

The genus *Soella* (Lejeuneaceae, Marchantiophyta) new to Thailand

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ABSTRACT

Soella obtusifolia, a rare species previously known only from China and Japan, is reported here as a new genus and species record for Thailand. A description and photographs of Thai plants are provided.

KEYWORDS: *Drepanolejeunea obtusifolia*, liverwort, Peninsular Thailand, rare species.

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INTRODUCTION

Lejeuneaceae (Marchantiophyta) is the world's largest liverwort family with more than 1,800 species in about 75 genera (Zhu *et al.*, 2019). It is also the largest liverwort family in Thailand with more than 150 species in 25 genera. For taxon names see the most recent checklist of Thai liverworts and hornworts by Lai *et al.* (2008) and the many recent additions by Wang *et al.* (2014), Inuthai *et al.* (2014, 2015, 2019), Lee *et al.* (2014), Pócs & Podani (2015), Promma *et al.* (2017), Pócs & Chantanaorrapint (2016), Chantanaorrapint *et al.* (2018) and Sangrattanaprasert *et al.* (2017, 2018, 2019). Note, that the three additional genera reported since 2014 [i.e. *Frullanoides* Raddi (Wang *et al.*, 2014), *Tuyamaella* S.Hatt. (Promma *et al.*, 2017), and *Mohamedia* R.L.Zhu & L.Shu (Inuthai *et al.*, 2019)], have not increased the total number of genera in Thailand because three of the 25 already recognized by Lai *et al.* (2008) [i.e. *Leucolejeunea* A.Evans, *Mastigolejeunea* (Spruce) Steph. and *Trocholejeunea* Schiffn.] have been reduced to synonyms.

The monospecific genus *Soella* was established by Zhu *et al.* (2018) based on *S. obtusifolia* (T.Yamag.) R.L.Zhu *et al.* from China and Japan. The genus (and sole species) is characterized by the following combination of characters: 1) stems in transverse section with seven cortical cells and three medullary cells; 2) leaf lobes comprised of large thin-walled

cells; 3) ocellate cells (ocelli) much larger than non-ocellate cells; 4) basal ocelli usually arranged in a transverse unbroken row; 5) presence of oil bodies in non-ocellate leaf cells; 6) oil bodies of non-ocellate leaf cells usually almost homogeneous; 7) gynoeceial innovations (when present) of the pycnolejeuneoid-type; and 8) presence of elongate gemmae on leaf margins. *Soella obtusifolia* appears to be a very rare species which, until now, has only been reported from Ishigaki Island, Ryukyu, Japan (Yamaguchi, 1984 as *Drepanolejeunea obtusifolia* T.Yamag.), Okinawa Island, Japan (Furuki & Fujita, 2006 as *D. obtusifolia*), and Guangxi, China (Zhu *et al.*, 2018).

During our bryological exploration of southern Thailand, an interesting liverwort was discovered on tree trunks in lowland dry evergreen forest in Krabi Province. Based on relevant literature and comparison of herbarium specimens, it was identified as *Soella obtusifolia*. This is the first record of this species from Thailand and the third report worldwide. The following description and photographs are based on the recent specimens from Thailand.

TAXONOMIC TREATMENT

Soella obtusifolia (T.Yamag.) R.L.Zhu *et al.*, *Bryologist* 121(3): 334. 2018.—*Drepanolejeunea obtusifolia* T.Yamag., *J. Jap. Bot.* 59(11): 332. 1984.

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Type: JAPAN. Okinawa Prefecture: Yaeyama Islands, Ishigaki Island, Mt. Omoto, 24°25'N, 124°11'E, 470 m, on tree trunk in evergreen forest, 11 July 1982, *Yamaguchi T.Y.-2666* (holotype: **HIRO**; isotype: **NICH!**). Fig. 1

Plants epiphytic, yellowish green, minute, 2–5 mm long, 0.35–0.4 mm wide, irregularly branched,

branches of the *Lejeunea*-type. Stems 47.5–55 μm in diam., in transverse section composed of 7 cortical cells surrounding 3 medullary cells; cortical cells subquadrate to oblong, 10–17 \times 9–12 μm , slightly thick-walled; medullary cells \pm isodiametric, somewhat smaller than cortical cells, 6–10 \times 5–7 μm , slightly thick-walled; ventral merophyte on stems 2

