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Thismia submucronata (Thismiaceae), a new species from Mainland Southeast Asia

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ABSTRACT: *Thismia submucronata* is described and illustrated as a new species from Thailand. The new species is characterized by 1) vermiform roots, 2) inner perianth lobes forming a convex mitre with a mucro together with three foveae at apex, 3) the inner surface of perianth tube possessing an irregularly reticulate surface without transverse bars, 4) the presence of papillate hairs at the annulus surface and the outer surface of stamen filaments, and 5) the stamens positioned almost at apex of annulus. Morphological description, illustrations of the new species and a comparison with the related species are presented.

KEY WORDS: Mycoheterotrophy, New species, Thailand, *Thismia submucronata*, Thismiaceae.

INTRODUCTION

With almost 80 currently accepted species, *Thismia* Griff. represents one of the richest mycoheterotrophic plant genera (e.g., Govaerts *et al.*, 2017; Chantanaorrapint and Suddee, 2018; Hroneš *et al.*, 2018; Nishioka *et al.*, 2018; Sochor *et al.*, 2018). The genus has been variously treated as a part of the family Burmanniaceae (e.g. Jonker, 1938; Maas *et al.*, 1986; Govaerts *et al.*, 2007; APG, 2016), Dioscoreaceae (Chantanaorrapint and Suddee, 2018; Soltis *et al.*, 2018) or Thismiaceae (e.g. Merckx *et al.*, 2006, 2009; Merckx and Smets, 2014).

Thailand is located in Mainland Southeast Asia whose *Thismia* diversity has been intensively studied. To date, 11 species of *Thismia* have been reported from this country (Larsen, 1965, 1987; Chantanaorrapint and Sridith, 2007; Chantanorrapint, 2008, 2012, 2018; Chantanaorrapint and Chantanaorrapint 2009; Chantanaorrapint *et al.*, 2015, 2016, Suetsugu *et al.* 2017, Chantanaorrapint and Suddee 2018). However, more new species records are expected from its unexplored areas. In May 2011, the second author collected a single flower of an unknown *Thismia* from vicinity of Romglao-Paradon waterfall, Phu Hin Rong Kla National Park, Phitsanulok province in northern Thailand. Later, three more collections of this unknown *Thismia* species were collected by the staff of BKF herbarium and the authors during their visits to Phu Hin Rong Kla and Phu Suan Sai National Parks. After careful examination, these four collections were shown to possess a unique combination of characters that does not match to that of any described species. Consequently, a new species, *Thismia submucronata*, is here described and illustrated.

TAXONOMIC TREATMENT

Thismia submucronata Chantanaorr., Tetsana & Tripetch, ***sp. nov.*** **Figs. 1 & 2**

***Type*:** Thailand. Phitsanulok Province: Phu Hin Rong Kla National Park, Romglao-Paradon waterfall, 30 May 2018, *Chantanaorrapint & Suwanmala 2732* (holotype: BKF; isotype: PSU, TAI).

***Diagnosis*:** *Thismia submucronata* is similar to *T. mucronata*, but differs in having three foveae together with a mucro at the apex of the mitre and outer surface of stamen filaments and both surfaces of annulus covered by papillate hairs.

Description: Terrestrial, achlorophyllous herbs. *Roots* horizontal, vermiform, branched, up to 2 mm in diameter, whitish when young, pale brown when mature, often producing young bud. *Stem* erect or sometimes ascending when growing from under forest litter, unbranched, 2.5–3.2 mm in diameter, whitish, to 14 cm tall, glabrous, terete and slightly angled. *Leaves* glabrous, whitish, scale-like, narrowly triangular to lanceolate, leaves increase in size towards plant apex, 2–6.5 mm long, 1.5–3.5 mm wide at base, apex acute to acuminate. *Floral bracts* 3, white, similar to upper leaves but slightly larger, 6.5−8.5 mm long. *Flowers* solitary or in clusters of 2, opening in succession in latter case, the lateral flower located in the axil of one of involucral bract of the terminal flower and also bearing its own involucral bracts; each flower 1.7–2.1 cm long (including ovary), 0.8–1 cm wide at widest part, whitish in upper half, dark brown to blackish below. *Perianth* actinomorphic with 6 tepals fused to form a perianth tube with a mucronate mitre. *Perianth tube* dark brown or blackish at base, whitish above, urceolate, 8.5–13 mm

