1985b). *Glycosmis suberosa* is easily distinguished from the other known species in having conspicuous corky branches. In Malay Peninsula, *G. crassifolia* Ridl. and *G. chlorosperma* var. *lindleyana* (Swingle) B.C.Stone are recorded as species having predominantly simple or unifoliolate leaves (Stone 1972, 1985b). *Glycosmis suberosa* is distinguished from the former species by corky (vs. smooth) branches, subcoriaceous (vs. thick coriaceous) leaves and 4-locular (vs. 2–3-locular) ovaries, and from the latter by corky (vs. smooth) branches, relatively narrower leaves (length/width ratio 2.7–4.2 vs. 2.8–3.2) and axillary shorter inflorescences (vs. terminal, 51–84 mm long ones).

DNA sequences of the barcoding regions of *G. suberosa* are identical with *G. parviflora* (Sims) Little (accession no. KP094702, identities: 562/562), *G. chlorosperma* Spreng. (KJ594728, 553/553) and *G. macrophylla* Miq. (AB925327, 531/531) in *rbcL*, and *G. macrophylla* (AB924716, 764/764), *G. pentaphylla* (Retz.) DC. (AB762391, 764/764), *G. parviflora* (KP093765, 728/728) in *matK*.

Genbank accession number. — *Tagane et al. T4165*: LC128588 (*rbcL*), LC128589 (*matK*).

KEY TO THE SPECIES OF *GLYCOSMIS* HAVING PREDOMINANTLY SIMPLE OR UNIFOLIOLATE LEAVES IN THAILAND (character states mostly based on Stone, 1985b).

1. Branches corky — **G. suberosa**
1. Branches not corky
  2. Flowers (except for the ovary) 4-merous (with 8 stamens)
    3. Petals dorsally puberulent — **G. parkinsonii**
    3. Petals entirely glabrous — **G. cyanocarpa**
  2. Flowers (except for the ovary) 5-merous (with 10 stamens)
    4. Ovaries finely densely puberulent — **G. puberula**
    4. Ovaries glabrous
      5. Ovaries with 3 locules — **G. parva**
      5. Ovaries with usually 5 locules
        6. Gynophores small, poorly developed — **G. longipes**
        6. Gynophores well-developed
          7. Gynoecium papillate or tuberculate — **G. cochinchinensis**
          7. Gynoeciums smooth — **G. dinhensis**

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