

# Analysis of the Avian Biodiversity in Qingliang Mountain Area in spring

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**Abstract**— *The Qingliang mountain area located in the downtown of Nanjing, there were plenty of botany species in Qingliang Mountain Area, such as forest, bamboos and grasslands, the environment was good habitat to avians. In this paper, avian resource of Qingliang mountain area was studied, 11 species was watched which belonging to 2 Orders and 7 Families. 2 summer breeding birds and 9 resident birds were recorded, 4 species were oriental realm birds, 2 species were palaeartic realm birds. The Shannon-Wiener Index was 1.6869, The Pielou Index was 0.3055, and The G-F Index was 0.2261. The feeding condition and safety condition affects the biodiversity of avian of Qingliang mountain area.*

**Keywords**— *Avian Biodiversity Qingliang Mountain.*

## I. INTRODUCTION

Zhang Xiulei (2006) investigated the bird composition and population number of Mamize Nature Reserve in Sichuan, and recorded a total of 105 species, 7 orders, 23 families, and 1948 of birds, including 6 species of the national protected birds, 7 species of unique birds in China [1]. Birds' areas are mainly composed of oriental components. The results of the analysis of varieties of the birds showed that the similarity index of bird community was the highest among plantations and shrub grassland habitats, and the similarity of bird community between shrub grassland and virgin forest was the lowest. The diversity index of secondary forest bird diversity was the highest, the lowest in the shrub grassland. And the number of the birds in the original forest was the biggest. The species had the highest density in the middle layer of the forest.

Xu Xiaojun (2006) conducted a census of bird resources in Shanghai World Expo Park and surrounding areas, and studied the correlation of bird quantity, species and environmental factors. The results showed that there were 67 species, 23 families, 7 orders of birds in the region, with a community diversity index of 3.46 [2]. The community structure and distribution characteristics of bird community were analyzed by probabilistic statistical method. The bird community index and the eight environmental indicators were analyzed. The results showed that the number, quantity and diversity index of the bird were significantly correlated with the area of the park, and water area, the shape index and the habitat species. The diversity and uniformity index of birds were significantly correlated with the total number of species. The number of birds was related to the location conditions in the environment.

Wu Yi (2007) investigated the diversity of birds in Yuexiu Park, Guangzhou, and recorded 43 species of birds, belonging to 8 orders and 20 families, of which 27 species of birds, two summer migratory birds, eight winter migratory birds, and 6 species of other breeding birds [3]. The characteristics of bird community in summer and winter habitats were compared and analyzed. And the diversity, density and dominance of birds in summer were higher than those in winter, while the diversity index and uniformity index were lower than those in winter. There are great differences in the species, quantity and diversity of birds in the six habitats of the lawns of Nanxiu Lake, the Jinyin Playground, Bamboo Forest, Nanxiu Grove, Nanxiu Lake and Central City. The diversity of birds is the highest. According to the diversity of birds in different environments of the park put forward the protection measures.

Qingliang Mountain, also known as Stone Mountain in the past, is squatting in the west corner of Nanjing City, located in the western of the Guangzhou Road, Nanjing. The height of Qingliang Mountain is more than 100 meters, a radius of about 4 km, has been built as Qingliang Mountain Park. The trees in the garden are lush, the terrain are steep. Qingliang Mountain Park is located in the downtown area of Nanjing, the surrounding residents

gathered, shops everywhere, from 2006 onwards, Qingliang Mountain Park free to the public, as a city of Green Island, gets more and more attention from the public, this article started from the Qingliang Mountain area Bird diversity, trying to analyze the composition of the birds to reflect the urbanization process on the impact of urban birds and the evaluation of the environment.

## II. MATERIAL AND METHOD

### 2.1 Survey using sample method

A number of samples are selected in different habitat types, and the number and type of birds are recorded and heard by the investigators in the sample.

### 2.2 Using the sample line survey

In different habitat types selected in different lines, and the investigators observed on both sides of the sample line.

And record the type and number of birds within 50 meters, each sample line repeated investigation; use the repeated observed average as a statistical basis.

At the time of observation, only birds in the opposite direction of flight are counted. The survey was completed from 20 March 2008 to 10 April 2008, and the sample and sample lines are shown in Figure 1. Selected samples are more concentrated birds of woodland and bushes; sample line is taken in the park within the road.

