

Change in diversity and structure of ground arthropod communities during the restoration of satoyama in Kanazawa with special reference to ground beetles (Coleoptera:Carabidae)

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学位授与の題目	Change in diversity and structure of ground arthropod communities during the restoration of satoyama in Kanazawa with special reference to ground beetles (Coleoptera: Carabidae) (金沢の里山の再生過程における地表性節足動物の多様性と群集構造の変化, 特に地表歩行性甲虫類 (コウチュウ目: ゴミムシ科))
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Summary

“Satoyama” is a common Japanese traditional rural landscapes characterized by an environmental mosaic, consisting of various types of habitats such as secondary forests, grasslands, ponds, creeks, paddy and other farmlands. However, most of satoyama areas have been abandoned and destroyed due to the industrialization and westernization in Japan. Recently, aged society and depopulation have also become serious problem, giving raise to the expansion of abandoned areas in satoyama landscapes. The “satoyama problems” have resulted in the loss of biodiversity. Therefore, the conservation of the existing satoyama areas and the restoration of the abandoned ones have been major efforts to restore biodiversity in Japan.

The restoration activities undoubtedly alter the environment and affect the flora and fauna to some extent. In order to monitor the effect of the restoration of satoyama on biodiversity, we conducted a study using arthropods and carabids. Arthropod was selected due to their high species diversity, great biomass and high trappability. As for species level analysis, carabids were selected because they are sufficiently varied taxonomically, abundant, and sensitive to anthropogenic disturbances to be a reliable monitoring group. This study was conducted using pitfall traps in a satoyama area in

Kanazawa, covering various natural and semi-natural habitats. The sampling period spanned from May to November in 2004 and 2005.

The arthropod communities collected from different habitat types found in satoyama, could be categorized into (1) those preferring wetland and (2) those associated with non-wetland (forest, sasa, forest edge and grassland) habitats. The level of soil moisture and litter thickness are likely to contribute to their habitat preference. There was no significant difference in abundance and taxal diversity and composition between restored and non-restored wetlands, possibly reflecting the high similarity in habitat conditions as well as the lack of sensitivity of high taxonomic level analysis. Nevertheless, studies on higher taxonomic levels can at least provided the basic information on the arthropod communities that may give early indications of robust or sensitive taxa. Management activities during the restoration apparently resulted in drier and more open habitat. Therefore, in the scheme of biodiversity conservation, taxa that provide the indication of sensitivity to desiccation and exposure should be taken into consideration in determining the course of management activities during the restoration.

In addition to different habitat preference, some carabid species response clearly to the changes due to the restoration, which in turn caused the change in species composition. Smaller beetles with good dispersal ability predominated the restored wetland, reflecting the characteristic of disturbed habitat. Very large wingless beetles were collected in relatively high abundance in non-restored wetland, indicating the ongoing succession from paddy field to forest.

Despite their sensitivity to anthropogenic disturbance and fragmentation, the number of carabid species collected in restored wetland is slightly higher than that in non-restored area. The added potential habitats for carabid species from the

establishment of ponds and paddy fields in the restored area may contribute to higher species richness. The high connectivity between restored areas and the surrounding forests, as well as the presence of field margin or refuge, is likely to enhance diversity of carabids in the restored area.

Effects of red-pine forest management for matsutake mushroom production on invertebrate communities were also studied using four sampling methods: window and pitfall traps, and sampling of litter and soil. Samples were collected from the "managed site" and from the surrounding "control site" without management. Total number of individuals collected, were significantly lower for pitfall trap and higher for litter sampling in the control site than in the managed one. Management significantly reduced the diversity of higher taxa in litter samples in the managed sites. DCA analysis of revealed the difference in faunal composition of higher taxa between the two sites.

学位論文審査結果の要旨

本研究では、里山の小無脊椎動物の生物多様性と群集構造に関して、特に里山再生過程（第1部では棚田復元、第2部ではマツタケ山再生）における変化に注目して、野外調査を実施した。

（第1部）金沢大学角間キャンパス内の里山ゾーン内のコナラ林、モウソウチク林、スギ林、棚田の復元地、草地等において、地表歩行性の小無脊椎動物、特に地表歩行性甲虫類（コウチュウ目：ゴミムシ科）に注目し、落とし穴トラップを用いて、2004年と2005年の5月～11月まで月1回採集した。ゴミムシ類を対象とした解析の結果、（1）生息環境による種類構成の差が明瞭に検出された。（2）棚田復元作業により種類構成、個体数にはっきりした差が生じ、小型で飛翔力のある種が増加した。

（第2部）珠洲市のマツタケ山再生地において、管理作業地と放置区の無脊椎動物相を4種類のサンプリング法（落とし穴法、ウィンドウトラップ、リターと土壌からの採集）を用いて2005年9月に調査した。その結果、（1）管理作業による影響の受け方は、地上部を利用する分類群と地表の落ち葉や土壌を利用する分類群で大きく異なった。（2）管理されたアカマツ林では、落ち葉かきと下草刈りの結果、トビムシ類やダニ類など分解者の生息数が非常に少なかった。

本研究は、里山の生物多様性に関する重要な新知見を多数含んでおり、本委員会は博士（学術）に値すると判断した。