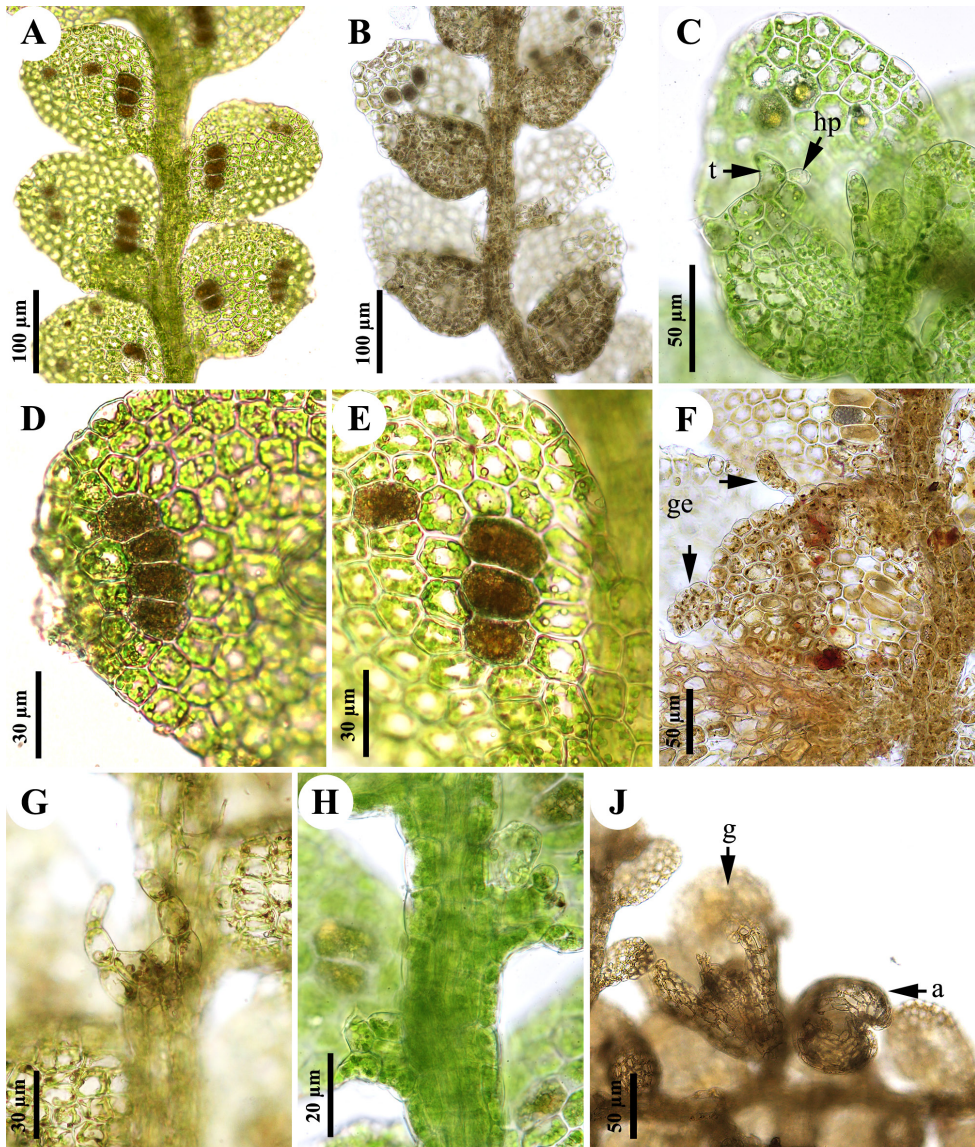


Figure 1. *Soella obtusifolia* (T.Yamag.) R.L.Zhu *et al.*: A. Dorsal view of shoot portion showing basal ocelli in transverse unbroken rows and non-basal ocelli more variously arranged; B. Ventral view of shoot portion; C. Leaf lobule with a unicellular tooth (t) at the apex and a single, unicellular, hyaline papilla (hp) at the proximal base of the tooth; D. Leaf lobe apex showing four non-basal ocelli in a transverse unbroken row (non-basal ocelli usually more scattered as shown in Fig. 1A); E. Leaf lobe base showing three basal ocelli in a transverse row and one non-basal ocelli; F. Elongate gemmae (ge) on leaf lobe margin; G. Underleaf; H. Ventral view of stem showing reduced lobules; J. Androecium (a) and gynoecium (g). A, C–J from *Senayai 348* (PSU), B from *Senayai 347* (PSU). Photos by A. Senayai.

