Volcanic sundews: an ecologically unique population of round-leaved sundews (*Drosera rotundifolia*) growing on an active volcano in Hokkaido, Japan

Ken Kwak • Hokkaido University • Sapporo • Japan • mackenziekwak@gmail.com

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Abstract: *Drosera rotundifolia* has one of the widest natural distributions of any carnivorous plant species, and is commonly associated with bogland habitats. New observations are presented of an ecologically unique population of *D. rotundifolia* growing on the gravely, poorly vegetated, slopes of an active volcano in Hokkaido, Japan. These field observations highlight the ecological plasticity of *D. rotundifolia* and indicate that under appropriate biotic and abiotic conditions, it can thrive in atypical habitats.

Field observations

Mount Tarumae (樽前山) (pronounced as Tarumae-zan in Japanese) is 1041 meters high and is an active andesitic stratovolcano. It is located in the Shikotsu-Toya National Park on the northern Japanese island of Hokkaido. It can be accessed from the prefecture's capital city Sapporo by car, which takes approximately 1.5 hours. The mountain is open to hikers and the summit can be reached in 60–90 minutes depending on fitness level. Mount Tarumae was formed approximately 9000 years ago and the last major eruptions occurred from 1978–1981 (Atunnisa & Ezawa 2019). However, the volcano still emits large volumes of observable gases particularly from the central lava dome which can be seen at the summit.

During a number of fieldtrips to Mount Tarumae in 2023 and 2024, a large population of *Drosera rotundifolia* were observed growing on the open, gravely slopes of the volcano between 630–850 meters elevation (Figs. 1-4). Flowering was observed in July and the plants remained active until October, when hibernacula were formed before they are blanketed in snow from November till April. Although the population of *D. rotundifolia* in Hokkaido typically produce long, erect petioles, the population on Mount Tarumae are noticeably more prostrate. To my knowledge, this is the first time this species has been observed growing, and indeed thriving, in a volcanic habitat.

Discussion

Within Japan, *D. rotundifolia* is widespread from the south-western island of Kyushu to the northern island of Hokkaido and further north into the Kuril Islands, Sakhalin, and Kamchatka. Kagawa (2023) lists it in Japan as growing in "marshlands, mountain forests, limestone areas, or even coasts in some cases". Although *D. rotundifolia* is mainly associated with bogs, it exhibits remarkable ecological plasticity in some places. *Drosera rotundifolia* has been recorded growing in/on sand dune valleys, silicate and dolomite rocks, clay mining areas, and on rotting logs (Baranyai & Joosten 2016). Soil pH is typically low (acidic) in places where *D. rotundifolia* grows. In the habitat it was observed on Mount Tarumae, the pH ranges from 4.44–5.39 (Atunnisa & Ezawa 2019). Interestingly,

Figure 1. The view from the summit of Mount Tarumae highlighting the loose, gravely soil and limited vegetation extending to the base of the volcano.

Figure 2. The lava dome at the summit of Mount Tarumae.

Figure 3. A thick patch of *Drosera rotundifolia* growing at approximately 700 m elevation on Mount Tarumae.

Figure 4. *Drosera rotundifolia* observed in early July preparing to flower on Mount Tarumae.

while *D. rotundifolia* is often associated with soils low in inorganic nutrients throughout its range, due to the volcanic nature of Mount Tarumae the soils there have significant levels of important nutrients including magnesium, calcium, potassium, phosphate, ammonia, and nitrate (Atunnisa & Ezawa 2019). The highly inorganic soils of Mount Tarumae are loose, gravely, and free-draining. This seemingly presents a major challenge for *D. rotundifolia* which is sensitive to desiccation. However, due to the high latitude of Hokkaido, the elevation of the mountain, and its close proximity to the ocean, it is cool and often blanketed in clouds and rain. The temperature on the mountain, even in summer, is often fairly low (<30°C) and although the high winds undoubtedly drive transpiration stress, the cool temperatures and regular rain and fog likely buffer the *D. rotundifolia* population there from extreme desiccation. Chorologically the Japanese distribution of *D. rotundifolia* roughly matches the ranges of *Pinguicula vulgaris* s. lat. incl. *P. macroceras* and *Utricularia vulgaris* s. lat. incl. *U. macrorhiza*, two further circumboreal carnivorous plant species that probably migrated to Japan from the north with cool periods relatively recently during the Ice Ages. The respective habitats of these rapidly spreading species reflect their individual ecological plasticity. The adaptability of *D. rotundifolia* enables this species to thrive in high mountain habitats south of Japan including the Philippines and New Guinea (Fleischmann 2021).

References

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