Ecology of the Yakusugi

Yakusugi is the name given to *sugi* (Japanese cedars; *Cryptomeria japonica*) on Yakushima that are over 1,000 years old; younger trees are called *kosugi*, meaning child *sugi*. The Jomon Sugi, discovered in 1966, is the largest known *yakusugi*, with an estimated height of 25.3 meters and a trunk circumference of 16.4 meters. It is thought to be at least 2,170 years old according to a 1984 study. Harsh growing conditions, including a thin, one to two-meter soil layer low in nutrients, have contributed to the wide spread of the tree's roots.

Growing Conditions

Yakushima is formed largely of granite, and only a thin topsoil covers the bedrock. *Yakusugi* are rooted in this granitic soil and grow extremely slowly due to the soil's low nutrient content. Heavy rainfall and high humidity also reduce photosynthesis, resulting in annual growth rings that are spaced closer together than those of mainland Japanese cedar. Slow growth increases the tree's durability and leads to a higher resin content, which in turn makes the tree less prone to decay, helping it live longer. Moss growing on the *yakusugi* absorbs and supplies water to the tree, which compensates for the limited water obtained through its root system.

Forest Regeneration

Japanese cedars cannot sprout where forest floors are deeply shaded; instead, they grow in sunlit places, for example where trees have fallen due to a landslide or typhoon. Cedar seeds that drop from surrounding trees on stumps of fallen trees often germinate in a process known as nurse-log regeneration, in which the fallen trees actually provide more nutrients than ground soil, enabling substantial growth. The Nidai Osugi (Two-Generation Great Sugi) at Shiratani Unsuikyo Ravine is an example of a new cedar that has grown on top of the roots of a giant hollow nurse log; the second-generation tree towers over an impressive spread of thick roots.

New cedars also grow on the stumps of logged trees, in a process known as stump regeneration. Some stump-regenerated trees on Yakushima date as far back as the Edo period (1603–1867). The Twins Sugi, found in Yakusugi Land, is an example of two young cedars of similar thickness growing on a single stump. The Sandai Sugi (Three-Generation Sugi) along the Anbo Trail exhibits both nurse-log and stump regeneration. After a first-generation tree fell around 2,000 years ago, a second-generation tree grew on top of it, then was cut down when it was 1,000 years old. The third-generation tree now growing on the stump is about 500 years old, sustaining a life cycle that has

continued for some 3,000 years. Trees from the first two generations have not rotted away completely. The enlarged roots belong to the second-generation tree, while the large hollow remains are from the first-generation tree. The Sandai Sugi demonstrates how several trees can be tangled together yet remain distinguishable, with moss-covered older trees showing their age while newer trees exhibit their youth with new growth.

Epiphytes

Japanese cedars offer excellent breeding ground for epiphytes—plants that grow on another plant rather than on the ground—thanks to the rain and a moss cover that provides moisture and nutrients. The Jomon Sugi alone nurtures 13 plant and tree species, including cherry rhododendron, Keisuke rhododendron, trochodendron, Japanese cedar, and mountain ash. It is common for plants to attach to one another in this manner but not for trees; thus the epiphytes in Yakushima are an unusual phenomenon.