cells wide. *Rhizoids* few, fasciculate at the base of underleaves, hyaline, rhizoid disc absent. *Leaves* imbricate to slightly distant, obliquely spreading, at an angle of 50–80° to the stem; leaf lobes ovate to triangular-ovate, more or less falcate, 0.19–0.25 mm long, 0.14–0.18 mm wide, margin entire to irregularly crenulated, apex obtuse to rounded, flat, ventral margin entire to weakly sinuate, dorsal margin arched near base; leaf lobules ovoid-rectangular to subquadrate, strongly inflated, $\frac{2}{3}$ – $\frac{1}{2}$ as long as the lobes, sometimes strongly reduced, 57.5–80 µm wide, 97.5–117.5 µm long; lateral free margin slightly incurved from base almost to the apex, apex usually slightly constricted, with a curved, unicellular, apical tooth; keel arched, almost smooth; a single, unicellular, hyaline papilla situated at the proximal base of apical tooth; papilla oblong, 10–12.5 × 4–5 µm. *Cells of leaf lobe* with thin walls and minute trigones, without intermediate thickenings, surfaces smooth; marginal cells quadrate to rectangular, 15–20 × 10–19 µm; median and basal cells ± hexagonal, 20–25 × 15–18 µm. *Oil bodies* 2–4 (–7) per median cell, grayish yellow, usually almost homogenous, ovate to oblong, 3.7–6 × 2.5–6 µm. *Ocelli* oblong, much larger than non-ocellate cells, 3–6 (–10) per leaf lobe, consisting of 1–5 basal ocelli and 1–6 non-basal ocelli; basal ocelli the largest, 30–47.5 × 18–22 µm, usually 2–4 (–5) in a transverse unbroken row, separated from the stem cells by 1 or 2 basal ordinary leaf cells; non-basal ocelli 23–40 × 14–18 µm, variously arranged, generally scattered, sometimes 2–4 in a transverse unbroken row. *Underleaves* remote, longer than wide, as wide as or slightly wider than stem, 45–70 × 40–45 µm, bilobed to $\frac{1}{2}$ – $\frac{2}{3}$ their length, sinus U-shaped, lobes narrowly triangular, erect, acute at apex, 2–4 cells long, (1)–2–4 cells wide at base.

Autoicous. *Androecia* terminal, capitate, usually on the (occasionally produced) gynoecial innovations, bracts in 1–3 pairs, closely imbricate, hypostatic, strongly concave and inflated, shortly and subequally bifid, apex rounded, margin entire; lobule slightly shorter; bracteoles 1–2, borne only at the basal portion of the androecium, similar to ordinary underleaves. *Gynoecia* terminal on lateral branches, occasionally with 1 pycnolejeuneoid innovation; lobes of female bracts obovate to spatulate, 0.22–0.35 mm long, 0.15–0.2 mm wide, rounded at apex, margin entire, with 1–10 ocelli; bract lobule $\frac{1}{2}$ – $\frac{2}{3}$ as long as the bract lobe, apex obtuse, keel slightly sinuate to

straight; bracteole connate with bracts on both sides at base, oblong, apex bilobed to ca $\frac{2}{5}$ its length, sinus U-shaped, margin entire. *Perianth and sporophyte* not seen. *Asexual reproduction* by gemmae produced on leaf margins; gemmae elongate, of various lengths.

Distribution.— China & Japan.

Thailand.— PENINSULAR: Krabi [Hat Noppharat Thara-Mu Ko Phi Phi National Park, Khao Ngon Nak Mt, 8°05'19.9"N 98°46'21.3"E, ca 500 m, 11 June 2019, *Senayai* 347 (BKF, PSU); *ibid.*, 27 Oct. 2019, *Senayai* 348 (BKF, PSU)].

Ecology.— In Thailand, *Soella obtusifolia* grows in association with other bryophytes such as *Acanthorrhynchium papillatum* (Harv.) M.Fleisch. and *Leucophanes glaucum* (Schwägr.) Mitt. on tree trunks in lowland dry evergreen forest at an altitude of about 500 m.

Notes.— *Soella obtusifolia* was originally described as *Drepanolejeunea obtusifolia* by Yamaguchi (1984). However, a recent phylogenetic analysis of Lejeuneaceae based on molecular data (Zhu *et al.*, 2018) placed *D. obtusifolia* as sister to the other members of Lejeuneaceae subtribe Lepidolejeuneinae rather than in the *Drepanolejeunea* lineage (i.e. Lejeuneaceae subtribe Drepanolejeuneinae). As a consequence, Zhu *et al.* (2018) proposed a new genus, *Soella*, and transferred *Drepanolejeunea obtusifolia* to it. Although there are many genera of Lejeuneaceae in Thailand with ocelli, *Soella* can be separated from the most closely related genera (i.e. those of subtribe Lepidolejeuneinae: *Lepidolejeunea* R.M.Schust., *Matalejeunea* Grolle, and *Mohamedia* R.L.Zhu & L.Shu) by the following combination of characters: 1) presence of 2–4 (–5) enlarged basal ocelli arranged in a transverse unbroken row in the leaf lobes; 2) presence of oil bodies in non-ocellate leaf cells; 3) oil bodies of non-ocellate leaf cells usually almost homogeneous; and 4) presence of elongate gemmae on leaf margins.

The discovery of *Soella obtusifolia* in Krabi Province is not just a new record for Thailand but also greatly extends the known range of the species, both westwards and southwards. It is presently known only from one locality in Thailand, but being so small and easily overlooked it is likely to occur elsewhere. In light of several other new species and new records of bryophytes from southern Thailand (e.g. Inuthai *et al.*, 2014, 2015; Lee *et al.*, 2014; Pócs & Podani, 2015; Pócs & Chantanaorrapint, 2016; Chantanaorrapint

et al., 2018; Sangrattanaprasert *et al.*, 2019), it is clear that this is an important region for bryophytes and further discoveries can be expected.

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