DIVERSITY OF BIRD COMMUNITY IN HOHHOT

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ABSTRACT

The article contains research on avifauna compliment, numeral and bird distribution which depend on differentiation of habitat and seasons in Hohhot for last year.
A bird is one of the important species of vertebrates which has an essential role on ecological balance and biological control. Having diversity of birds is the main composition of biological diversity. Bird community structure is determined by relationship of bird's species and general correlation of birds and environment.
Diversity of bird community structure has direct correlation of its species, bird community numeral and habitat. Also it depends on geographical factor, habitat, diversity of plant community, plant vertical structure, food resource, possibility of shelter and other factors. Therefore, bird species become a very valuable indicator for ecological condition of the city and environmental ecological quality.
We have divided the areas around Hohhot, Inner Mongolia into 6 different habitats such as grassland, farmland, residential area, woodland, wetland and garbage dump. We have performed the bird fundamental study, and investigated bird flora, ecology, distribution, diversity, environment, and community structure in different habitats and seasons.

KEYWORD: ecological distribution, seasonal dynamic

BIRDS FIELD SURVEY METHOD

The observation was done from November, 2010 to October, 2011. We used point and line methods of transect for determining environmental conditions and avifauna. The observation was done in recommendable weather condition and bird active hours. Transect area with 1000 m of length and 100 m of width, was selected for the observation.

The transect samples are wetlands, woodlands, residential areas, farmland, grassland and dump typical habitat types on the basis of the field survey, topography, vegetation type according to the survey area, selected in the survey area. Each habitat selected a sample of transects. Six habitats were emplaced in the 34 transects.

STATISTIC METHODS

- Calculating the bird species diversity index (H') shannon-wiener index:

$$H = -\sum_{i=1}^{s} (p_i \ln p_i)$$ S=bird species number, Pi=i-total species number;

- Calculating Pielou-evenness index: J=H'/Hmax, Hmax-theoretical maximum diversity index, Hmax=Lns;
- $C = \sum_{i=1}^{s} (Pi)^2$ Dominance index (C) was calculated using the formula where S and Pi were the same meanings as defined above;
- Density index, D=N/S, where: D-density index; N-observed bird number, S-observation field. (unit hm2);
- Data of study were processed with Excel and SPSS software.

RESULTS

It was recorded during the investigation of 69 kinds of birds, belonging to 13 orders and 29 families. 53 species or 76.81% of total recorded bird species breed in the area. 49.06 % of them are not migratory species and rest 50.94 % of them inhabit in summer time.

Non-breeding birds, 16 species (including migratory birds and winter birds), accounting for 23.19% of the total number of birds in the survey area, including 10 kinds of migratory birds, accounting for 62.5% of the total number of non-breeding birds, winter migratory species, accounting for 37.5%.

ECOLOGICAL DISTRIBUTION OF BIRDS

Ecological distributions of birds are in different habitat conditions.

1. Woodland: Total area is relatively large, it has less human effect. This type of area has become convenient for birds to breed, to shelter and to rest. There were 1962 individualities of 50 species observed and dominated species were *Passer montanus, Pica pica, Streptopelia decaocto, Sturnus cineraceus, Columba livia, Corvus dauuricus, Corvus frugilegus, and Pyrrhocorax pyrrhocorax*.
2. Garbage dump: The size of the area is relatively small. There are *Pennsetum reed*, *Pennisetum Setaria*, *Chloris*, *Amaranthus retroflexus*, *latex Euphorbia and Bidens parvifflora*. The area was suitable for resting and breeding. There were 531 individualities of 18 species observed and *Passer montanus* and *Pica pica* dominated *Columba livia, Corvus dauuricus, Corvus corax* were common.
3. Farmland: Main plantations were corn, soy and potato. There were 666 individuality of 15 species observed and dominated species were *Pica pica, Passer montanus, Sturnus cineraceus,* and *Streptopelia decaocto, Corvus dauuricus, Columba livia,* were common.
4. Grassland: *Chloris*, *Pennisetum*, *squarrosa Lai grass*, *thistles*, *Setaria*, *Altai Gouwa*. There were 1176 individuality of 20 species observed and dominated species were *Passer montanus*, *Pica pica* and *Corvus dauuricus, Streptopelia decaocto, Passer montanus*, *Calindrella cinerea* were common.
5. Wetland: The area is large and had many shelters. There were 376 individuality of 27 species observed and dominated species were *Streptopelia decaocto, Passer montanus*, *Podiceps cristatus,* and *Columba livia, Motacilla alba, Corvus dauuricus, Perdix dauurica, Lanus brunnicephalus, Sturnus cineraceus, Pica pica* were common.
6. Residentials area: There were 1692 individuality of 46 species observed and dominated species were *Streptopelia decaocto, Passer montanus*, *Pica pica* and *Falco columbarius*, *Corvus dauuricus, and Hirunda rustica. Columbia rupestris and Columba livia* were common.