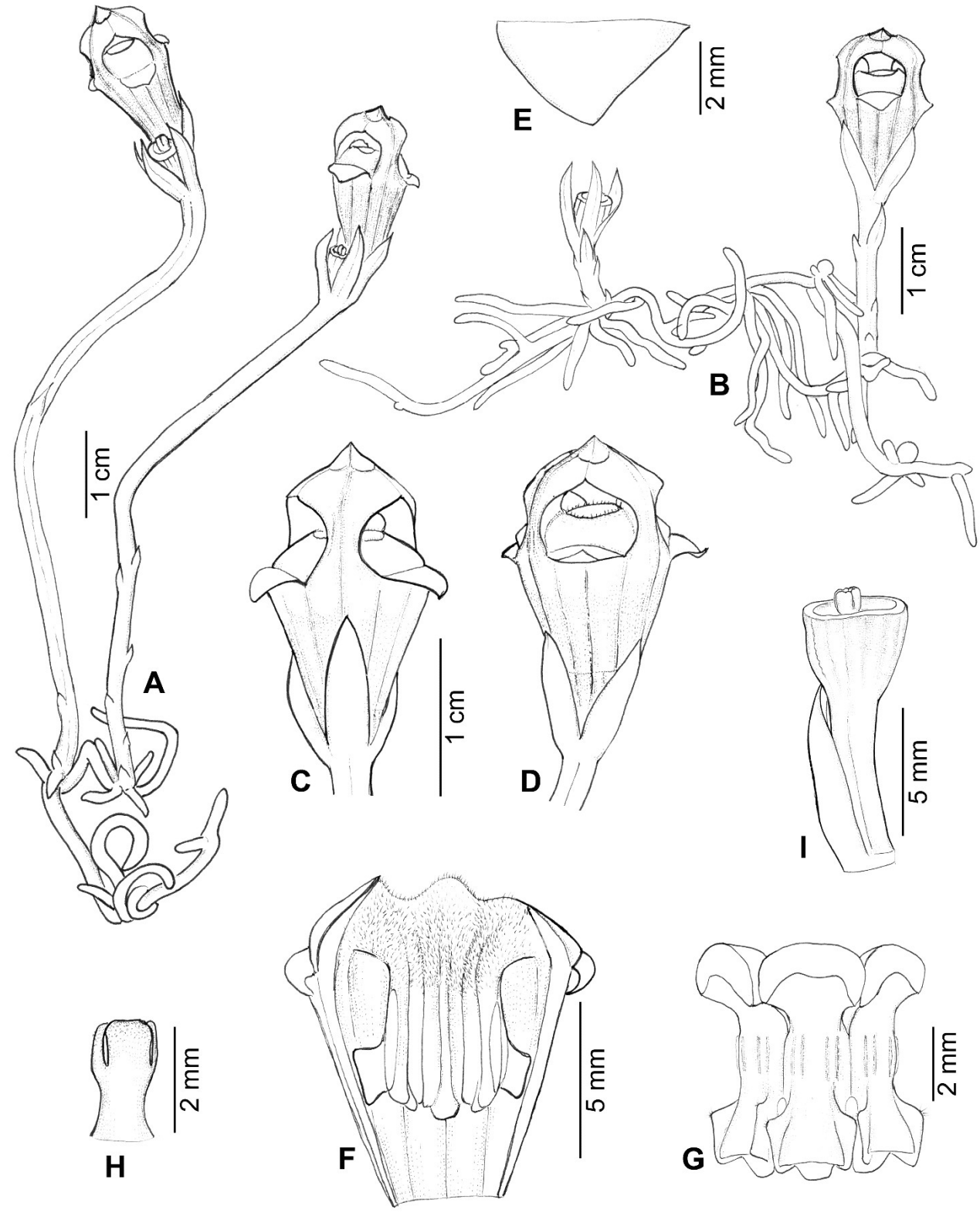

Fig. 1. ***Thismia submucronata***: **A** & **B.**: Plants with flowers. **C** & **D**: Side view of flowers. **E**: Outer tepal. **F**: Longitudinal section of perianth tube with stamens. **G**: Inner view of three pendulous stamens. **H**. Stigma and style. **I**. Young fruit. **A** & **C**–**I** from the holotype *Chantanaorrapint & Suwanmala 2732*, **B** from *Tetsana et al. 311* (BKF). All drawn by S. Chantanaorrapint.