### 2.3 Diversity index

Shannon-Weaver diversity index

$$H' = -\sum_{i=1}^s \frac{n_i}{n} \ln \frac{n_i}{n}$$

s: species number;  $n_i$ : the number of biological individuals; n: the total number of individual individuals

The statistics of the evenness index were calculated using the pielou index

$$J = H' / H_{max}$$

$H_{max} = \ln S$ , s is the number of species

G-F index analysis:

Use the distribution of birds and mammals, and the Shannon-Wiener index based on the information measure, the species diversity of DG, the diversity DF and the standardized GF index were calculated and defined: if there is only one species in one region or only a few species distributed in different families, the definition of the region GF index is zero.

1) F index, DF:

In a particular section k:

$$D_{Fk} = \sum_{i=1}^n \rho_i \ln \rho_i$$

$\rho_i = s_{ki} / S_k$ ,  $S_k$  = the number of species in the k group in the directory,  $s_{ki}$  = the number of species in the family, and  $n = k$ .

F index for a region:

$$D_F = \sum_{k=1}^m D_{Fk}$$

m = the number of subjects in the list of birds or beasts.

2) G index, DG:

$$D_G = -\sum_{j=1}^p D_{Gi} = -\sum_{j=1}^p q_j \ln q_j$$

Where:  $q_j = s_j / S$ ,  $S$  = the number of species in the bird or beast in the list,  $s_j$  = the number of species in the  $j$  genus of the bird or the beast,  $p$  = the number of species in the bird or the beast.

3) G-F index:

$$D_{G-F} = 1 - \frac{D_G}{D_F}$$

If all the families of the bird or the beast are single species, ie  $D_F = 0$ , the G-F index of the area is specified to be zero,  $D_{G-F} = 0$ .

G-F index characteristics:

- (1) The more non-single species, the higher the G-F index. Since  $p_i = s_{ki} / S_k = 1$ ;  $D_{Fk} = 0$ ; the contribution of single species to F index (DF) is zero, the more non-single species, the  $\frac{D_G}{D_F}$  smaller, the higher the G-F index.
- (2) The G-F index is a measure of 0 to 1.  $D_G$  is the diversity of the  $D_F$  subclasses, with reference to Pielou,  $D_G \leq D_F$ , so, generally,  $0 \leq \frac{D_G}{D_F} \leq 1$ .

### III. RESULTS AND ANALYSIS

#### 3.1 Results

TABLE 1  
LIST OF BIRDS OBTAINED FROM THE SURVEY

Birds	Order	Family	Migration habit	Distribution	Habitat type
<i>Turdus merula</i>	Passerine	Muscicapidae	Residents	Oriental Region	L, D
<i>Pycnonotus sinensis</i>	Passerine	Pycnonotidae	Residents	Oriental Region	L
<i>Cettia fortipes</i>	Passerine	Sylviidae	Residents	Oriental Region	L
<i>Garrulax perspicillatus</i>	Passerine	Sylviidae	Residents	Widespread	L, G
<i>Parus major</i>	Passerine	Paridae	Residents	Widespread	L, G, D
<i>Streptopelia chinensis</i>	Columbiformes	Columbidae	Residents	Oriental Region	L
<i>Streptopelia orientalis</i>	Columbiformes	Columbidae	Residents	Widespread	L, D
<i>Eophona migratoria</i>	Passerine	Fringillidae	Migrants	Palaeartic realm	L, D
<i>Eophona sp.</i>	Passerine	Fringillidae	Migrants	Palaeartic realm	L
<i>Cyanopica cyana</i>	Passerine	Corvidae	Residents	Widespread	L
<i>Pica pica</i>	Passerine	Corvidae	Residents	Widespread	L, D

**Description:** (1) "ancient" ancient north boundary, "East" Oriental world, "wide" for the wide variety; "winter" winter migratory birds, "stay" to stay birds. (2) L-woodland, G-shrub, D-land. (3) In the column of the International Protection Agreement, the R-generation refers to the type of protection in the Sino-Japanese Migratory Bird Protection Agreement.

TABLE 2  
SPECIES QUANTITY COMPOSITION

Birds	Number	Habitat
<i>Eophona sp.</i>	1	tree
<i>Turdus merula</i>	6	land
<i>Streptopelia orientalis</i>	7	Tree and land
<i>Pica pica</i>	5	tree
<i>Pycnonotus sinensis</i>	46	tree
<i>Cettia fortipes</i>	3	tree
<i>Garrulax perspicillatus</i>	6	Tree, land, Shrub
<i>Parus major</i>	6	Tree, land, Shrub
<i>Streptopelia chinensis</i>	4	Tree and land
<i>Eophona migratoria</i>	50	tree
<i>Cyanopica cyana</i>	1	tree

There were 11 species of spring birds in the area, which belonged to 2 orders and 7 families, accounting for 135, accounting for 81.82% of stay birds and 18.18% for winter migrants (Table 1). There were 4 species of birds in the eastern part of the region, accounting for 36.36% of the birds in the region, and 2 species of ancient north boundary birds, accounting for 18.18%, and 5 species that were widely distributed in the Oriental and Palaearland, accounting for 45.46%. The survey found only one species of protected birds in the region, belonging to the protected species of Sino-Japanese migratory birds, accounting for only 9.99% of the total number of birds. From the quantitative point of view (Table 2), *Pycnonotus sinensis* and Black-tailed Worries were the dominant species in the Qingliang Mountain area in spring, and the number of turtles, big tits, black-faced babes and blackbirds were also more, all were common species for spring.

