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Neotypification of *Lecanorchis purpurea* (Orchidaceae, Vanilloideae) with the discussion on the taxonomic identities of *L. trachycaula*, *L. malaccensis*, and *L. betung-kerihunensis*

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Abstract

This paper presents a re-evaluation of the taxonomic identities of *Lecanorchis trachycaula* and *L. betung-kerihunensis*. Consequently, *L. trachycaula* is reduced to a synonym of *L. purpurea* while *L. betung-kerihunensis* is treated as a synonym of *L. malaccensis*. Because no original material of *L. purpurea* is existent, we designate its neotype to stabilize its taxonomic status.

Key words: Japan, Borneo, Singapore, Malay Peninsula, mycoheterotrophy, taxonomy

Introduction

Lecanorchis Blume (1856: 188) comprises about 30 species of mycoheterotrophic orchids (Seidenfaden 1978, Hashimoto 1990, Szlachetko & Mytnik 2000, Govaerts *et al.* 2017). It is characterized by having numerous long, thick, horizontal roots produced from a short rhizome, presence of a calyculus (i.e., a cup-like structure located between the base of the perianth and apex of the ovary), and an elongate column with a pair of small wings on each side of the anther (Seidenfaden 1978, Hashimoto 1990). The genus is distributed across a wide area including China, India, Indonesia, Japan, Korea, Laos, Malaysia, New Guinea, Pacific islands, the Philippines, Taiwan, Thailand and Vietnam (Seidenfaden 1978, Hashimoto 1990, Pearce & Cribb 1999, Szlachetko & Mytnik 2000, Hsu & Chung 2009, 2010, Averyanov 2011, 2013, Lin *et al.* 2016).

The identification of *Lecanorchis* taxa is often hindered by their morphological similarity and brief flowering periods (Hashimoto 1990, Averyanov 2011, Suddee & Pedersen 2011, Tsukaya & Okada 2013, Suetsugu & Fukunaga 2016, Suetsugu *et al.* 2016). In addition, important diagnostic characters are often lacking in herbarium specimens because flowers of *Lecanorchis* are easily lost or damaged during preservation (Suetsugu *et al.* 2016, 2017a, b). Therefore, the species diversity of *Lecanorchis* is likely to be underestimated (Suetsugu *et al.* 2016, 2017a, b, 2018).

The taxonomic identity of *Lecanorchis purpurea* Masamune (1929: 60) has remained particularly unclear. The species was first described from Yakushima Island, Japan. The description consists of only two words (“*flos purpureus*”). The description is so simple, and *L. purpurea* has often been considered a *nomen nudum* (Garay & Sweet 1974) or a “*nomen seminudum*” (Tuyama 1955, Ohwi 1965). However, considering that there were no recognized *Lecanorchis* species with purple flowers when Masamune (1929) described *L. purpurea*, the description represents its diagnostic character and the name *L. purpurea* should, therefore, be valid based on Art. 38.2 of the Shenzhen Code (Turland *et al.* 2018). However, as mentioned before, the protologue is very simple, and Masamune (1929) did not designate its type materials. Therefore, we could not conduct a detailed, comparative study based on original materials. Nonetheless, fortunately, we could understand the taxonomic identity that Masamune referred to as *L. purpurea* because the line drawing later published by the same author (Masamune 1969) presents enough details. While this taxon is often treated as a synonym of *L. nigricans* Honda (1931: 470), possibly because *L. nigricans* is the most common species with a purplish lip (Tuyama 1955, Ohwi 1965, Govaerts *et al.* 2017), the line drawing clearly demonstrates that *L. purpurea* is not identical to *L. nigricans*, due to its 3-lobed lip and dense, tortuous and clavate hairs at anterior disc of lip (Fig. 1).

