

論文名 : **The effects of maintenance and loss of open-water habitats on avian diversity in mountainous agricultural regions with heavy snowfall: Comparison of cultivated rice paddy, pond, and abandoned rice paddy at the spatial and temporal scales.** (要約)

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(以下要約を記入する)

1. In Japan, known as one of “biodiversity hotspots” in the world, the government established the “National Biodiversity Strategy of Japan 2012–2020” in 2012 considering the importance of biodiversity conservation. Mountainous agricultural regions (“chu-sankanchi” in Japanese) that cover about 70 % of the national land and about 40 % of arable lands of Japan are essential for biodiversity conservation in Japan. In mountainous agricultural regions, open-water habitats for birds provided by cultivated rice paddies have changed into grasslands, shrub lands, or woodlands and have decreased owing to rice paddy abandonments caused by aging farmers and depopulation. These phenomena have severely proceeded in heavy snow regions that include the moat area of the mountainous agricultural regions of Japan, although specific bird species such as yellow bunting *Emberiza sulphurata* and ecosystems have been retained. Therefore, environment change owing to paddy abandonment would immediately affect biodiversity and specific ecosystems in the mountainous agricultural regions with heavy snowfall. Ponds in agricultural areas are also important components to supply aquatic habitats for birds, and then enhance habitat heterogeneity.

However, the impacts of ponds on avian diversity have not been understood well in the agricultural landscape compared that of rice paddies.

2. In this study, I investigated the effects of the maintenance and loss of open-water habitats on avian species diversity compared to that in cultivated rice paddy, pond, and abandoned rice paddy at both spatial and temporal scales in mountainous agricultural regions with heavy snowfall.
3. I found that rice paddy abandonments replaced open land species with bush or woodland ones along successional stages of vegetation, although they enhanced species richness. Moreover, yellow buntings, which are one of the threatened bird species, were frequently observed in abandoned paddies that act as a secondary habitat. Conversely, ponds significantly contributed to species richness of water birds. Although large differences were not found among each land use, avian diversity (abundance and species richness) remarkably changed across seasons.
4. At the spatial scale, almost all land uses (cultivated paddy, pond, and abandoned paddy with less successional stages such as a grassland or bush) except for abandoned paddies with more successional stages such as woodlands could enhance beta diversity (difference of species composition among land uses) and thus the gamma diversity of mountainous agricultural regions with heavy snowfall. With regard to temporal species diversity, beta diversity (difference of species composition among seasons) rather than alpha diversity could enhance the gamma diversity (species diversity across a year) in the study region. Moreover, gamma diversity, which indicates species diversity in the entire study region, would temporally change owing to the

temporal changes in species diversity in each land use (alpha diversity) or among land uses (beta diversity).

5. Conservation of avian diversity in mountainous agricultural regions with heavy snowfall requires the maintenance or enhancement of gamma diversity of this region by combining various types of land uses considering pond management and utilizing abandoned paddies account. Continuous monitoring is also needed to save temporal species diversity from threats such as climate change and mass-capture of migratory birds via illegal trapping. Misinterpretation of results obtained from snapshot surveys should be avoided by assessing species diversity across not only a single season but also several seasons, wherein species composition might remarkably differ in the future.

Keywords: alpha diversity, beta diversity, bird community, gamma diversity, species diversity