ECOLOGICAL DISTRIBUTION OF BIRDS IN DIFFERENT SEASONS

Summer birds ecological distribution

A total of 31 species of 18 families and 11 orders were observed. And 16 species i.e. 51.61% were local, 9.68% was passing by, 12 species were stayed and 3125 individualities were observed in the summer.

In summer, magpies, sparrows, pigeons and gray turtledove distributed in 6 habitats, birds composed of relatively large differences between different habitats, between woodland and grassland birds greatest difference.

- Residential area: There were 848 individualities of 19 species observed and

dominated species were *Passer montanus*, *Upupo epops, Hirunda rustica* and *Streptopelia decaocto, and Columba livia, Pica pica* were common.

- Farmland: There were 127 individualities of 9 species observed such as *Passer montanus*, *Pica pica, Streptopelia decaocto, Upupo epops, and Columba livia,*
- Woodland: There were 1582 individualities of 22 species observed. Comparing to other habitat areas in this area there were more individualities and species. Dominated species were *Passer montanus*, *Sturnus cineraceus, Streptopelia decaocto, Corvus frugilegus, Lanius cristatus, Apus apus, Upupo epops, Pica pica, Hirunda rustica, Columba livia.*
- Grassland: There were 213 individualities of 8 observed species and relatively lesser species were observed. *Columba livia, Corvus dauuricus, Passer montanus, Pica pica, Apus apus.*
- Wetland: There were 243 individualities of 12 observed species and dominated species were *Passer montanus*. Lanius brunnicephalus, Pica pica, Apus apus, *Sturnus cineraceus, Streptopelia decaocto, Charadrius dubius* were common.
- Garbage dump: There were 113 individualities of 10 species observed and *Passer montanus*, *Pica pica, Streptopelia decaocto,* and *Falco verpertinus* dominated.

Autumn bird ecological distribution

The fall birds were recorded to be 39 species belonging to 8 orders and 22 families. 15 kinds of resident birds, accounting for 38.46% of the fall to the total number of bird species recorded; summer migratory birds of 17 species, accounting for 43.59%; winter migratory species, accounting for 5.13%; trip bird species, accounting for 12.82%. Records fall to 4,905 birds

- Residential area: There were 1329 individualities of 18 species observed and dominated species was *Accipiter nisus. Columba rupestris, Falco columbarius, Hirunda rusica, Picoides major* were common.
- Farmland: There were 378 individualities of 9 observed species. Dominated species were *Pica pica, Streptopelia decaocto, Corvus dauuricus, Passer montanus*
- Woodland: There were 1895 individualities of 27 species observed. Comparing to other habitat areas in this area there were more species. Dominated species was *Pica pica*. *Corvus frugilegus, Sturnus cineraceus, Streptopelia decaocto, Hirunda rustica, Columba livia,. Upupo epops* were common.
- Grassland: There were 306 individualities of 8 observed species. *Passer montanus, Columba livia. Pica pica, Streptopelia decaocto.*
- Wetland: There were 511 individualities of 17 species observed and dominated specie was *Passer montanus* . Podiceps cristatus, *Lanus brunnicephalus*, *Sturna hirundo, Pica pica, Streptopelia decaocto,* were common.
- Garbage dump: There were 486 individualities of 9 species observed and *Corvus dauuricus, Pica pica, Passer montanus, Streptopelia decaocto* and *Columba livia.* dominated.

