

A Study on the Change of Birds Community in Gyeongju National Park

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Abstract: This study examined birds community distributed in the forest and the surrounding areas from July to December, 2011 targeting 5 areas including Namsan area (21.00 km²), Tohamsan area (76.95 km²), Seoak area (4.30 km²), Hwarang area (3.90 km²), and Sogeumgang area (6.8 km²) which are designated as Gyeongju National Park. As a result of examination, observed birds are total 5,060 individuals from 11 orders, 30 families and 71 species, Tohamsan area and Namsan area recorded the most species, 43 species respectively. The number of individuals are the most in Namsan area (1,678 individuals), followed by Hwarang area (1,178 individuals), Sogeumgang area (1,082 individuals), Tohamsan area (741 individuals) and Seoak area (382 individuals). Dominant species included *Corvus frugilegus* (19.37%), *Streptopelia orientalis* (11.40%), *Passer montanus* (9.51%), *Paradoxornis webbianus* (7.69%), *Pica pica* (6.11%), *Anas platyrhynchos* (6.01%) and *A. poecilorhyncha* (5.83%). Tohamsan area which recorded the biggest number of species showed the highest species diversity (2.91) and species richness (6.36), and Sogeumgang area which had the smallest number of species and *Corvus frugilegus* as an extremely dominant species showed the lowest species diversity (1.35) and species richness (3.29). The number of species of birds observed in each area in each season was the most in summer (47 species), 44 species in winter and 31 species in autumn, the least.

Keywords: Dominant species, Species diversity, Species richness, Namsan area, Tohamsan area

Introduction

Gyeongju National Park is located in the downtown of Gyeongju-si or the surrounding area unlike other national parks, and was designated as a national park on December 31, 1968 focusing on historical sites with historic and cultural values. Also, it was designated as World Heritage by the UNESCO on December 2, 2000, being acknowledged with its value as the world heritage which should be preserved by human kinds.

However, as Gyeongju National Park is located in the city unlike other mountain-type or ocean-type national parks and has lots of historical spots around the park, it gives more meanings to historical and cultural values and protection rather than the value of natural resources such as natural landscape or habitats for wild animals and plants (Gyeongju City, 2005). As for investigations on birds community in this area until now, Paek (1997) examined the bird fauna during spring and autumn, Gyeongju City (2005) during summer and Paek *et al.* (2007) during spring and summer, and as for investigations during winter, there is only a material of census of birds in winter conducted by the Ministry of Environment (2004, 2005) focusing on Deokdongho

and Bomunho Lake.

This study was conducted to predict changes in this natural ecology by figuring out a biota in the Gyeongju National Park through a common ecological investigation as a part of comprehensive academic examination in summer by the subcommittee for national park and reservations of the Korean Society of Environment & Ecology and to use the result as the basic materials for establishing a plan for managing and preserving cultural heritages and natural ecology of the Gyeongju National Park.

Materials and Methods

Overall Condition of the Survey areas

This study investigated birds community distributed in the forest and the surrounding areas from July to December, 2011 targeting 5 areas including Namsan area (21.00 km²), Tohamsan area (76.95 km²), Seoak area (4.30 km²), Hwarang area (3.90 km²), and Sogeumgang area (6.8 km²) which are designated as Gyeongju National Park. The investigating site, Gyeongju National Park is located between 35°39' and 36°04' north latitude and between 128°58'~129°31' east longitude, and corresponds to the southern part of the temperate climate regions. Generally, Tohamsan area is composed of oak trees including *Quercus serrata*, *Q. variabilis* and *Q. mongolica*, and mainly *Pinus densiflora* are distributed in Namsan, Seoak, Hwarang and Sogeumgang

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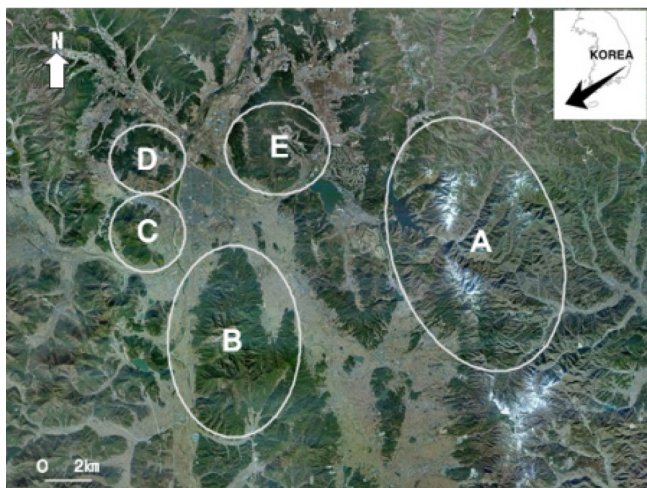


