

# タヌキノシヨクダイの新産地と菌根形態について

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## Kenji Suetsugu<sup>1\*</sup> and Kenya Ishida<sup>2</sup>: New locality and fungal association of *Thismia abei* (Thismiaceae)

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Several lineages of land plants have evolved total dependence on fungal-derived energy sources and have become non-photosynthetic (Leake 1994). These plants are ecologically distinct from plants that directly parasitize other plants, as do, for example, mistletoes and their allies (Santalaceae; Suetsugu et al. 2008), and instead depend upon mycorrhizal associations, hence they are termed mycoheterotrophic plants (Leake 1994). Mycoheterotrophy occurs in approximately 400 species of flowering plants of the families: Ericaceae, Polygalaceae, Gentianaceae, Burmanniaceae, Thismiaceae, Corsiaceae, Orchidaceae, Petrosaviaceae, Iridaceae and Triuridaceae (Leake 1994).

All species of Thismiaceae (which consists of more than 50 species in five genera; Maas-Van De Kamer 1998; Woodward et al. 2007) are small achlorophyllous mycoheterotrophic herbs. Leaves are absent or reduced to scales. The largest genus, *Thismia* (consisting of approximately 35 species), is distributed throughout tropical rainforests in South America and Asia, although a few species extend into more temperate regions, including Japan (Merckx et al. 2006). A remarkably common feature of most Thismiaceae is their extreme scarcity and smallness (Franke 2004). In addition, most species are found in the dark understory of tropical rainforest, only discoverable during the flowering period when aboveground organs appear through the leaf litter (Maas et al. 1986; Merckx 2009). The majority of species are known exclusively from the type collection, or appears to have been collected only once or a few times (Jonker 1938). In addition, many species are presumed extinct (Maas et al.

1986).

Two species have been described from temperate Japan, however one of these species, *T. tuberculata* Hatus., is now extinct (Tadashi Minamitani personal communication). Four populations of the other species, *T. abei* (Akasawa) Hatus., have been reported; at Kirishima, Kagoshima Prefecture, Naka Town, Tokushima Prefecture, and Ito City and Hamamatsu City, Shizuoka Prefecture. It is now thought that all populations, except that in Naka Town, where it is very rare, are extinct because of succession (Tadashi Minamitani, Toru Kato and Hirokazu Tsukaya personal communication).

This paper reports a new population of *T. abei* in Kouzushima Island, Kouzushima Village, Tokyo Prefecture. A voucher specimen was preserved in KYO. In this habitat, approximately 30 flowering individuals (Fig. 1A) were found growing on the floor of a dense forest, dominated by *Cryptomeria japonica*, *Castanopsis sieboldii* and *Machilus thunbergii*, in late June to early July from 2007 to 2010.

We examined the morphology of the mycorrhiza of *T. abei* to reveal the fungal association. The sampled roots were fixed and preserved in formalin-acetic acid-alcohol (formaldehyde: glacial acetic acid: 50% ethanol = 1:1:18) before use. The roots were then stained using the method of Giovannetti and Mosse (1980) with slight modifications, as follows. The roots were cleaned in 10% KOH solution at 90°C for 15 min and stained with 0.05 % trypan blue in lactoglycerol at 90°C for 30 min. They were then squashed and observed under a light microscope.

Morphological investigation showed that my-

corrhizal colonization of *T. abei* occurred in the form of cell-to-cell spread with hyphal coils within the cells (Fig. 1B) and that the fungal association could be considered to be a *Paris*-type arbuscular mycorrhiza (Peterson et al. 2004). Similar arbuscular mycorrhizal colonization has also been shown in other member of Thismiaceae (Imhof 2006; McLennan 1958).

Because the arbuscular mycorrhizal fungi are obligate biotrophs, *T. abei* should obtain their carbon by forming mycorrhizal associations with adjacent autotrophic plants (Bidartondo and Bruns 2002; Winther and Friedman 2008). Therefore, considering the extreme rarity of *T. abei*, further study, such as molecular identification of arbuscular fungi in *T. abei* and surrounding autotrophs, will be urgently required to reveal what surrounding plants work as its carbon source.

