

Revealing the History of Akita-sugi forest by Pollen Analysis on Lake Ichi-no-Megata, Akita Japan

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Akita-sugi (Akita Japanese cedar: *Cryptomeria japonica*) forest is considered to be one of the most beautiful forests in Japan. It has a long history of utilization and during the history, the forests were exploited severely and now a part of forests is conserved. It is said that the forest of the Tohoku area including Akita prefecture had been logged by AD1700. Deforestation was caused not only for timbers but also for reclamation of land. Although the coverage of forest in Akita prefecture is over 60%, natural forests of Akita-sugi cedar forests are now remained and preserved in small areas, e.g. Nibetsu in Akita city. Recently annual laminated sediments have drawn attention and the analyses of them have made possible to understand the detail of environmental changes. In this study, the pollen of annually laminated sediment core from Ichi-no-Megata Lake in Oga peninsula, Akita was analysed to understand the history of Akita-sugi cedar forest.

Lake Ichi-no-Megata is located in Oga peninsula, Akita prefecture. The climate of the region is on the boundary of cool temperate and warm temperate region. The vegetation of natural forest is summer green broad-leaf forest dominated by *Fagus crenata*, but now it is substitutional community in *Fagus crenata* region and the area is mainly occupied by secondary forest of *Quercus serrata*, plantation of *Pinus densiflora*, *Cryptomeria japonica* (sugi cedar), *Chamaecyparis obtusa* (hinoki cypress) or cultivated land due to the human activity from the old time. Over 150 archaeological sites from Jomon to Yayoi period has been identified in Oga peninsula. An oral tradition and historical records indicate that human beings have been involved in the vegetation change around the area from the ancient time.

Coring campaign was conducted in 2006. An absolutely continuous core (IMG06) was taken. About 30,000 years of sediment was recovered. Age-depth model was drawn based on 74 plant macrofossil samples dated by an accelerator mass spectrometer (AMS) at the Poznan Radiocarbon Laboratory and tephra. Pollen samples taken every about 5-10 years excluding turbidite layers. We focused on the top part, about last 4000 years in this study. Pollen was extracted and was examined and then, the percentages of these pollen sums were calculated based on the total of terrestrial pollen and then percentage pollen diagrams were constructed. Pollen concentration (grains/cc) diagrams were also constructed based on the added and counted marker grains.

Dominant pollen taxa were *Cryptomeria* and *Fagus crenata* type by AD1150. The first increase of *Cryptomeria* was detected around 1500BC. Akita-sugi forest has been established from this time. At that time, the vegetation was mixed with deciduous trees, mainly *Fagus crenata*. *Cryptomeria* pollen was the most abundant in AD100-AD1000. During 12th century, the main deforestation activity was observed. Gramineae and *Artemisia* pollen increased in both percentages and concentration. It indicates that land reclamation for rice paddies occurred. Still *Cryptomeria* forest was mixed with deciduous trees and in 16th century, forest resources were exhausted. Entering Edo period, mine development was active. These were recorded in pollen. After that, forest was conserved by law. However until 19th Century, *Cryptomeria* pollen was low in both percentages and concentration. There was severe famine caused by Little Ice age during 18th century. In addition, trees were harvested when big fires occurred in Edo. These events seemed to prevent from the recovery of forests. After the severe famine periods, conservation activity was high and plantation of *Cryptomeria* occurred, but deciduous elements in the forests have much less than before. The landscape has changed completely by deforestation and plantation during the historical time.

Keywords: Ichi-no-Megata, pollen analysis, deforestation