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First Record of the Mycoheterotrophic Orchid Aphyllorchis montana var. rotundatipetala (Orchidaceae) from Amami-Oshima Island, Ryukyu Islands, Japan

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This is the first report of *Aphyllorchis montana* var. *rotundatipetala*, a peloric variant of *A. montana* from Amami-Oshima Island, Ryukyu Islands, southern Japan, previously reported only from Taiwan. It can be distinguished from *A. montana* var. *montana* by its sub-actinomorphic flowers, a labellum that is not divided into hypochile and epichile, and a reduced stigma. Additionally, *A. montana* var. *rotundatipetala* can be distinguished from *A. simplex* from Vietnam and southern China—another probable peloric, sub-actinomorphic form of *A. montana*—by its obtuse lip apex (vs. acute in *A. simplex*), a highly reduced rostellum (vs. the prominent erect ligulate rostellum in *A. simplex*), and inconspicuous apical staminodes on both sides of the column (vs. two large, curved staminodes in *A. simplex*).

Keywords: Orchidaceae, peloria, Ryukyu Islands, taxonomy

Aphyllorchis Blume (Orchidaceae) comprises around 20 species distributed from Sri Lanka and the western Himalaya to China, Indochina, Malaysia, Indonesia, Taiwan, and the Philippines, extending as far north as Japan and southeast to New Guinea and Australia (POWO 2024). Species of Aphyllorchis are leafless and mycoheterotrophic, have erect, unbranched stems, racemose inflorescences, multiple resupinate flowers with petals similar to sepals but shorter and narrower, and a lip divided into a hypochile and epichile (Pridgeon et al. 2005). As with many other mycoheterotrophs, the diversity in the species of Aphyllorchis may be underestimated due to their brief flowering period and inconspicuous nature, making them easily overlooked in the wild (Suetsugu et al. 2018).

Only one species of *Aphyllorchis*, *A. tane*gashimensis Hayata (now recognized as a synonym of *A. montana* Rchb. f.), has been described

from Japan (Hayata 1911, Suetsugu et al. 2018). Consequently, A. montana, with its wide distribution across Sri Lanka, India, Bhutan, Thailand, Cambodia, Malaysia, Indonesia, the Philippines, China, Taiwan, and Japan, remains the only species reported to be in Japan (Seidenfaden 1978, Su 2000, Suetsugu et al. 2018, Tshewang et al. 2021). Nonetheless, during a recent botanical survey on Amami-Oshima Island in the Ryukyu Islands, Japan, a species of Aphyllorchis was discovered that could not be readily identified. After a thorough review of the literature and herbarium specimens, these plants were identified as A. montana var. rotundatipetala, previously reported only from Taiwan (Lin et al. 2016, Lin 2019). This is the first report of the occurrence of this variety in Japan along with a description of the plants from Amami-Oshima Island.



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Aphyllorchis montana var. rotundatipetala (C. S. Leou, S. K. Yu & C. T. Lee) T. P. Lin in Taiwania 61: 80 (2016). \equiv *Aphyllorchis rotundatipetala* C. S. Leou, S. K. Yu & C. T. Lee in Ann. Bot. Fennici 50: 179 (2013). —Type: TAI-WAN: New Taipei City: Sanxia district 400 m, 30 August 2012, *C. T. Lee 033* (holo- TAI284548 image!) (Fig. 1).

Herbs, achlorophyllous, mycoheterotrophic. Underground parts not observed. Flowering stem gravish purple, 35-55 cm long, marked with scattered purple stripes or dots, glabrous, enveloped in numerous membranous sheaths; sheaths tubular, apex obtuse, gradually larger toward apex. Inflorescences loosely racemose, with 13-23 flowers. Floral bracts lanceolate, $7-15 \times 2.5-4$ mm, whitish yellow marked with purplish brown spots or stripes, apex reflexed, acute. Pedicellate ovary straight, $16-26 \times 2.5-4$ mm, purple, glabrous. Flowers widely opening, approximately 2 cm across, slightly ascending at onset of blooming, then drooping; sepals equal, oblong-cymbiform, $9.5-12 \times 3-4.5$ mm, creamy yellow, apex obtuse, with purple dots abaxially. Petals and lip spreading, oblong, $9.5-12 \times 3.2-4$ mm at base, slightly falcate, creamy yellow, margins revolute, apex obtuse. Column arcuate, approximately 10 mm long, yellow, apex slightly dilated; staminodes inconspicuous, apical on both sides of column; stigma and rostellum highly reduced. Anther cap ellipsoid, succulent, orangish yellow, approximately 2×1.5 mm; pollinia 2, each 2-partite, powdery, yellow. Fruits pendulous, fusiformclaviform, 32-40 mm long, 8-12 mm in diameter. Seeds not seen.