Winter Birds ecological distribution

Winter birds were recorded as 32 species belonging to 14 families and 6 orders. Twenty three kinds of resident birds, accounting for 71.88% of the total number of winter birds; winter migratory species, accounting for 15.63%; traveling birds species, accounting for 3.13%; summer migratory bird species, accounting for 9.38%. Winter records are 16,353 birds.

During this season *Pica pica, Corvus frugilegus,* and *Passer montanus* were observed in 3 habitat areas. Maximum differences of bird species were in the garbage dump and residential area.

- Residential area: There were 7180 individualities of 23 species observed and the bird species number was the highest in the area. Dominated species was *Passer montanus. Pica pica, Corvus frugilegus, Picoides major, Streptopelia decaocto, Columba livia, Corvus corax, Phasianus colchicus* were common.
- Farmland: There were 40 individualities of 10 observed species. Dominated was *Pica pica. Corvus frugilegus,*and *Streptopelia decaocto, Passer montanus, Columba livia* were common.
- Woodland: There were 5481 individualities of 22 species observed. Dominated species was *Passer montanus. Streptopelia decaocto Corvus frugilegus,Pica pica* and *Corvus dauuricus* were common.

- Grassland: There were 891 individualities of 9 observed species. *Passer montanus, Corvus dauuricus, Columbia livia, Pica pica.*
- Wetland: There were 1615 individualities of 8 species observed and dominated species were *Passer montanus. Corvus dauuricus, Pica pica, Columbia livia* were common.
- Garbage dump: There were 696 individualities of 6 species observed and it means this area had the least number of species observed. Dominated species were *Corvus dauuricus, Passer montanus, Pica pica.*

Spring Birds ecological distribution

Spring birds were recorded, 30 species belonging to 7 orders, 17 families. Sixteen kinds of resident birds, accounting for 53.33% of the total number of birds in spring; winter migratory species, accounting for 3.33%; traveling birds species, accounting for 13.33%; summer migratory bird species, accounting for 30%. In spring 4815 birds were recorded.

The sparrow was the only one habituated in these 6 habitat areas. Species were abundant in populated and woodland area and differentiation for species composition were very much in populated, farmland and wetland areas.

- Residential area: There were 2021 individualities of 21 species observed and it had the highest number of bird species than others. Dominated species was *Passer montanus*. *Corvus dauuricus,Pica pica*, *Picoides major, Apus pacificus, Streptopelia decaocto, Columba livia, Corvus corax* and *Phylloscopus proregulus* were common
- Farmland: There were 458 individualities of 8 species observed. There was no one but *Calandrella cinerea* dominated species. *Passer montanus, Streptopelia decaocto Pica pica* and *Columba livia* were common.
- Woodland: There were 1690 individualities of 22 species observed. Dominated species was *Pica pica*. *Corvus dauuricus, Streptopelia decaocto, Emberiza spodocephala, Passer montanus, Upupo epops, Hirunda rustica* and *Carduelis sinica* were common.
- Grassland: There were 497 individualities of 9 observed species. Dominated species were *Calandrella cinerea, Passer montanus, Pica pica, Hirunda rustica* and *Corvus frugilegus.*
- Wetland: There were 41 individualities of 9 species observed and *Motacilla alba* was dominated species. *Corvus frugilegus, Upupo epops, Columba livia, and Streptopelia decaocto* were common.
- Garbage dump: There were 108 individualities of 9 species observed and dominated species were *Passer montanus, Pica pica, Emberiza spodocephala* and *Corvus frugilegus.*

Seasonal dynamics of bird community

Studies have shown that the seasonal changes of the community structure of the various habitats of bird and bird community structure in Hohhot 6 habitats are obvious.

