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New combinations in the genus *Didymoplexis* (Orchidaceae; Epidendroideae; Gastrodieae), with a new variety of *D. siamensis* from Amami-Oshima Island, Japan

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The mycoheterotrophic orchid genera *Didymoplexiella* Garay (1955: 33) and *Didymoplexis* Griffith (1844: 383) include seven and ca. 20 species, respectively (Averyanov 2011, Hu *et al.* 2014, Tsukaya *et al.* 2014, Suetsugu *et al.* 2017). *Didymoplexiella* is similar in both habit and floral appearance to *Didymoplexis*, with which it was considered congeneric by some earlier authors (Smith 1920, Holttum 1953). However, modern taxonomists generally agreed that *Didymoplexiella* species can be distinguished from *Didymoplexis* species by the presence of a pair of long recurved stelidia on the tip of the column and the absence of a distinct column foot (Garay 1954, Seidenfaden 1978, Seidenfaden & Wood 1992, Su 2000, Comber 2001, Jin *et al.* 2004, Pridgeon *et al.* 2005, Tsukaya *et al.* 2005, 2014, Chen *et al.* 2009, Rojchana-Umpawan *et al.* 2014, Yokota *et al.* 2016).

In May 2018, an unknown mycoheterotrophic orchid was discovered in Amami-Oshima Island, Japan. In general morphology, this orchid is nearly identical to *Didymoplexiella siamensis* (Rolfe ex Downie 1925: 416) Seidenfaden (1972: 99) distributed from Thailand to Taiwan (Hu *et al.* 2014) and also recorded in Yakushima, Tanegashima and Amami-Oshima Islands, Japan (Suetsugu *et al.* 2019). However, the unknown taxon is distinguished from *D. siamensis* because its column lacks the long recurved stelidia (Fig. 1A) that otherwise characterise *Didymoplexiella*. Its taxonomic placement is thus ambiguous under the generic concepts mentioned above.