Fig. 2. ***Thismia submucronata*** (A–H): **A**: Plants with underground parts. **B**: Plants in natural habitat. **C**−**D**: Top view of mitre. **E**: Side view of flowers. **F**−**G**: Longitudinal section of flowers. **H**: Young fruit, showing ovary and stigma. ***T. angustimitra*** (I−J): **I**: Flowers. **J**: Longitudinal section of flower. ***T. mirabilis*** (K–L): **K**: Top view of mitre. **L**: Longitudinal section of flower. ***T. nigricans*** (M): **M**. longitudinal section of flower. Photos **A**–**E** & **H**–**M** by S. Chantanaorrapint; **F**–**G** by P. Tripetch.

Table 1. Morphological differences between ***Thismia submucronata*** and related species. The characters of previously described species are taken from the protologues (Larsen 1965; Chantanaorrapint 2008; Chantanaorrapint and Sridith 2015; Nuraliev *et al.* 2014, 2015) and also from fresh material of *T. angustimitra* (*Chantanaorrapint & Suwanmala 3321*, PSU), *T. mirabilis* (*Chantanaorrapint & Promma 3927*, PSU), and *T. nigricans* (*Chantanaorrapint & Promma 3897*, PSU).

Characters	*T. submucronata*	*T. angustimitra*	*T. mirabilis*	*T. mucronata*	*T. nigricans*	*T. puberula*
Flower length (including ovary)	1.6−2.1 cm	1–1.2 cm	1.6−2.2 cm	1.2–1.7 cm	1.7–2 cm	ca. 1.9 cm
Mitre						
- color	white	brownish, dark blue or blackish	white	white	brownish, dark blue or blackish	white
- foveae	present	present	present	absent	present	present
- apex	mucronate	nearly flat	nearly flat	mucronate	nearly flat	nearly flat
Annulus						
- shape	dome-shaped	dome-shaped	vertical (erect) with broad aperture	dome-shaped	dome-shaped	dome-shaped
- color	white	white at base, bluish to purple at apex	yellowish-brown	white	creamy-white at base, blackish at apex	white at base, roof reddish-orange
- outer surface	pubescent	glabrous	glabrous	glabrous	glabrous	pubescent
- inner surface	pubescent	reticulate	glabrous	glabrous	glabrous	glabrous
Position of stamens on the inner surface of annulus	almost at apex of annulus	below apex of annulus	below apex of annulus	apex of annulus	below apex of annulus	below apex of annulus

long, constricted just above the ovary, widest at its upper third; outer surface with 12 irregularly dentate longitudinal ribs; inner surface irregularly reticulate, without transverse bars. *Outer perianth lobes* 3, spreading or reflexed, white, broadly triangular, 3–4 mm long, 4–5.5 mm wide at base, apex acute or mucronate, margin nearly entire. *Inner perianth lobes* 3, whitish above, light to dark brown below, connate to form a mucronate mitre with 3 lateral apertures and 3 foveae on top; lateral aperture arch-shaped, 5–7 mm wide; each fovea cordate to rounded, ca. 1.5 mm wide. *Annulus* incurved, dome-shaped, white, outer and inner surfaces pubescent; apex with rounded-triangular aperture, aperture 3.5–5 mm in diam. *Stamens* 6, pendent, attached near apical margin of annulus; filaments yellowish brown, free, ca. 2 mm long, outer surface covered by papillate trichomes; connectives laterally connate to form a tube, white in lower half and yellowish orange in upper half; each stamen with 2 thecae (adaxial, dehiscing towards inner surface of perianth tube), each theca ca. 1 mm long; interstaminal glands present, elliptic-oblong, ca. 0.6 mm long, placed adaxially between bases of lateral appendages; lateral appendage present, yellowish orange, exceeding the connective apex, skirt-like; apex obtuse, truncate to shallowly bilobed with 2−4 glandular hairs. *Ovary* inferior, obconical, ca. 3 mm long, with papillose longitudinal ridges, unilocular, placentas 3; style 0.7−0.9 mm long; stigma 3-lobed, ca. 1 mm long, light blue-green, surface papillose, apex of stigma lobe obtuse to truncate. *Fruit* cup-shaped, ca. 5 mm long, fruiting pedicel thickened and lengthened after flowering.