We have created list of bird community and dominant bird species that inhabit in different kinds of habitat in same season.

Table 1

Hohhot different habitats in each season bird community structure index

Habitat	Season	Species number	Number of individual	density/ (m^2)	Diversity index	Evenness index	Dominance index
Residential area	Autumn	17	1329	1.58	0.55	0.19	0.37
	Winter	23	7180	8.55	0.93	0.29	0.61
	Spring	22	2023	2.41	0.43	0.46	0.24
	Summer	19	848	1.01	1.29	0.44	0.47
Farmland	Autumn	9	378	0.63	1.64	0.75	0.22
	Winter	9	490	0.82	1.41	0.64	0.28
	Spring	8	458	0.76	1.17	0.56	0.43
	Summer	9	127	0.21	1.33	0.61	0.32

Woodland	Autumn	27	1895	1.32	1.89	0.57	0.39
	Winter	22	5481	3.80	1.00	0.32	3.56
	Spring	22	1690	1.17	1.91	0.62	0.28
	Summer	22	1581	1.09	1.90	0.61	0.24
Grassland	Autumn	8	306	0.63	1.18	0.56	0.40
	Winter	9	891	1.85	1.22	0.55	0.34
	Spring	9	497	1.03	0.76	0.34	0.66
	Summer	8	213	0.44	1.60	0.77	0.24
Wetland	Autumn	17	511	1.06	2.03	0.71	0.18
	Winter	8	1615	3.36	1.35	0.65	0.30
	Spring	9	41	0.08	1.81	0.82	0.14
	Summer	11	205	0.42	1.42	0.59	0.22
Garbage dump	Autumn	9	486	2.02	1.42	0.64	0.31
	Winter	6	696	2.9	0.88	0.49	0.50
	Spring	9	108	0.45	1.68	0.76	0.23
	Summer	10	113	0.47	1.67	0.72	0.24

As a result of bird community observation, high density is observed in forest area during all seasons. Species diversity and evenness index is spring>summer>autumn>winter, number of recorded individuals, density and dominance is winter>autumn>spring>summer.

Habitats in a residential area, the number of summer and the lowest density, dominance and diversity is highest; winter types, quantity, highest density and dominance, evenness is relatively low. Autumn species and evennessis minimal. Spring uniformity of highest diversity is lowest. In the fields, species diversity and evenness is the minimum number of the highest density and dominance. Winter the number, type, the highest density. The highest diversity and evenness is observed in autumn. The low number and the lowest density is observed in summer.

Number and density of grassland bird species is observed in winter> spring>autumn>summer; diversity and evenness is summer>winter>autumn>spring; dominance is spring> autumn>winter>summer.

In the wetlands, the number, density and dominance is winter> autumn>summer>spring; Species diversity is autumn> summer>spring>winter and summer on the evenness high.

The number, density and dominance index is high on garbage dump in winter> autumn>summer; and uniformity index is the highest valued in spring; kindsummer> autumn>spring>winter; uniformity spring>summer>autumn>winter and spring on the diversity of high-.

Ecological distribution characteristics of the different seasons of birds

(1) the summer birds composed basically stable. Feeding habits of most birds have obvious changes, basic food grain-eating birds and omnivorous birds to animal food, one of the reasons is the summer insects multiply fast, can provide adequate for the birds the food source, the second reason is the local breeding birds need to capture the insects to the care of the offspring that require large amounts of energy to complete their reproductive process. Variety of insects and their larvae in summer to become the most important food source for small and medium-sized birds, small and medium-sized birds also become the main food of the birds of prey.

The widely distributed sparrows, magpies, gray turtledoves, pigeons and Hoopoe food Orthoptera mole crickets and crickets and other insects, sparrows feeding grain of wheat to meet the needs of reproduction in grain filling stage.

