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Bird Diversity of Gokdudo · Daehangdo · Mokdo Islands in Dadohaehaesang National Park of Korea

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Abstract: As a result of conducting the study on the current state of bird diversity living in specific islands (Gokdudo, Daehangdo and Mokdo) twice for two days each on June and September, 2012, total 30 species, 184 birds were observed. As for each island, 8 species, 79 birds were observed in Is. Gokdudo, 17 species and 46 birds in Is. Daehangdo, and 20 species and 59 birds in Is. Mokdo. The most dominant species was *Apuspacificus* in the whole areas, total 58 birds (31.5%) were observed. In analysis of ecological index, species diversity was 2.62, species evenness was 0.77 and species richness was 5.56, and as for protected species, 3 species of natural monuments, two species of endangered wildlife class II and one kind of vulnerable species of the International Union for Conservation of Nature were recorded.

Keywords: Gokdudo Island, Daehangdo Island, Mokdo Island, bird, diversity

Introduction

As birds have wings unlike other animal taxonomic groups and move to another habitat when their living conditions are degenerated, birds are used as an index for figuring out the inhabiting environment of each area. Also, as islands are far away from land and there are relatively few predators such as mammals, they provide a place for birds to breed or relax by stopping over on their way during the movement (Kwon *et al.,* 2007). It would be possible to check whether there is a certain problem or not when a specific population rapidly increases or decreases (NPMBC 2007). Islands located in Daedohaehaesang National Park have excellent national ecosystem, topography, geological features and natural environment, they are designated as a specific island (Gokdudo, Daehangdo and Mokdo) by the Minister of Environment according to the Article 4 of the special law on the preservation of the ecosystem in island areas and the Article of the enforcement ordinance of the same law. The reason for designation is that they have excellent geographical landscape, lots of marine biota. Especially, Is. Gokdudo and Is. Daehangdo develop evergreen broad-leaved forest very much, Is. Mokdo has excellent vegetation on the rock, and falcons live in Is. Gokdudo which belong to the 1st class of endangered wildlife designated by the Ministry of Environment (NE 2000). There are survey reports to examine birds in these areas including the 2nd Korean Nationwide Survey on Natural Environments (1997) and a survey report on the current condition of winter birds' living in Jeonnam area (2001) and a report surveying the natural ecosystem in specific islands in Goheung-gun. However, the purpose of this survey is to be used as basic materials for planning management and preservation of the national parks in the future in changes in bird diversity, living in deserted islands and specific islands in changes in bird species in the ecosystem after about 10 years from existing literature materials.

Materials and Methods

The survey was conducted twice for two days on June and September, 2012. As for a survey method, both a scanline survey and a point survey were conducted in each surveyed area, and species appearing, the number of birds and the possibility to breed was figured out. Exact locations of the point-surveyed areas, appearing birds, an area where appearance of specific species and breeding was confirmed and areas having high potential were figured out using GPS. The observation was arranged with the unaided eye, telescopes (Swarovski x20-60) and binoculars (Nikon 8×35), and species were distinguished based on the flying type and birds' cry. Birds' movement referred to Lee *et al*

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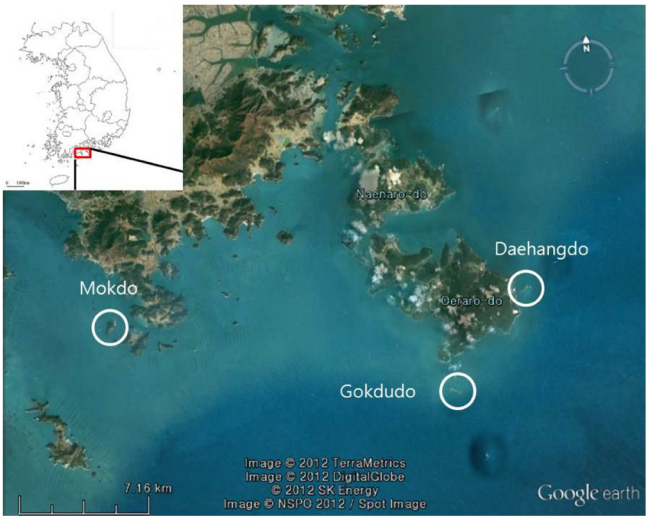

Fig. 1. Map of the survey areas (Gokdudo · Daehangdo · Mokdo Islands)

(2000), and scientific names and English names referred to the bird list of Howard & Moore (2003) and Clements (2000).

Dominance Index: D.I

It is an index deduced from an aspect that as a specific species shows dominance when the changes in environment are degenerated, it can be used as a clear index toward the changes in environment by calculating a relative proportion of a certain dominant species in the community (McNaughton, 1967).

$$DI=ni/N$$

DI: Dominance index
N: Total number of birds
ni: The number of birds in the ith species

Biodiversity Index: H'

It means relative balance between species richness and the number of birds in an animal group, a value to represent the complexity of the group, and is calculated by using Shannon & Weaver function (Pielou, 1966) induced by the information theory of Margelef (1968).

$$H' = -\Sigma(ni/N)\ \ln(ni/N)$$

ni: The number of birds in each species
N: Total number of birds
ln: Natural logarithms

Evenness Index: J'

Evenness is expressed as a proportion of actual figures about the maximum figures of each index. As each evenness index reaches its maximum when the number of all species in the group is the same, the evenness index means the degree of evenness of species composition in the group, calculated by using a formula of Pielou (1975).

$$J' = H'/Ln(S)$$

S: Total number of observed species
H': Species diversity
Ln: Natural logarithms

Richness Index: eH'

Richness index expresses the state of a group only with total number of birds and total number of species, and assumes that as the composition of species becomes richer with higher index value, it means good environment. Richness index was calculated by using an index of Margalef (1958).

$$eH' = (S-1)/Ln(N)$$

eH': Richness
S: Total number of species
N: Total number of birds

Results and Discussion

Avifauna

As a result of the survey, total 30 species, 184 birds were observed in 3 specific island areas. As for each island, 8 species and 79 birds were observed in Is. Gokdudo, 17 species and 46 birds in Is. Daehangdo and 20 species and 59 birds in Is. Mokdo. The most dominant species in the whole areas was *Apus pacificus*, accounting for 31.5% (58 birds), followed by *Microscelis amaurotis* (19 birds accounting for 10.3%), *Monticola solitarius* (17 birds accounting for 9.2%) and *Parus ater* (12 birds accounting for 6.5%), recorded as top 5% of dominant species. In analysis of ecological index, biodiversity was 2.62, evenness was 0.77, and richness was 5.56 (Table 1).

Comparison of the current state of birds between each island

Among three islands including Gokdudo · Daehangdo · Mokdo Islands, the most species (20 species) were recorded in Is. Mokdo, and the biggest number of birds (79 birds) waw recorded in Is. Gokdudo (Figure 2). Species diversity was the highest in Is. Mokdo (2.66) and 2.58 in Is. Daehangdo, but Is. Gokdudo recorded the lowest species diversity (1.06). Evenness was 0.91 in Is. Daehangdo, close to 1, showing the evenest tendency in the number of birds of appearing species, and it was the lowest in Is. Gokdudo (0.51). It is judged that this is because the number of *Apus pacificus* observed in Is. Gokdudo recorded the number of birds recorded as the most dominant species. Species richness was 4.66 and 4.18 in Is. Mokdo and Is. Daehangdo respectively, showing similar level, but it was 1.60 in Is.