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#### References

- Bidartondo, M. I., Redecker, D., Hijri, I., Wiemken, A., Bruns, T. D., Domínguez, L., Sérsic, A., Leake, J. R. and Read, D. J. 2002. Epiparasitic plants specialized on arbuscular mycorrhizal fungi. *Nature* **419**: 389–392.
- Franke, T. 2004. *Afrothismia saingei* (Burmanniaceae, Thismieae), a new myco-heterotrophic plant from Cameroon. *Systematics and Geography of Plants* **74**: 27–33.
- Giovannetti, M. and Mosse, B. 1980. An evaluation of techniques for measuring vesicular-arbuscular mycorrhizal infection in roots. *New Phytol.* **84**: 489–500.
- Imhof, S. 2006. Two distinct fungi colonize roots and rhizomes of the myco-heterotrophic *Afrothismia gesnerioides* (Burmanniaceae). *Canadian Journal of Botany* **84**: 852–861.



Fig. 1. (A) *Thismia abei*; bar: 5 mm (B) Longitudinal section of *Paris*-type arbuscular mycorrhizal root of *T. abei*; bar: 50  $\mu$ m

- Jonker, F. P. 1938. A monograph of the Burmanniaceae. Meded.Bot.Mus.Herb.Rijks Univ. Utrecht. **51**: 1-279.
- Leake, J. R. 1994. The biology of myco-heterotrophic ('saprophytic') plants. New. Phytol. **127**: 171-216.
- Maas, P. J. M., Maas-Van De Kamer, H., Van Benthem, J., Snelders, H. C. M. and RübSamen, T. 1986. Burmanniaceae. Flora Neotropica Monograph **42**: 1-189.
- Maas-Van De Kamer, H. 1998. Burmanniaceae. Families and Genera of Vascular Plants, Monocotyledons, Lillianaes (Except Orchidaceae): 154-164.
- McLennan, E. I. 1958. *Thismia rodwayi* F. Muell. and its endophyte. Aust. J. Bot. **6**: 25-37.
- Merckx, V. 2009. Bias and conflict in phylogenetic inference of myco-heterotrophic plants: a case study in Thismiaceae. Cladistics **25**: 64-77.
- Merckx, V., Schols, P., Maas-Van De Kamer, H., Maas, P., Huysmans, S. and Smets, E. 2006. Phylogeny and evolution of Burmanniaceae (Dioscoreales) based on nuclear and mitochondrial data. Am. J. Bot. **93**: 1684-1698.
- Peterson, R. L., Massicotte, H. B., Melville, L. H. 2004. Mycorrhizas: Anatomy and Cell Biology. p. 59.
- Suetsugu, K., Kawakita, A. and Kato, M. 2008. Host range and selectivity of the hemiparasitic plant *Thisium chinense* (Santalaceae). Annals of Botany **102**: 49-55.
- Winther, J. L. and Friedman, W. E. 2008. Arbuscular mycorrhizal associations in Lycopodiaceae. New. Phytol. **177**: 790-801.
- Woodward, C.L., Berry, P. E., Maas-van De Kamer, H. and Swing, K. 2007. *Tiputinia foetida*, a new mycoheterotrophic genus of Thismiaceae from Amazonian Ecuador, and a likely case of deceit pollination. Taxon **56**: 157-162.
- 末次健司<sup>1</sup>・石田賢也<sup>2</sup>：タヌキノシヨクダイの新産地と菌根形態について  
タヌキノシヨクダイ科の植物は稀産であり目立たないものが多く、そのためその分布情報は極めて不足している。我々はタヌキノシヨクダイの新産地として神津島を報告する。またタヌキノシヨクダイの菌根を観察したところ、他の近縁種と同じく、侵入した細胞内でコイルを形成しつつ細胞から細胞へと侵入しながら広がるパリス型のアーバスキュラー菌根性であることが分かった。  
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