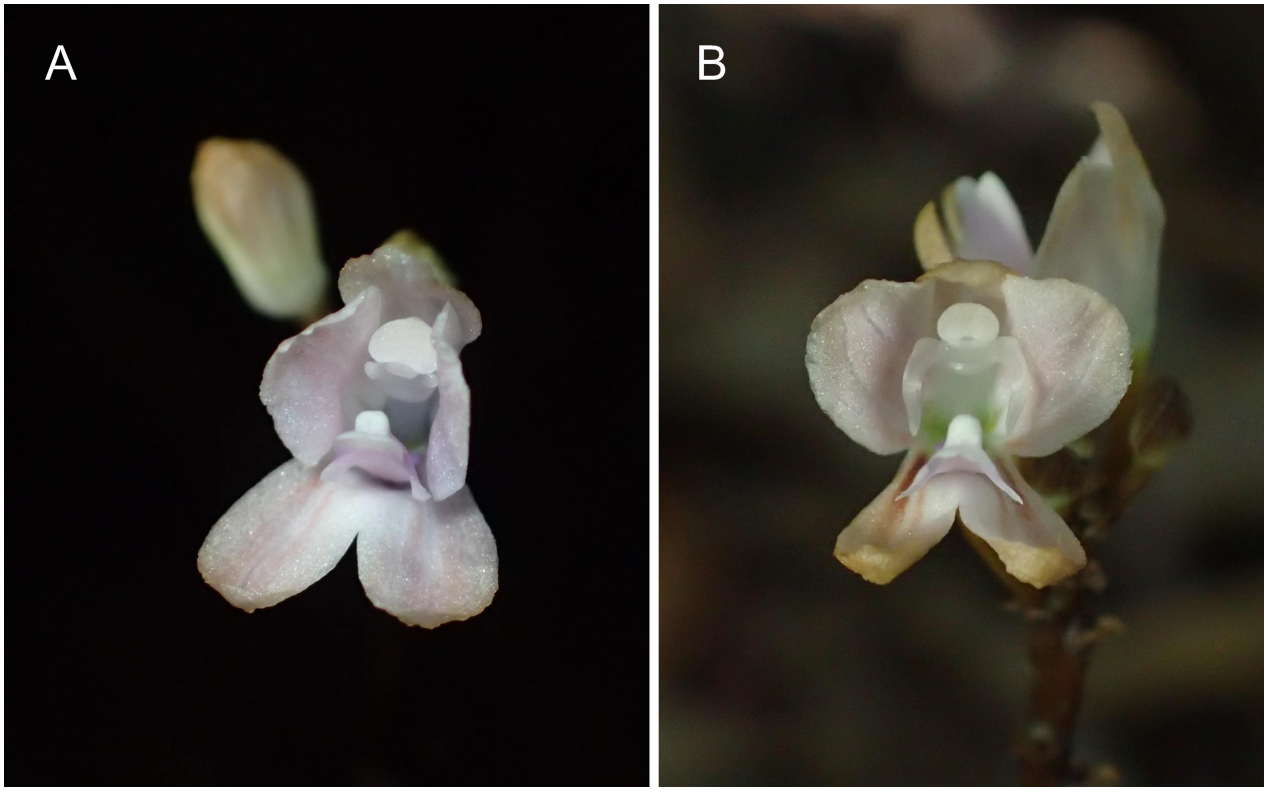

FIGURE 1. A. *Didymoplexis siamensis* var. *amamiana* from the type locality. B. *Didymoplexis siamensis* var. *siamensis* from Amami-Ohshima Island. Photograph by Hidekazu Morita.

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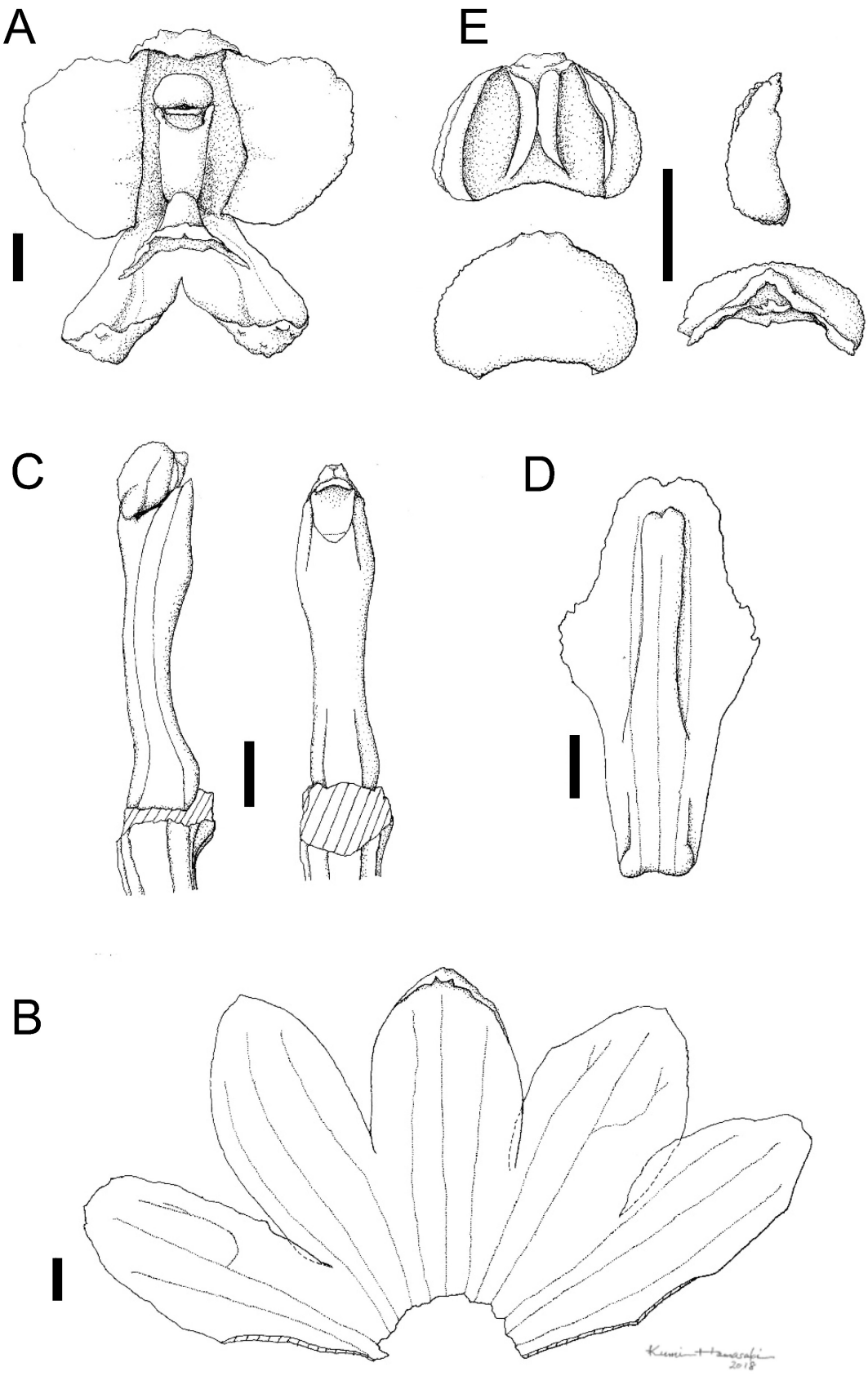