Fig. 1. The location map of the survey areas in Gyeongju National Park (A: Tohamsan area, B: Namsan area, C: Seoak area, D: Hwarang area, E: Sogumgang area).

areas (Gyeongju City, 2005). Also, Hyeongsangang (River) is located adjacent to Namsan, Seoak and Hwarang areas, and Bohumho Lake is included to Sogumgang area and Deokdongho Lake to Tohamsan area.

Investigation Method

Birds community was investigated in a line transect census (Bibby *et al.* 1992) along the forest roads and trails in 5 areas of the Gyeongju National Park, and in a point census distinguish bird species and calculated the number of individuals using binoculars (Nikon 10×50) through observation with the unaided eye and by listening to birds' cry, and recorded the observed points using GPS (Gamin 60CS) for arranging and analyzing data.

The result was divided and arranged by each area according to Won (1981)'s Illustration flora & fauna of Korea. vol. 25 avifauna, and A Field Guide to the Birds of Korea (Lee *et al.*, 2000).

Analyzing Method

As for analyzing birds community, dominance based on Brower *et al.* (1990), species diversity of Weaver (1949) and species richness of Marglef (1963) were used.

$$Dom. (Dominance, \%) = (ni/N) \times 100$$

ni: Number of birds belonging to *i* species

N: Total number of birds

$$H' (\text{Species diversity}) = -\sum (ni/N) \times \ln(ni/N)$$

ni: Number of birds belonging to *i* species

N: Total number of individuals in the area

$$Da (\text{Species richness}) = (s-1)/\ln(N)$$

s: Total number of species

N: Total numbers of individuals observed

Results and Discussion

Characteristics of Birds Community in Each Areas

As a result of investigating birds in 5 national park areas including Tohamsan area, Namsan area, Seoak area, Hwarang area and Sogumgang area of the Gyeongju National Park from July to December, 2011, observed birds are total 5,060 individuals from 11 orders, 30 families and 71 species (Table 1). Tohamsan area and Namsan area recorded the biggest number of species, 43 species respectively, followed by Hwarang area (37 species), Seoak area (25 species) and Sogumgang area (24 species). The number of species appearing in Tohamsan and Namsan area having a large extent was high. It corresponded to the result of Park and Choi (2005) suggesting that the extent of city forest has a high correlation with the number of species. The number of individuals was the highest in Namsan area (1,678 individuals) showing high density of *Streptopelia orientalis* and *Corvus frugilegus* which are mainly observed around farmland, followed by Hwarang area (1,177 individuals) where a group of Anatidae appeared in Hyeongsangang (River) in winter and Sogum area (1,082 individuals) where a large group of *Corvus frugilegus* appeared around wide farmland in winter. The number of individuals was the lowest in Tohamsan area (741 individuals) and Seoak area (382 individuals) (Table 1).

Dominant species include *Corvus frugilegus* (19.37%), *Streptopelia orientalis* (11.40%), *Passer montanus* (9.51%), *Paradoxornis webbiana* (7.69%), *Pica pica* (6.11%), *Anas platyrhynchos* (6.01%), and *A. poecilorhyncha* (5.83%) (Fig. 2). Dominant species in Namsan area include *Streptopelia orientalis* (31.76%), *Corvus frugilegus* (14.30%), *Passer montanus* (9.83%), *Paradoxornis webbiana* (9.18%) and *Anas platyrhynchos* (5.24%), mainly species living in large-sized farmland, grassland and bushes. *Anas platyrhynchos* stay over the coldest season around Hyeongsangang (River) adjacent to Namsan area. Dominant species in Tohamsan area include *Passer montanus* (13.09%), *Pica pica* (12.15%), *Emberiza elegans* (10.66%), *Anser fabalis* (10.26%), *Hypsipetes amaurotis* (8.37%) and *Paradoxornis webbiana* (8.10%), mainly species living in large-sized farmland, grassland and bushes. *Anser fabalis* stay over the coldest season around Deokdongho Lake. Dominant species in Hwarang area include *Larus ridibundus* (18.52%), *Anas poecilorhyncha* (14.70%), *Anas platyrhynchos* (14.19%), *Anas crecca* (13.08%), *Paradoxornis webbiana* (9.35%)

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