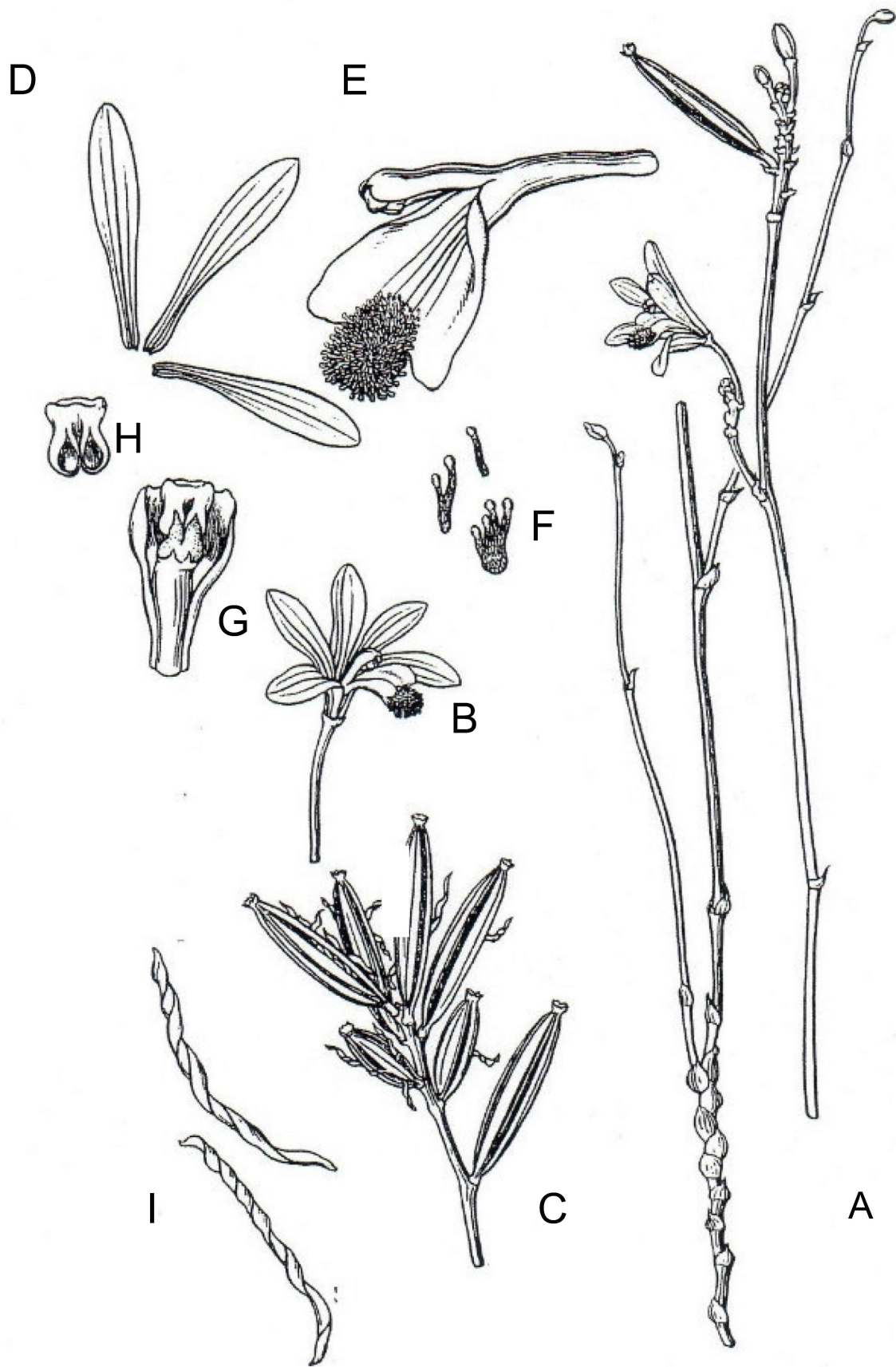


FIGURE 1. Line drawings of *Lecanorchis purpurea*. A. Habit. B. Flower and pedicellate ovary. C. Rachis D. Sepals and lateral petal. E. Lip and column. F. Hairs at the anterior disc of the lip. G. Upper part of the column. H. Anther cap. I. Seeds. Reproduced from Masamune (1969).

