

A natural disaster can be a factor of landscape change? –with special reference to Lake Kitagata in Awara, Fukui, Japan

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The change of landscape might be caused by the combination of climate change, human activities, natural disasters, etc. Many human activities transformed the landscape during historical period. Lake Kitagata is located in Japan Sea coastal area, central Japan, and is surrounded by sand hill, coastal terrace and flat plain. Many archaeological sites including a salt production site are distributed around the areas. In the flat plain, major land transformation to agriculture is recorded in the early 12th century AD. Considering the impact of tsunami in Tohoku area, natural disasters have also influenced the surrounding vegetation and landscape. Several tsunamis were recorded in Japan Sea coastal area during historical period, and the Tensho Tsunami which might influenced the area occurred in AD1586. A crop failures and consequent peasant uprising due to salt damage and typhoon was also recorded in AD1712. However, the damages from them are unknown. Five sediment cores were recovered from Lake Kitagata. We sub-sampled for pollen analysis from three cores, and analyzed the samples, in order to reveal the landscape change around Lake Kitagata.

Based on the pollen analysis, the land including plain area were covered with dense forests of evergreen oak and *Castanopsis*. Salt making caused a deforestation in plain area and around the 12th century when land transformation to agriculture occurred, paddy fields seems to be developed in the deforested area for salt making around Lake Kitagata. Buckwheat has been cultivated intensively since the late 13th century AD when the Little Ice Age started in Japan. The development of pine forests dates back to around the 17th Century AD. Before this, the area was spotted with few trees especially in plains and ferns grew thickly in the river mouth of Daishoji River. It seems that the surrounding vegetations have transformed to Japanese cedar and evergreen forests recently.

During this succession, natural disasters seemed to change the vegetation. One may be in response to Tensho Tsunami in 1586. Almost all pollen taxa decreased but *Pinus* subgen. *Diploxylon*. In this time, salt damage might not happen since Chenopodiaceae which has salt tolerance did not increase. Another one was observed in the late 17th century AD. It seems that the vegetation was damaged by salt. Large amount of Chenopodiaceae pollen was observed in this period. A peasant uprising which was caused by crop failures due to salt damage and typhoon was recorded in AD1712. However, the vegetation was soon recovered. Although an impact from disasters on vegetation was observed, it did not last long. Human activities and climate seems to be much bigger factors.

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