Kenji SUETSUGU: The Northernmost Locality of the Mycoheterotrophic Orchid Gastrodia flexistyloides from Fukue-jima Island, Nagasaki Prefecture, Kyushu, Japan

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Summary: I found a rare mycoheterotrophic plant Gastrodia flexistyloides from Fukuejima Island, Nagasaki Prefecture, Japan. Because G. flexistyloides was previously discovered only from Takeshima Island, Kuroshima Island and Iojima Island, northern Ryukyu, Japan, this habitat represents the northernmost locality of the species.

The genus Gastrodia Brown is a mycoheterotrophic group that is distributed throughout the temperate and tropical regions of Asia, Oceania, Madagascar and Africa (Chen et al. 2009, Cribb et al. 2010, Tan et al. 2012). The genus is characterized by fleshy tubers, absence of leaves, fusion of the sepals and petals and two mealy pollinia that lack caudicles. Many species of Gastrodia section Codonanthus (Schlechter 1911, Tuyama 1967) produce inflorescences that are 3–15 cm in length at flowering (Chung and Hsu 2006). In addition, as is the case with most other mycoheterotrophic species, they occur in a small population and appear only for a short flowering and fruiting period (Tuyama 1982, Suetsugu et al. 2012, Suetsugu 2017). Consequently, plants belonging to section Codonanthus are seldom found due to their short flowering season and small habit (Tuyama 1982, Suetsugu et al. 2012, Suetsugu 2017).

Although species taxonomy remains to be revised in the section Codonanthus, due to these limitations, many recent studies have recently re-examined the diversity of Codonanthus species in various Asian countries including Japan (e.g., Hsu and Kuo 2010, 2011, Hsu et al. 2012, Suetsugu 2012, 2013, 2014, 2015, 2016, 2017a, b). Consequently, Gastrodia is now considered to comprise ca. 90 species, making it the largest mycoheterotrophic genus among vascular plants (Tian-Chuan Hsu unpublished data in Hsu et al. 2016).

Gastrodia flexistyloides was described based on the materials from a bamboo forest on Takehsima Island, northern Ryukyu, Japan (Suetsugu 2014). In addition, Suetsugu (2017a) found the populations of G. flexistyloides in Iojima Island and Kuroshima Island, northern Ryukyu, Japan. Here I reported G. flexistyloides from Fukuejima Island, Nagasaki Prefecture, Japan. Because G. flexistyloides was previously discovered only from three islands of northern Ryukyu, this locality represents the northernmost locality of the species. The following description is based on the material from Fukuejima Island. The plants were recognized several years ago, but have been considered Gastrodia nipponica which has similar flowering phenology (Koichi Ueda, personal communication). The description of fruiting plants is based on observations by Mr. Koichi Ueda, and the fruiting plants were not collected, due to both the small population size and the difficulty in identifying Gastrodia species at fruiting stage.

Terrestrial, mycoheterotrophic herb. Roots
Fig. 1. Flowering individual of a mycoheterotrophic orchid *Gastrodia flexistyloides* from Fukue-jima Island, Nagasaki Pref., Kyushu, Japan (Photographed by Koichi Ueda).

few, slender or occasionally thickened, mostly extending from apex of the rhizome. Rhizome tuberous, fusiform or cylindrical, 2–5 cm long, 4–9 mm in diameter, pale brown, covered with numerous scales and unicellular hairs. Inflorescence erect, pale brown, 6–9 cm long, 2.5–3 mm in diameter, 3–4 nodes, with tubular, membranous sheaths. Bracts up to 8 mm long, 5 mm wide. Pedicel and ovary up to 10 mm long. Flowers 1–2, tubular, slightly upwards or downwards, resupinate, 14–17 mm long, 5 mm in diameter. Sepals and petals united forming a five-lobed perianth tube. Perianth tube enclosed or never opening. Sepals subsimilar, fleshy, 14–17 mm long, connate ca. 4/5 of their length with petals, lateral ones connate ca. 3/4 with each other, outer surface pale brown, verrucose; free portion of dorsal sepal ovate-rectangular, apex retuse, ca. 4.5 mm long, 4 mm wide; free portions of lateral sepals ovate, ca. 4.5 mm long, 4.5 mm wide, apex obtuse. Free portions of petals pale orange, ovate, ca. 4 mm long, 3 mm wide, base contracted and thickened, margin slightly scabrous. Lip adnate to column foot, pale green, ca. 8 mm long, 4.5 mm wide; hypochile with 2 greenish, globose calli; epichile rhombate-ovate, base contracted, 4–6 ridged on the disc, with two central ridges extending toward the apex, margin slightly undulate; apex portion ligulate, red, ca. 1.5 mm wide. Column 3-lobed, lateral lobes erect, ca. 6 mm long, central lobe strongly incurved; column foot well developed; rostellum absent. Anther hemispheric, ca. 1 mm in diameter, pollinia 2. Capsule cylindrical, 3–3.5 cm long, pedicel elongating to at least 30 cm long in fruit. Seeds fusiform, ca. 2 mm long.

Note: Only ca. 10 flowering individuals were found in a dense forest dominated by *Castanopsis sieboldii* (Makino) Hatus. in Fukuejima Island. Flowering was observed from mid to late April, and fruiting from mid to late May. As stated in the above description, *Gastrodia flexistyloides* in Fukuejima populations tended to be smaller than northern Ryukyu populations (Suetsugu 2014, 2017a), as a consequence of their shorter inflorescence (6–9 cm vs. 7–18 cm). However, other than this, there were no clear differences in either coloration or
morphology, particularly with regard to the lip and column, which are important characteristics used to classify _Gastrodia_ species. Given their dependence on fungi for nutrition (Leake 1994), resource limitation in mycoheterotrophic plants is relatively common, and it is therefore not surprising that the _G. flexistyloides_ specimens varied in size, depending on environmental factors such as the activity of their mycorrhizal fungi. The relatively minor differences between the specimens from northern Ryukyu and those from Fukuejima Island were therefore attributed to intraspecific variation.

It is intriguing that _Gastrodia flexistyloides_ shows disjunctive distribution (i.e., northern Ryukyu and northern Kyushu). As is the case with most mycoheterotrophic species, _Gastrodia_ species are easily overlooked due to their short flowering seasons and dwarf habits. Therefore, _G. flexistyloides_ and other undescribed species may possibly be mistaken for more common _Gastrodia_ species, such as _G. nipponica_ which has similar flowering phenology. Considering that precise identification in the genus _Gastrodia_ requires the detailed observation of floral organs hidden in the perianth tube, and that the continued discovery of new species and distributional records in _Gastrodia_ has been made from a limited number of surveys (e.g., Suetsugu et al. 2012, 2013, 2014, Suetsugu 2012, 2013, 2014, 2015, 2016, 2017a, b), future detailed morphological investigation will reveal many new taxa and new distributional records.

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References


末次健司：ヌカヅキヤツシロラン（ラン科）を長崎県福江島から記録する

長崎県福江島でヌカヅキヤツシロラン（ラン科）の開花個体を発見した。これは、薩南諸島（三島村）の竹島、硫黄島、黒島に次ぐ産地であり、分布の北限となる。オニノヤガラ属の*Codonanthus*節に属する種は、開花期間が短く結実個体では同定困難なものも多いため、日本における*Codonanthus*節に属する種の詳細な分布状況の検討が望まれる。

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