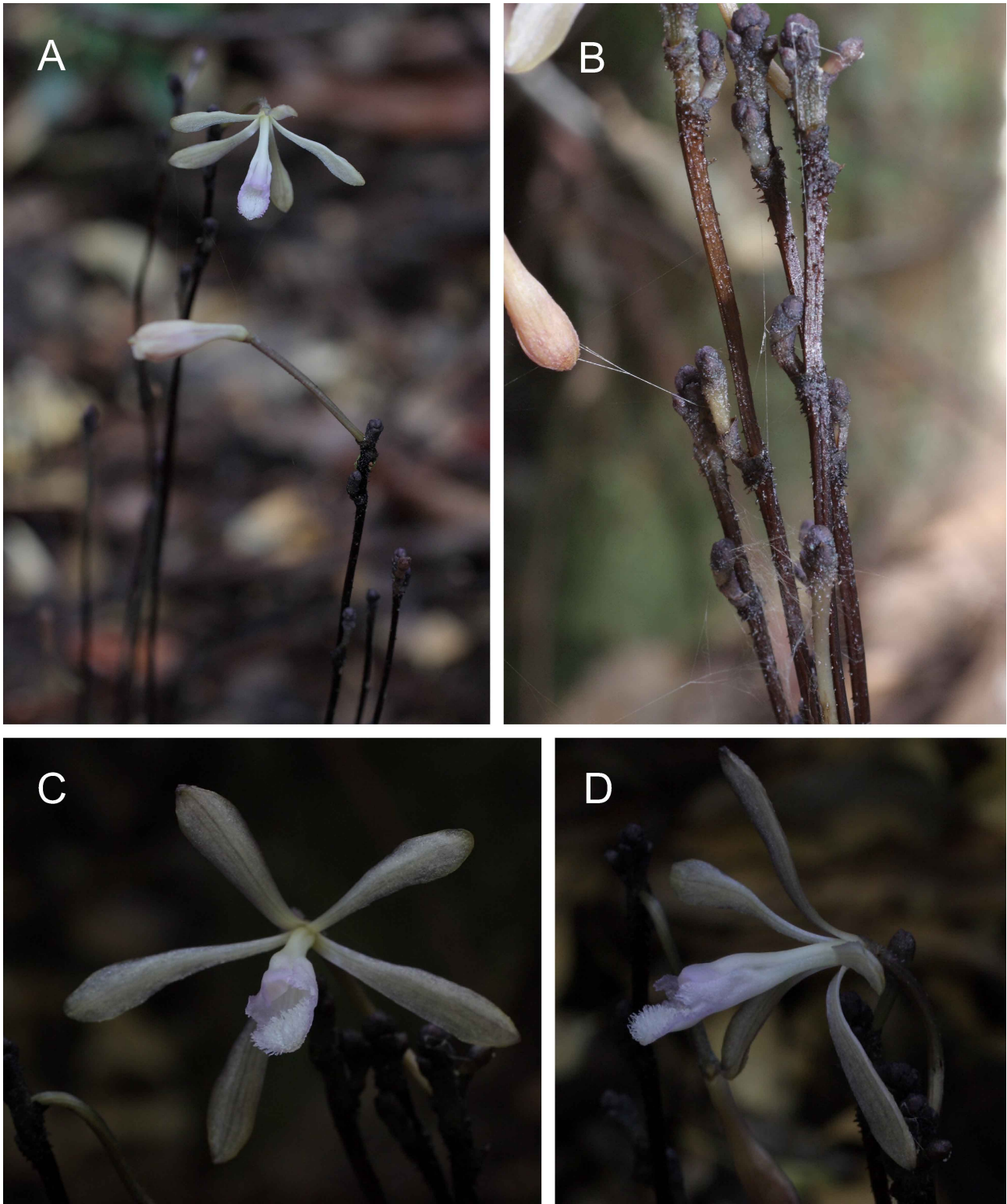


FIGURE 2. *Lecanorchis purpurea* in Tokushima Prefecture, Japan. A. Flowering plant. B. Tuberculate inflorescences. C–D. Flower. Photographed by Hisanori Takeuchi on 10 September 2011.