***Additional specimens examined*: THAILAND**. Phitsanulok province: Phu Hin Rong Kla National Park, around Romglao-Paradon waterfall, 26 May 2011, *Tetsana et al. 311* (BKF); same location, 8 Jul 2017, *Tripetch 170701* (PSU). Loei province: Na Haeo, Phu Suan Sai National Park, 14 Jun 2018, *Tetsana et al. 1390* (BKF).

***Etymology*:** The specific epithet "*submucronata*" refers to the presence of a short mucro at the top of the mitre.

***Habitat, ecology and distribution*:** *Thismia submucronata* is known only from two localities: Phu Hin Rong Kla and Phu Suan Sai National Parks; however, it may also occur in other areas of Northern and North-eastern Thailand with similar climatic conditions and vegetation type. The new species grows amongst leaf litter, under shade of moist evergreen forest, near waterfall or streamside, at elevation of 1200−1300 m. Flowering and fruiting was observed from May to July.

***IUCN Red List category*:** IUCN (2012) category Least concern (LC). Although only two locations were found in Thailand, they are within the well-protected areas. Therefore, this species is not under immediate threat.

***Taxonomic remarks*:** *Thismia submucronata* is most similar to *T. mucronata* Nuraliev endemic to southern Vietnam (Nuraliev *et al.*, 2014). These two species share several common features, *viz*. vermiform underground parts, flower coloration being dark blue or dark brown below and whitish above, inner perianth lobes forming a convex mitre with a mucro at apex, the inner surface of perianth tube possessing an irregularly reticulate without transverse bars, annulus almost horizontal, stamens positioned at apex of annulus, and stigma translucent light blue and densely finely papillose. *Thismia submucronata* is distinguished from *T. mucronata* by presence of papillate hairs at the annulus surface and the outer surface of stamen filaments, and top of the mitre bearing three foveae together with a short mucro.

In addition, the new species is similar to *T. angustimitra* Chantanaorr., *T. mirabilis* K. Larsen, *T. nigricans* Chantanaorr. & Sridith from Thailand, and *T. puberula* Nuraliev from Vietnam, which are also

characterized by vermiform roots, foveate mitre, and presence of interstaminal grands (Larsen 1965; Chantanaorrapint 2008; Chantanaorrapint and Sridith 2015; Nuraliev *et al.* 2015). The comparison of morphological characters of these five species with foveate mitre are summarised in Table 1.

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LITERATURE CITED

Angiosperm Phylogeny Group 2016. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. Bot. J. Linn. Soc. **181(1)**: 1-20.

Chantanaorrapint, S. 2008. *Thismia angustimitra*, a new species from Thailand. Blumea **53(3)**: 524-526.

Chantanaorrapint, S. 2012. *Thismia filiformis*, a new species of Thismiaceae (formerly Burmanniaceae) from Thailand. Kew Bull. **67(1)**: 69-73.

Chantanaorrapint, S. 2018. Lectotypification of *Thismia arachnites* (Thismiaceae), a mysterious species newly reported for Thailand. Kew Bull. **73(3)**: 43.

Chantanaorrapint, S. and A. Chantanaorrapint 2009. *Thismia clavigera* (Thismiaceae), a new record for Thailand. Thai For. Bull. (Bot.) **37**: 27-31.

Chantanaorrapint, S. and K. Sridith 2007. *Thismia alba* (Thismiaceae), a new record for Thailand. Thai For. Bull. (Bot.) **35**: 34-37.

Chantanaorrapint, S. and K. Sridith 2015. *Thismia nigricans* Chantanaorr. & Sridith, a new species of Thismiaceae from southern Thailand. Phytotaxa **217(3)**: 293-297.

Chantanaorrapint, S. and S. Suddee 2018. *Thismia thaithongiana* (Dioscoreaceae: Thismieae), a new species of mycoheterotroph from an unusual habitat. Phytotaxa **333(2)**: 287-292.