FIGURE 2. A. *Didymoplexis siamensis* var. *amamiana* (drawn from the holotype). A. Flower. B. Flattened perianth tube. C. Column. D. Lip. E. Anther cap. Bar = 1 mm. Drawing by Kumi Hamasaki.

This curious case led us to reappraise the delimitation of *Didymoplexis* and *Didymoplexiella*. After a thorough literature study, it is revealed that the boundary between them is actually not clear and disrupted by several taxa with mixed generic characters. For example, both *Didymoplexis vietnamica* Ormerod (2000: 15) and *D. recurvata* Cribb, Nusbaumer & Gautier in Cribb *et al.* (2013: 44) have long recurved stelidia agreeing with *Didymoplexiella*, but their well-developed column foot is in contrast distinct from *Didymoplexiella* species (Averyanov 2011). Additionally, *Didymoplexis micradenia* (Reichenbach 1868: 295) Hemsley (1883: 311) and the unknown taxon discovered in Amami-Oshima Island share obscure column feet with *Didymoplexiella* species, whereas they lack a pair of elongated stelidia (Hsu & Chung 2007, Phueakkhlai *et al.* 2014, Gray 2017). The monotypic genus *Didymoplexiopsis* Seidenfaden (1997: 13) with *D. khiriwongensis* Seidenfaden (1997: 13) represents another case of intermediate nature. It was originally described based on the unique combination of characters of *Didymoplexis* (i.e. prominent column feet) and *Didymoplexiella* (i.e. long recurved stelidia) plus the almost free dorsal sepal and petals that were not reported from any *Didymoplexis* or *Didymoplexiella* species known at that time. However, the weakly connate dorsal sepal and petals have now also been described in two distinctly related Madagascarian species *Didymoplexis avatraensis* Cribb, Nusbaumer & Gautier in Cribb *et al.* (2013: 43) and *D. recurvata* and are hence not unique. Consequently, neither *Didymoplexiella* nor *Didymoplexiopsis* can be clearly differentiated from *Didymoplexis* by any single morphological character proposed in previous studies, and we thus consider that it is impractical to recognise *Didymoplexis*, *Didymoplexiella* and *Didymoplexiopsis* as distinct genera due to their overall morphological similarity and relatively minor and obscure differences. Although molecular data are still lacking in these groups, we presume that *Didymoplexiella* and *Didymoplexiopsis* are more likely derived groups within *Didymoplexis*, judging from their morphological patterns and also the fact that the distribution of *Didymoplexiella* and *Didymoplexiopsis* are both within the known range of *Didymoplexis*.

Based on the above discussion, we propose to redefine *Didymoplexis* to include *Didymoplexiella* and *Didymoplexiopsis* with necessary new combinations. This treatment is actually a reinstatement of the earlier concepts of *Didymoplexis* (Smith 1920, Holttum 1953). The enlarged *Didymoplexis* now comprises about 30 species widely distributed from East Africa and Madagascar through Asia to Oceania and could be characterized by the following floral characters: tepals ± connate but always deeply cleft between petals and lateral sepals and thus only forming short tube or not tubular; lip basally adnate to abbreviate or prominent column foot, widest near apex, with basal and/or central calli; column dilated and with a pair of stelidia at apex; stelidia variable from small teeth-like to prominent anchor-like projections; and stigma always located directly below rostellum near column apex. The unknown taxon in Amami-Oshima Island is then described as a new variety of *Didymoplexis siamensis* because it only differs from typical *D. siamensis* in lacking elongate stelidia.

Taxonomic Treatment

Didymoplexis Griffith (1844: 383).

Type species:—*Didymoplexis pallens* Griffith.

Synonyms: *Leucolena* Ridley (1891: 340) [not *Leucolaena* (de Candolle 1829: 5) Bentham (1837: 55)]. Type species:—*Leucolena ornata* Ridley (1891: 340).