(2) the fall bird migration in the year, the second peak period, migratory birds began to cluster migration south. After the breeding season, an increase in the number of local resident birds, birds food demand over the summer, start deciduous trees and shrubs, understory plants gradually dwindled, but already mature fruit trees and weeds, grass insects active degrees began to decrease, this is for the local resident birds sub adults and southward migration of the summer migratory birds prepare enough animal and plant foods.

Rook, Daurian Jackdaws, carrion crow during the investigation we often see only a few thousand large group mixed groups migrated to the local rich farmland, woodland, grassland, street trees and the surrounding garbage dump food source environment forage grass seed, crop seed; a large number of local resident birds such as gray

turtledoves, magpies and sparrows started to fly around the feed mill and flour mills to forage; insectivorous birds such as the great spotted woodpecker and the gray-headed green woodpecker also often appear in the woodlands; increase in the number of mice and small birds also become a Raptor to provide food.

(3) the main food source for winter birds someone's garbage, grass seed, Very rich bird food, pigeon gray turtledoves, magpie, and sparrows scattered in the ground can the farmland pick up the autumn harvest when food or to eat in the village, corn and grain farmers recover omnivorous birds class cows excrete feces and human garbage discharged for food, exposure to food and its food processing plants in the granary, grain by-products are also attracted to these birds can be; great spotted woodpecker feeding in large tracts of forest land and trees habitat hibernation insects and eggs, and sometimes go to the farmland feeding food debris.

(4) the main food source of the spring birds including soil arthropods, ants, insects, flight of mosquitoes, the plant's new leaves, buds and flower bud, keep garbage and small rodents. It can be said that compared with winter, spring food sources become very rich food sources is a prerequisite to attract birds, attract a lot of birds in this area.

The carnivorous birds kestrels They prey on rodents and small birds for food, sparrow, swallow, Hoopoe, Red-throated Flycatcher, Great Spotted Woodpecker and the gray-headed green woodpecker and other insectivorous birds, mosquitoes and other airborne insects, grass activities of earthworms, ants, mole crickets, Coleoptera, Neuroptera mesh and other small invertebrates, insects and their larvae in the tree for food.

CONCLUSIONS

1. During the investigation, a total of 69 kinds of birds, 6403, belonging to 13 orders and 29 families were recorded. There are 53 kinds of breeding birds in the area (including resident birds and summer migrants), accounting for 76.81% of the total number of birds in the survey area, the resident bird species, accounting for 49.06% of the total number of breeding birds, 27 kinds of summer migratory birds, accounting for 50.94%. Non-breeding birds, 16 species (including migratory birds and winter birds), accounting for 23.19% of the total number of birds in the survey area, including 10 kinds of migratory birds, accounting for 62.5% of the total number of non-breeding birds, winter migratory species, accounting for 37.5%.
2. Habitat environment and seasonal changes are the main reasons for changes on structure of bird community. Diversity of bird community is mostly depending on seasonal changes. Bird diversity index is summer>autumn>spring>winter, evenness index is summer>spring>autumn>winter, dominance index is winter>spring>autumn>summer.
3. In the spring, diversity index is very low due to residential have indirect human influence and insufficient diet resource. In the winter the number and density are very high, but dominate and evenness index is very low. In the spring, before sowing there are lesser food resources in the farmland areas therefore diversity and evenness index are the lowest. Thus abundant diet resources, diversity and evenness index are high in the autumn. Summer, diversity index is high in the grassland. Tall grasses become shelter and suitable surrounding of finding foods. In the garbage dump area, spring and summer diversity index is high as well as winter density and dominance index, and also evenness index is high in spring.
4. The woodland area is the most favorable place for birds to live during all four seasons. Spring diversity and evenness index are the highest, but they are the lowest in the winter, density and dominance index are high in the winter, low in the spring and summer.

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