Japanese name. Hoshizaki-tanegashima-muyouran (nov.).

Distribution and habitat. In Japan, Aphyllorchis montana var. rotundatipetala is currently known only from the locality reported here, where 13 flowering individuals were found in the understory of a forest dominated by Castanopsis sieboldii (Makino) Hatus. ex T. Yamaz. et Mashiba, Machilus thunbergii Siebold et Zucc., and Toxicodendron succedaneum (L.) Kuntze. Notably, all individuals of *A. montana* at this site bear completely peloric flowers. Although *A. montana* var. montana has been recorded on Amami-Oshima Island (Hotta 2013, Suzuki et al. 2022), no individuals of *A. montana* var. montana were found near the newly discovered locality of *A. montana* var. rotundatipetala. To the best of our knowledge, the closest population of *A. montana* var. montana is located 1.4 km away from the population of *A. montana* var. rotundatipetala.

Morphological and taxonomic notes. Aphyllorchis montana var. rotundatipetala is a peloric, actinomorphic form of A. montana (Lin et al. 2016, Lin 2019). It differs from A. montana var. montana in its sub-actinomorphic flowers and a labellum that is not divided into hypochile and epichile. Additionally, the column of A. montana var. rotundatipetala exhibits a markedly reduced stigmatic surface compared to that of A. montana var. montana (Hsieh et al. 2013, Lin 2019). Aphyllorchis montana var. rotundatipetala also resembles A. simplex Tang et F. T. Wang, of Vietnam and southeast China, which is likely another peloric, actinomorphic variant of A. montana (Averyanov 2011, Hsu & Chung 2016, Lin et al. 2016, Lin 2019). However, A. simplex and A. montana var. rotundatipetala probably developed peloric morphology independently, with notable morphological differences. In A. simplex, two large curved staminodes are present apically on either side of the column, accompanied by an erect, prominent ligulate rostellum and an acutely pointed apex of the lip (Averyanov 2011, Lin 2019), features absent in A. montana var. rotundatipetala.

If these morphological distinctions are not emphasized, *A. simplex* and *A. montana* var. *rotundatipetala* could be considered conspecific. Indeed, Hsu & Chung (2016) adopted this view, merging both taxa under the name *A. simplex*. However, it is important to note that peloric mutants are frequently classified as formae (Suetsugu 2013, 2018, 2019, 2021, Hayakawa *et al.* 2014, 2020, Suetsugu & Hayakawa 2019), or even treated as genetic variation within a population (Hay-



FIG. 1. Aphyllorchis montana var. rotundatipetala discovered on Amami-Oshima Island, Ryukyu Islands, Japan. A, Portion of inflorescence. B, Inflorescences at the fruiting stage. C, Closeup of flower, front view. D, Dorsal sepal, adaxial view. E, Petal, adaxial view. F, Lateral sepal, adaxial view. G, Labellum, adaxial view. H, Column. Photographs of non-voucher individuals were taken on 31 August 2023 (A) and 11 October 2023 (B). Photographs of the voucher specimen individual were taken *in situ* on 25 August 2024 (C) and in the laboratory on 2 September 2024 (D–H). Scale bars: 3 cm (A–B), 5 mm (C), and 2 mm (D–H). Photo credit: Mikio Takashi (A–C) and Kenji Suetsugu (D–H).

akawa *et al.* 2016), when they are sympatric with the normal form. Given (i) its allopatric distribution away from *Aphyllorchis montana* var. *montana* and (ii) the fact that *A. montana* var. *montana* and *A. montana* var. *rotundatipetala* are autonomously self-pollinated, which likely enhances biological isolation (Suetsugu *et al.* 2024), it is more appropriate to recognize these plants at the level of variety, rather than forma. Nevertheless, I consider it difficult to justify recognizing peloric variants of *A. montana* as separate species. Therefore, despite *A. simplex* being described prior to *A. montana* var. *rotundatipetala*, the latter takes precedence at the varietal rank under Art. 11.2 and 11.4 of the ICN (Turland *et al.* 2018). Consequently, I consider the name *A. montana* var. *rotundatipetala* appropriate for the newly discovered plant in Japan, even if *A. simplex* and *A. montana* var. *rotundatipetala* are regarded as being the same.

Specimen examined. JAPAN. Kagoshima Pref., Amami-Oshima Island, Amami City, Naze, 31 August 2014, *Mikio Takashi A3* (TNS). I extend my gratitude to Saori Taira for discovering *Aphyllorchis montana* var. *rotundatipetala* in Japan, and to Mikio Takashi for sampling. I also thank Kazuma Takizawa for technical support. This study was financially supported by PRESTO (JPMJPR21D6, KS) from the Japan Science and Technology Agency.

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