Chantanaorrapint, S., J.S. Wai, M. Poopath and N. Tetsana 2016. *Thismia claviformis* (Thismiaceae), a new species from the Thai-Malay Peninsula. Phytotaxa **280(3)**: 292-296.

Govaerts, R., P. Wilkin and R.M.K. Saunders 2007. World Checklist of Dioscoreales. Yams and their allies. Kew Publishing, Royal Botanic Gardens, Kew.

Govaerts, R., R.M.K. Saunders, H. Maas-van de Kamer, P. J.M. Maas and D.X. Zhang 2017. World Checklist of Burmanniaceae. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; http://apps.kew.org/wcsp/ Retrieved 2017-08-10.

Hroneš, M., M. Rejžek, M. Sochor, M. Svátek, J. Kvasnica, Z. Egertová, J.T. Pereira, R. Nilus and M. Dančák 2018. Two new species of *Thismia* subsect. *Odoardoa* (Thismiaceae) from Borneo. Pl. Ecol. Evol. **151(1)**: 110-118.

IUCN 2012. IUCN Red List categories and criteria: version 3.1, second edition. IUCN, Gland Switzerland and Cambridge, UK.

Jonker, F.P. 1938. A monograph of the Burmanniaceae. Mededeelingen van het Botanisch Meded Bot Mus Herb Rijks Univ Utrecht **51**: 1-279.

Larsen, K. 1965. Studies in the Flora of Thailand 27. Thismiaceae. Dansk Bot. Ark. **23**: 169-174.

Larsen, K. 1987. Thismiaceae. In: Smitinand, T. and Larsen, K. (Eds.) Flora of Thailand 5(1). Chutima Press, Bangkok, pp. 124-126.

Maas, P.J.M., H. Maas-van de Kamer, J. van Benthem, H. C. M. Snelders and T. Rübsamen 1986. Burmanniaceae. Flora Neotrop. **42**: 1-189.

Merckx, V.S.F.T. and E.F. Smets 2014. *Thismia americana*, the 101st anniversary of a botanical mystery. Int. J. Pl. Sci. **175(2)**: 165-175.

Merckx, V., F.T. Bakker, S. Huysmans and E. Smets 2009. Bias and conflict in phylogenetic inference of myco-heterotrophic plants: a case study in Thismiaceae. Cladistics **25(1)**: 64-77.

Merckx, V., P. Schols, H. Maas-van de Kamer, P. Maas, S. Huysmans and E. Smets 2006. Phylogeny and evolution of Burmanniaceae (Dioscoreales) based on nuclear and mitochondrial data. Am. J. Bot. **93(11)**: 1684-1698.

Nishioka, T., K. Suetsugu, R. Repin and K. Kitayama 2018. *Thismia kinabaluensis* (Thismiaceae), a new species from Mt. Kinabalu, Sabah, Borneo. Phytotaxa **360(2)**: 174-178.

Nuraliev, M.S., A.S. Beer, A.N. Kuznetsov and S.P. Kuzentsova 2014. *Thismia mucronata* (Thismiaceae), a new species from southern Vietnam. Phytotaxa **167(3)**: 245-255.

Nuraliev, M.S., A.S. Beer, A.N. Kuznetsov and S.P. Kuzentsova 2015. *Thismia puberula* (Thismiaceae), a new species from southern Vietnam. Phytotaxa **234(2)**: 133-142.

Suetsugu, K., H. Tsukaya, S. Tagane, S. Suddee, S. Rueangruea and T. Yahara 2017 *Thismia brunneomitroides* (Thismiaceae), a new mycoheterotrophic species from southern Thailand. Phytotaxa **314(1)**: 103-109.

Sochor, M., M. Hroneš and M. Dančák 2018. New insights into variation, evolution and taxonomy of fairy lanterns (*Thismia*, Thismiaceae) with four new species from Borneo. Pl. Sys. Evol. **304(5)**: 699-721.

Soltis, D.E., P.S. Soltis, P.K. Endress, M.W. Chase, S. R. Manchester, W. S. Judd, L. C. Majure and E. V. Mavrodiev 2018. Phylogeny and evolution of the angiosperms. Revised and updated edition. Chicago University Press, Chicago. 580 pp.