Actually, due to their distinct side lobes of the lip, Garay & Sweet (1974) considered that a figure in Masamune (1969) under the name *L. purpurea* did not represent *L. nigricans* but *L. ridleyana* Schlechter (1911: 428), that is now considered as the junior synonym of *L. malaccensis* Ridley (1893: 377). However, both *L. malaccensis* from Singapore and Peninsular Malaysia and *L. ridleyana* from Bukit Timah, Singapore are also somewhat problematic taxa. While the protologue is brief and vague, the type of *L. ridleyana* was destroyed in B during WWII, and the types of *L. malaccensis*

(syntypes, both BM and SING) are also badly preserved, and no mature flower is now available for dissection. In addition, their protologue is not detailed enough with regards to the lip morphology. However, during the herbarium survey, we successfully found some flowering *Lecanorchis* individuals annotated as *L. malaccensis* collected at Bukit Timah, Singapore (Fig. 4). Considering that (i) the plants generally agree with the morphological characters of both *L. malaccensis* and *L. ridleyana* protologue and (ii) the plants were collected around their type locality, the plants should actually be considered as *L. malaccensis*. By comparing the illustration of *L. purpurea* (Masamune 1969) and the newly discovered specimens of *L. malaccensis*, we find that *L. purpurea* is similar to *L. malaccensis* in having densely flowered rachis and distinct side lobes but can be easily distinguished by lip hair morphology (short, tortuous and clavate hairs vs. mixture of long filamentous and ribbon-like hairs). On the other hand, *L. purpurea* should be considered to be identical to *L. trachycaula* Ohwi (1965: 1438) due to densely flowered rachis, 3-nerved lateral sepals and petals, tortuous and clavate hairs on the lip disc and lip with a relatively small midlobe (Hashimoto 1990, Hsu & Chung 2010). In addition, the lip of *L. trachycaula* is white but often tinged with light purple (Fig. 3). Therefore, we treat *L. trachycaula* as a synonym of *L. purpurea* (Fig. 2–3). Because Masamune (1929) did not designate any type materials, and currently no original materials could be discovered, we also designate a neotype to stabilize the taxonomic status of *L. trachycaula*, based on Art. 9.8 of the Shenzhen Code (Turland *et al.* 2018). Correct descriptions and illustrations of this species can be seen in Hashimoto (1990) and Hsu & Chung (2010), both as *L. trachycaula*.

In addition, we noticed that a species described from Borneo, *L. betung-kerihunensis* Tsukaya & Okada (2013: 70), shows close affinity to *L. malaccensis*. Based on morphological data and detailed images of the type specimens, we could conclude that the two taxa are conspecific. Hence, we treat *L. betung-kerihunensis* as a synonym of *L. malaccensis* as the later has priority. Correct descriptions and illustrations of this species can be seen in Tsukaya & Okada (2013), as *L. betung-kerihunensis*.

Taxonomic Treatment

Lecanorchis purpurea Masamune (1929: 60) (Fig. 1–3)

Type:—JAPAN. Kagoshima Pref., Yakushima Island, along the Futamata River, alt. 300 m, 30 July 1988, *S. Hatusima* 43695 (neotype: KAG-073201!), designated here.

Synonym:—*Lecanorchis trachycaula* Ohwi (1965: 1438), *syn. nov.* Type: JAPAN. Shishikuicho, 18 June 1964, *C. Abe* 15387 (holotype: TNS!).