Didymoplexiella Garay (1955: 33, as "*Didimoplexiella*"). Type species:—*Didymoplexiella ornata* (Ridley) Garay (1955: 33).

Didymoplexiopsis Seidenfaden (1997: 13). Type species:—*Didymoplexiopsis khiriwongensis* Seidenfaden (1997: 13).

Notes:—Ridley (1891) originally proposed *Leucolena* based on the presence of long, recurved, apical stelidia on the column. However, Garay (1954) proposed *Didymoplexiella* because he misunderstood Ridley's "*Leucolena*" as "*Leucolaena*" and then considered it as a later homonym of *Leucolaena* (de Candolle 1829: 5) Bentham (1837: 55). The epithet *Leucolena*, composed by Ancient Greek *leukos*, white, and *-olene*, arm or elbow, is presumably derived from its characteristic arm-like stelidia, whereas in *Leucolaena*, Ancient Greek *chlaina*, cloak, (Latinised to *–laena*, when combined) is presumably derived from its whitish woolly hairs. Therefore, the two epithets are not orthographic variants. However, despite their distinct etymologies, *Leucolena* and *Leucolaena* should still be treated as homonyms as the replaced name of the former, *Didymoplexiella*, has now been widely accepted, and this practice is to be continued in the interest of nomenclatural stability (see Art. 53.2 of the Shenzhen Code, Turland *et al*. 2018).

Valid names are already available for the following former *Didymoplexiella* species:

Didymoplexis borneensis (Schlechter 1911: 428) Smith (1920: 20) [=*Didymoplexiella borneensis* (Schlechter) Garay (1954: 33)]

Didymoplexis forcipata Smith (1927: 18) [=*Didymoplexiella forcipata* (J.J.Smith) Garay (1954: 33)]
Didymoplexis kinabaluensis Carr (8: 178) [=*Didymoplexiella kinabaluensis* (Carr) Seidenfaden 1978: 175]
Didymoplexis ornata (Ridley) Smith (1920: 20) [=*Didymoplexiella ornata* (J.J.Smith) Garay (1954: 33)]
Didymoplexis trichechus Smith (1920: 19) [=*Didymoplexiella trichechus* (J.J.Smith) Garay (1954: 34)].

Didymoplexis cinnabarina (Tsukaya, M.Nakajima & H.Okada) Suetsugu & T.C.Hsu, *comb. nov.* Basionym: *Didymoplexiella cinnabarina* Tsukaya, Nakajima & Okada (2005: 208).

Didymoplexis khiriwongensis (Seidenfaden) Suetsugu & T.C.Hsu, *comb. nov.* Basionym: *Didymoplexiopsis khiriwongensis* Seidenfaden (1997: 13).
Heterotypic synonym: *Didymoplexiella hainanensis* Jin & Chen (2004: 176).

Didymoplexis siamensis (Rolfe ex Downie) Suetsugu & T.C.Hsu, *comb. nov.* Basionym: *Leucolena siamensis* Rolfe ex Downie (1925: 416);
Homotypic synonyms: *Didymoplexiella siamensis* (Rolfe ex Downie) Seidenfaden (1972: 99).
Heterotypic synonym: *Didymoplexiella denticulata* Averyanov (2010: 92).

Didymoplexis siamensis* var. *amamiana Suetsugu, *var. nov.* (Figs. 1A, 2)
Type:—JAPAN. Ryukyu Islands: Kagoshima Pref., Amami-Oshima Island, Amami City, Naze, 5 May 2018, *Morita N15-04* (holotype: TNS, a flower in the spirit collection).
Didymoplexis siamensis var. *amamiana* differs from *D. siamensis* var. *siamensis* only in lacking a pair of the long recurved stelidia on each side of its stigma.

Additional specimens examined:—JAPAN. Ryukyu Islands: Kagoshima Pref., Amami-Oshima Island, Amami City, Naze, 5 May 2018, *Morita N15-07* (TNS, a flower in the spirit collection); Kagoshima Pref., Amami-Oshima Island, Amami City, 13 May 2018, *Morita N15-A* (KYO, a flower in the spirit collection).

Note:—The new variety is currently known only from a single population. About 20 flowering individuals were found in a dense forest dominated by *Castanopsis sieboldii* (Makino) Hatusima (1971: 223). The new variety is not completely sympatric with *D. siamensis* var. *siamensis*, whereas *D. siamensis* var. *siamensis* can be observed a few hundred meters from the type locality.

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