

BIOLOGICAL DIVERSITY OF PLANTS AND HUMAN ACTIVITIES FOR IMPROVING  
THE ENVIRONMENT IN THE SUBURBAN COPPICE FIELDS  
A CASE STUDY IN OAOTA FOREST

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ABSTRACT

The suburban coppice fields have been interacted with local people for a long time in Japan. Farmers in Japan have thinned and mowed in Satoyama since the *Jomon* era (Tsuji, 1997). Satoyama means “mountains close to villages”, and it is called as a place where the coppice fields exist (Arioka, 2004; Tanaka, 2011). However, vegetation on the forest floor has changed because the local people became less interacted with the Satoyama after 1960s when they started to rely on the crude oils for their energy source and chemical fertilizer for their compost. Suburban forest area has decreased as humans increase in population and develop land (Hamahashi, 1980; Saito et al., 2003; Nakashizuka and Iida, 1996). As a result of the social change in the interaction between the suburban coppice fields and humans, species diversity of plants decreased. For example, an introduced species, *Pleioblastus chino* (Bamboo), dominates the other diverse plant species. Moreover, *Polygonatum involcratum*, *Cephalanthera falcata* and *Ajuga nipponensis* those grow in the coppices where local farmers used to thin and mow became rare species and are under the threats of extinctions.

The extinction of diverse endemic plants causes problem for other creatures' survival, because insects and animals lose their foods. For example, the parent birds must fly further away from their nest to find and catch worms. Moreover, when rare species become extinct local people lose their tradition and kinship with them. For example, the *Polygonatum involcratum* is called “*Waniguchisou*” in Japan, named after a pray foyer of shrine, because its flower and fruit look like the pray curtain and the bell. Thus, maintaining human interaction with coppice fields is important for biodiversity conservation and living humanity. With this in mind, volunteers restarted the Satoyama activity such as thinning and mowing.

The purpose of this research is to examine the changes of ground flora in suburban coppice fields after the volunteer Satoyama activity. The hypothesis of this study was that the biodiversity of plants would increase as a result of Satoyama management. Moreover, rare plant species that sleep in the seed bank germinate supported by the improvement of the forest floor environment. Thus, there are two study objectives. 1) To clarify the biodiversity of plants after volunteer Satoyama activities and its changes from 2011 to 2013. 2) To clarify the characteristics of habitat environment of diverse plant species in Oaota forest and rare species *Polygonatum involcratum*.

This research area is in Oaota forest. Oaota forest is the largest secondary forest in Kashiwa city, Chiba prefecture in Japan (Fukushima and Takahashi, 1896). Kashiwa city is the suburb of Tokyo and it increased its population rapidly since 1995 (*Kashiwa-shi kokusei*

*chosa* [census], 2012), and it is the second city that decreased the forest area the most from 2004 to 2010 in Tohkatsu area (*Chibaken Shinrin Ringyo Tokeisyo* [statistics], 2012). NPO Chiba Satoyama Trust has conducted Satoyama activities cooperating with the University of Tokyo since 2011.

This research was conducted using two methodologies. One is the plant survey and the other one is the habitat environment survey. The experimental plots were set in the Oaota forests in 2011 (Table 1). The survey objectives were the plants whose heights are less than 130 cm. The overall coverage was measured in each small plot. The coverage and the maximum height of each species were measured for the all individual species.

The habitat environment survey was conducted in both Oaota forests and the habitats of *Polygonatum involvratum* in Kashiwa city. The canopy openness (%) and the soil water content (%) were measured.

The diversity index increased in all plots of different vegetation types of broad-leaved deciduous forest, coniferous mixed forest, and *Pleioblastus chino* plain. Especially in woodland plots, it increased in the third year after the Satoyama management.

Species richness in each plots from 2011 to 2013 showed that the species richness in *Pleioblastus chino* bush area that was mowed increased greatly since 2011. Contrary, the control plots remained the smallest. In the woodland plots, both Satoyama management and unmanaged control plots had the same change pattern.

Species composition showed that turnover of species was greater in the first period (2011-2012) than in the second period (2011-2013). What is more, the share of life forms for appeared species showed that more variety of life forms appeared in the first period than in the second period. A rewarding result was that some rare species, *Cephalanthera falcata* and *Ajuga nipponensis*, appeared as a result of the volunteer Satoyama management.

The relative dominance in Satoyama management plots have increased more in 2013 than that in 2012 and 2011. In control plots, however, it decreased over the three years except in one plot B2.

The habitat environment survey in Oaota for species diversity found that mean canopy openness is larger in Satoyama activity plots than that in control plots. The activities improve the light condition of forest floor. The characteristics of habitat were revealed that *Polygonatum involcratum* inhabited in the coppice of dark and tree-shaded area. The observation found that *Polygonatum involcratum* inhabited along pathways where growth of *Pleioblastus chino* was suppressed, and grew with diverse species next to each other.

Therefore, the hypothesis was verified in this study. The volunteer Satoyama management plays an important role in maintaining the species diversity of plants and conserving rare species. The habitats of *Polygonatum involcratum* and some rare species have interaction with humans care and passes.

*Key words:* Biodiversity, Species diversity of plants, Satoyama, Suburban coppice field