Additional specimens examined:—JAPAN. Wakayama Pref.: Higashimurogun, Kozagawacho, Ogawa, Nishiakagi, 25 October 1987, *Matsushita s.n.* (KYO, WMNH), Kozagawacho, Nishiakagi, 18 October 1987, *Ohora s.n.* (TI), Higashimurogun, Kozagawacho, Ogawa, Nishiakagi, 20 August 1973, *Manago s.n.* (OSA, KANA), Higashimurogun, Kozagawacho, Ogawa, Nishiakagi, 21 June 1996, *Matsushita s.n.* (WMNH), Tokushima Pref.: Kaifugun, Shishikuicho, 11 November 1978, *Yamazaki s.n.* (TI), Shishikuicho, Ooyama-jinja, 6 June 1976, *Takahuji s.n.* (KYO), Shishikuicho, Ooyama-jinja, 18 June 1964, *Abe* 252451 (TNS), Shishikuicho, 27 November 1963, *Abe s.n.* (TNS, TKPM), Shishikuicho, 26 June 1971, *Abe s.n.* (TNS, TKPM), Shishikuicho, May 1975, *Maekawa s.n.* (TNS), Kaifugun, Shishikuicho, 27 October 1963, *Takafuzi s.n.* (KANA, TKPM), Kaifugun, Shishikuicho, 25 June 1967, *Abe* 26889 (TKPM), Kaifugun, Shishikuicho, 11 June 1974, *Abe* 49821 (TKPM), Kaifugun, Shishikuicho, 18 June 1964, *Abe* 16606, 16608, 16609 (TKPM), Kagoshima Pref.: Amamioshima Island, Kinsakubaru, 14 May 1991, *Yamashita s.n.* (TNS), Amamioshima Island, Kinsakubaru, along the stream, 24 February 1990, *Hashimoto s.n.* (TNS), Amamioshima Island, Sumiyo Village, 9 April 1961, *Ohba* 17867 (KPM, KAG), Yakushima Island, along the Futamata River, alt. 300 m, 30 July 1988, *Hatusima* 43695 (KAG), Yakushima Island, along the Futamata River, alt. 300 m, 30 July 1988, *Hatusima* 43699 (KAG), Yakushima Island, along the Futamata River, alt. 300 m, 30 July 1988, *Hatusima* 43700 (KAG), Yakushima Island, along the Futamata River, 4 August 2015, *Yamashita* KS215 (TNS), Yakushima Island, along the Hanaage River, 16 July 1976, *Maekawa s.n.* (TNS). TAIWAN. Taipei Co.: Wulai Township, Polushan, 7 June 2009, *Hsu* 2236 (TAIF); Sanshia Township, Jiajouling, 20 August 2009, *Hsu* 2266 (TAIF). Taoyuan Co.: Fuhsing Township, Sileng, 1 March 2009, *Hsu* 2191 (TAIF); Fuxing Dist., Mt. Fuhsingchien, 19 May 2010, *Hsu* 2791 (TAIF). Nantou Co.: Mt. Shuishe, 29 April 2013, *Hsu* 6541 (TAIF).