### 3.2 Analysis

#### 3.2.1 Retro birds and migratory birds and floristic analysis

The observation of the spring birds in Qingliang Mountain area showed that stay birds were accounting 81.82%, 18.18% were winter birds, and most of the birds were resident birds. There were 4 species of birds in the eastern part of the region, accounting for 36.36% of the birds in the region, and 2 species of the ancient north boundary birds, accounting 18.18% of the birds, and 5 species were widely distributed in the Oriental and Palaearland, accounting for 45.46%.

#### 3.2.2 Analysis of the protected birds

Only one case was observed, the *Eophona migratoria*, belonging to the Sino-Japanese migratory protection agreement.

#### 3.2.3 Analysis of ecological types

Observations of the 11 species of birds are distributed in the woodland. Blackbirds, big tits, mountain tigers, magpies and *Eophona migratoria* are in the ground activities, black noodles and large tits in the shrub activities, large tits habitat type more in the woodland, and also active in shrubs and the ground.

#### 3.2.4 Related Statistical Analysis

The Shannon-Weaver diversity index was 1.6869 and the pielou evenness index was 0.3055.

G-F index analysis, the spring birds  $D_F = 2.7728$ ,  $D_G = 2.1458$  and the G-F index were 0.2261.

## IV. DISCUSSION

Through the analysis of the diversity of birds in Qingliang Mountain, the species and quantity of birds were obtained, and the diversity analysis was carried out to evaluate the surrounding environment of Qingliang Mountain, so as to provide quantitative basis for the corresponding protection and monitoring measures for urban ecological construction provide evidence. In recent years, due to the development of economic resources in the region, human disturbance and damage are becoming increasingly serious, so the investigation of the situation of bird resources in the study area, and strengthen the protection of bird resources in the region, are very important in protect the species resources and maintain ecological balance. [4].

The oriental boundary is not obvious from the nature of the winter birds in the region. The increase of the northern part of the birds in the region is related to the flying ability of the birds themselves and the migration to the winter. The main reason may be that Jiangsu is located at the junction of the Oriental and the ancient North boundary, the fauna composition has two characteristics at the same time, and Jiangsu in Australia - Siberian bird migration line, which is the definitely road of a lot of migratory birds. So in the spring the keep birds and migratory birds can be observed at the same time.

From the quantitative point of view, the dominant birds are *Pycnonotus sinensis* and *Eophona migratoria*, *Pycnonotus sinensis* is a medium-sized (19 cm) olive *Pycnonotus sinensis*. Eyes have a white wide stretch to the neck, black head slightly feathers, mustache black, hip white. The color of the young birds' head is olive; their chest is gray and striped. This is named after the *Pycnonotus sinensis*, the call is twittering and simple and no rhythm of the call is widely distributed in most of the country, often clustered in the shrubs, mangroves and forest garden. Lively, crowded on the fruit tree activities, and sometimes from the habitat flight predation. Also known as white head or Pulsatilla. Black tail wax mouth is slightly larger (17 cm) and the pier of the birds, with a huge yellow and black mouth. Breeding male shape is very similar to a black hood, body gray, and wings near black. Female is like a male but a black head. Young birds like brown but heavier brown. The song is a series of whistles and tremolo, euphemistic. They widely distributed in the southeastern region of China, the distribution of: local common. Generally inhabit in the woodland and orchards.

*Eophona migratoria* is the songbird that has wonderful sounds, Nanjing people have the tradition of raising the mouthbirds, in the Nanjing local chronicles on the use of the mouthbirds for the performance of the record, the sale of mouthbirds business can often seen in the Confucius Temple flowers and birds market ,The population of the mouthbirds in Qingliang Mountain area reached more than 50, and former cooperation with the Jiangsu Provincial Department of Agriculture and Forestry, found that someone in the Qingliang Mountain area to capture the mouthbirds, thus there should be more effective protection to make in the spring Qingliang Mountain area .

Large tits are act in the woodland, shrubs and the ground, the common name "brush througher", naturally like to move, and in the branches or the ground continually to move to find food. [7] Blackbirds, mountain turtles and magpies also have activities on the ground; the main reason is that these birds need to seek grass seeds or insects on the ground. Bead neck and dove have the body color that is close to the wild and more difficult to distinguish, but the two birds of different ecological types, bead neck doves generally only in the woodland activities, and mountain turtles often in open or farmland activities, this ecological characteristics can be used as the basis for the resolution of telling the two similar birds [8].

In comparison with other people's findings, in this study, the diversity of birds was lower and the uniformity was lower in spring. This shows that the biodiversity of birds in the Qingliang Mountain area is not well protected, and there are some problems with dominant species and other species. This may be due to the spring season is the migration of birds, some species of birds will also have a distribution of the distribution area, while some migratory birds transit, will have an impact on diversity and evenness. [9] But on the whole, the Qingliang Mountain area has more frequent human activities and has a greater impact on bird activities, so the diversity of birds is not rich in the expected.

In this survey, only bird species and pigeon-shaped birds were found. The number of birds was less, only 7 families. Most of the birds belonged to the locusts. The Qingliang Mountain area belonged to the typical type of birds liked habitat. More surprisingly, in this survey, did not find Nanjing common birds, sparrows but found more *Pycnonotus sinensis*, Li Yongmin (2005) pointed out that with the socio-economic development, In the past 10 years, the urban and rural ecological environment in Wuhu City has undergone great changes, which has made great changes in the community structure of birds. Compared with historical data, the rate of sparrows in Wuhu City is reduced from 45.64 per hour to 14.403 per hour, and the meeting rate of bluish blossom increased from 2.35 per hour to 47.27 per hour, and *Pycnonotus sinensis* was replaced by tree. The sparrow became the absolute dominant species of garden birds in Wuhu. There are cities in Hangzhou and other places in the farmland habitat [tree] sparrow and swallows have a significant decline. In the rural area the housing structure changes and pesticides, fertilizers in large quantities using, there may be the cause of this phenomenon. In the summer, in the farmland roadside shrub or sponge gourd, often can see dozens to hundreds of mercerized starling cluster activities, so that the meeting rate of encounter reached 46.862 per hour, such a high density is worth discussion [10].

The spring birds in the Qingliang Mountain area,  $DF = 2.7728$ ,  $DG = 2.1458$  and the GF index was 0.2261. Among them, the F index was significantly lower, because the single species were more in the calculation, The F index, and G index is not high, because the single species are more, single family also more. At the same time, the composition of the spring birds is only a small part of the annual composition of birds in a region, the diversity of the assessment is more one-sided, but also only typical and not universal significance, therefore, it can be inferred that if the Qingliang Mountain area birds The class composition makes a systematic monitoring that will provide more comprehensive data and results.

## V. CONCLUSION

### 5.1 Relationship between species and quantity and season

On the whole, there are few types of birds in the spring of Qingliang Mountain area, which are not high in number, low in diversity, and low in uniformity and obvious in dominant species. This may be due to the beginning of the snowstorm, causing a large number of birds died, while the disaster also affected the migration and reproduction of birds. In February 2008, the Naval Air Force Nantong Airport Bird Survey was conducted to find the phenomenon of summer breeding of summer black birds in winter. This phenomenon can be used as evidence of a low number of bird species in Qingliang Mountain area.

### 5.2 Relationship between species and quantity and human activity

The distribution of birds and human activities have a great relationship between the activities of birds are generally human activities or less disturbed areas, Qingliang Mountain area of human interference is large, and because of the winter bird biological characteristics and Ecological habits, resulting in the habitat of the species is small and uneven distribution, the

frequency of human activities and the distribution of birds inversely proportional to the density, in summary, the Qingliang Mountain area of birds in the place where the interference is very small, by the impact of human interference.

From the above points, it can be seen that the factors that affect the diversity of birds in the spring area of Qingliang Mountain are food, human disturbance, niche, climate, species ecological habit and biological characteristics, but the factors affecting spring bird diversity are Food and safe habitat. According to the observation and analysis, the diversity of birds in Qingliang Mountain area is not high in spring, and the number of dominant species is relatively simple. It is in line with the typical characteristics of birds in the landscape state of urban landscape. For the management of Qingliang Mountain area, the following suggestions: you can plant a variety of landscape gardens, so that birds can provide a variety of habitat, which attract more kinds of birds. Strengthen the scenic area of plant conservation management, we found in the investigation of a lot of damage to the vegetation of greening behavior, in order to make the city park green and green, for the broad masses of people to provide a harmonious environment, the need for management attention, but also need the general public with the active.

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