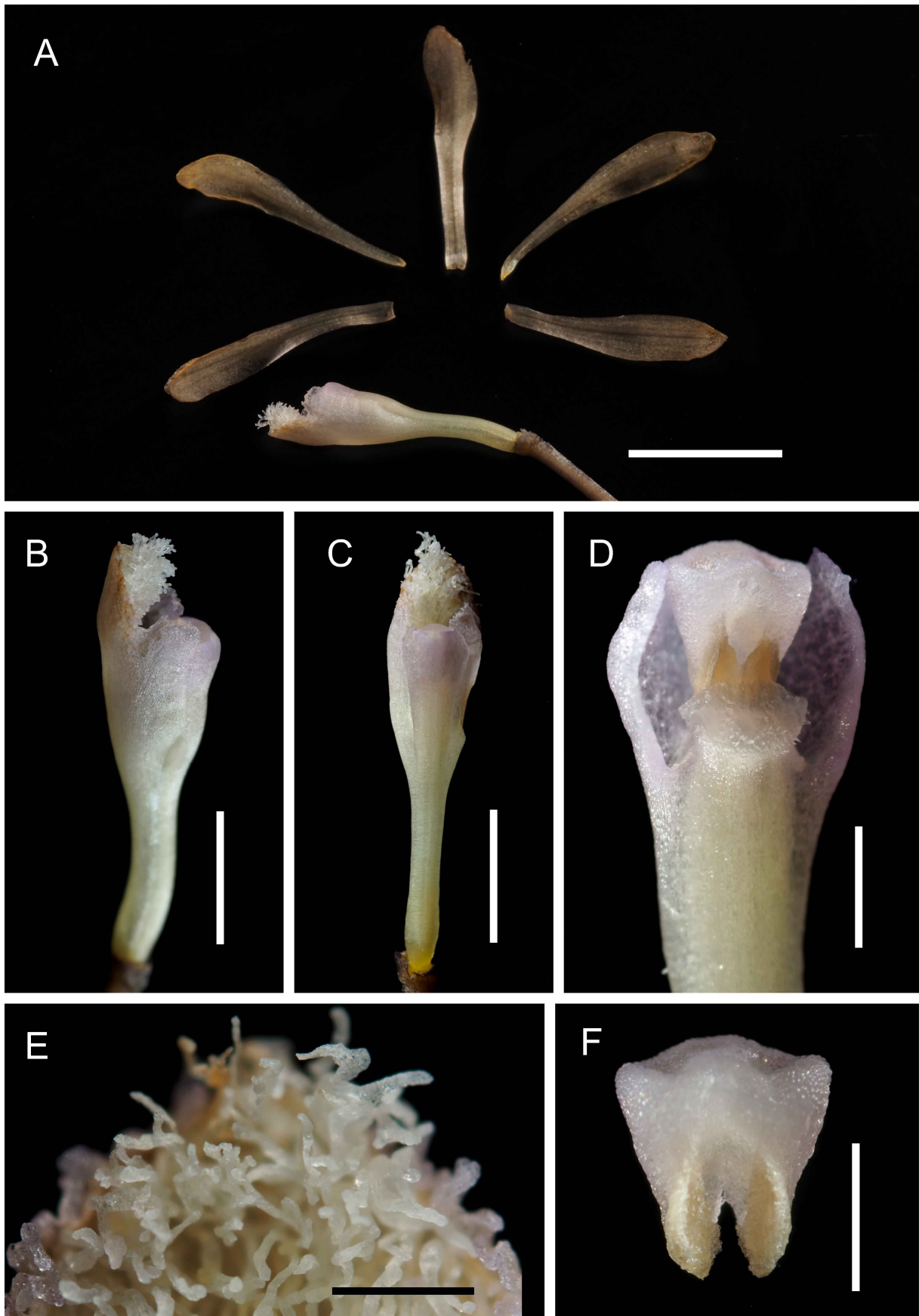


FIGURE 3. Dissected flowers of *Lecanorchis purpurea* collected in Yakushima Island, Kagoshima Prefecture, Japan on 4 August 2015 (*H. Yamashita KS215*; TNS). A. Dissected flower. B–C. Lip and column. D. Upper part of the column. E. Hairs at the anterior disc of the lip. F. Anther cap. Scale bars: A. 1 cm. B–C. 5 mm; D–F. 1 mm. Photographed by Takuto Shitara.

Lecanorchis malaccensis Ridley (1893: 377) (Fig. 4)

Type:—SINGAPORE, Bajan, date unknown 1882, *Ridley s.n.* (syntype: BM image!), MALAYSIA, Peninsular Malaysia: Pahang, Jerantut, Sg. Tahan, date unknown 1891, *Ridley s.n.* (syntypes: BM image!, SING image!).



FIGURE 4. Herbarium specimen of *Lecanorchis malaccensis* collected at Bukit Timah, Singapore (TNS).

Synonyms:—*Lecanorchis betung-kerihunensis* Tsukaya & Okada (2013: 69), *syn. nov.* Type: INDONESIA. West Kalimantan: BetungKerihun National Park, near Sungai (River) Rantaugong, 24 Dec 2011, *H. Tsukaya, H. Okada, & A. Soejima HT204* (holotype: BO; isotype: TI!), *Lecanorchis ridleyana* Schlechter (1911: 428) Type: SINGAPORE, Bukit-Timah, alt. 150m, Jan 1901, *R. Schlechter-13143* (B, destroyed).

Additional specimens examined:—SINGAPORE, Bukit-Timah, alt. 150m, 31 Aug 2002, *H. Nakayama s.n.* (TNS).

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