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Research Article

RELATIVE ABUNDANCE, STATUS AND MEAN PERCENTAGE OF WATERBIRD SPECIES IN FARMLAND AREAS OF SA GA IN VILLAGE, TADA-U TOWNSHIP, MANDALAY REGION, MYANMAR

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ABSTRACT

Present study was conducted to observe species composition, relative abundance, status and monthly mean percentage of some waterbird species in Tada-U environs, Mandalay Region from July 2018 to January 2019. A total of 13 species belonging to 12 genera distributed among 8 families and five orders were identified. The maximum individuals (599) were recorded in the month of December followed by (368) individuals in November, (315) individuals in January, (258) individuals in October, (142) individuals in July, (122) individuals in September, and minimum number of individuals (93) in August. The variety of relative abundance about waterbird species were showed greatly. The highest relative abundance (0.5704) was revealed for Grus grus (Common Crane), followed by 0.1075 for Bubulcus coromandus (Eastern Cattle Egret), 0.0938 for Ardeola bacchus (Chinese Pond Heron) and the lowest relative number 0.0005 for Ciconia nigra (Black Stork). The result of the study show that Grus grus was highest with a mean of 154.57 ± 161.27 and lowest mean of 0.14 ± 0.35 is for Ciconia nigra.

Keywords: Relative abundance; Water bird species; Myanmar

INTRODUCTION

Birds are the best monitors of environmental changes and have been used to evaluate the environment throughout the history as bio-monitors. Wetlands as well as farmlands are played an important role for many waterbird species with their activities including feeding, breeding, nesting and moulting. The highest number of waterbird species is often found in variety of wetlands and farmlands areas which have to greatest diversity of plants species and vegetation types.

Farmlands or wetlands areas are biologically very important for waterbird species and provided feeding grounds for a diverse range of resident and migratory species. Therefore, Joana et al., 2017 described that conserving biodiversity on farmlands and wetlands are essential element of worldwide efforts for reversing the global biodiversity decline.

Tada-U Township is a town in central Myanmar about 10km from the provincial capital of Mandalay. Sa Ga In Village is one of the over 136 village tracts of Tada-U Township. In view of this, the present research seeks to provide data on the relative abundance, status and significant difference of mean percentage of waterbird species monthly.

MATERIALS AND METHODS

Study area

Tada-U Township is located in Kyaukse District, Mandalay Region, Central Myanmar and situated between North Latitude 21° 48′ 32″ and East Longitude 95° 58′ 31″. It is 942.7 square kilometers (km^2) in size and its population is about 138,617 according to 2014 census by Department of Population (UNFPA).

Study site

Sa Ga In Village is located in Tada-U Township and situated beside the Asian Highway. It lies between North Latitudes 21° 45′ 41″ and East Longitudes 95° 58′ 41″. Three study sites were allocated for study.

1. Study Site I is located just beside the east of Zee-Chaung rode. Area is 1.2 km^2 and situated between 21° 45′ 33″ N and 95° 57′ 34″E.
2. Study Site II is located just beside the west of Zee-Chaung rode. It is 1.3 km^2 and situated between 21° 44′ 18″ N and 95° 57′ 36″ E.
3. Study Site III is located near the Kun-Gyan-Kone monastery, and it is situated between 21° 45′ 30″ N and 95° 57′ 06″ N.

Study period

The study period commenced from July 2018 to February 2019.

Bird survey and sampling method

This study period was commenced form July 2018 to January 2019. Preliminary surveys were carried out during

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May 2018 around the study area. The environmental and habitat conditions were noted based on ground surveys and questionnaire surveys. Three sampling sites were allocated in different plantation areas such as chick-pea, bread-wheat, sunflower, winged been and butter bean plantations. Observations were carried out alternate weekend per month and data collection was also made from 6:00 to 11:00 am. Birds counting was made by accurate point transects method adopted from Backland et al., 2000. In this method, observer travels along the transect and stop at predefined spot it can allow the birds time to settle and then record all the birds seen or heard for a predetermined time ranging from 5 to 20 minutes (Backland et al.,2000). Transect were allocated reliable to each study site. Then point were fixed regularly on this transect and the distance between of each point was 250m away. Bird counting was made at predetermined points where the bird seen or heard around 50m from the center of each point.

DATA ANALYSIS

Species composition and number of waterbird species for each month throughout the study period were evaluated by pooling the data recorded in alternate weekend. Most of the statistical analyses of mean percentage of waterbird species were calculated by using Microsoft excel and Analysis of Variance test (ANOVA). Relative abundance for all the species was evaluated by the following formula:

The average relative abundance of bird species recorded was categorized as method of Alonson (1993).

uC= (uncommon) having relative abundance less than 0.01

C= (common) having relative abundance of 0.100 and above but less than 0.05

vC= (very common) having relative abundance of 0.500 and above

Total no. of individuals of a species

Relative abundance = ---------- Total no. of individuals of all the species

RESULTS

During the study period that commenced from July 2018 to January 2019, total of 13 species and 1897 individuals distributed among 12 genera, eight family and five order were recorded. Moreover, 13 species of waterbird were revealed in Site I, 10 species from Site II and 11 species from Site III respectively (Tables 1-3).

Among the five order recorded from three study sites, Order Pelecaniformes represented the largest species composition of six species (46.15%) followed by Order Caradriiformes contains four species (30.77%) and Order Gruiformes, Ciconiiformes and Suliformes with one species each (7.69%) respectively. (Table 2) (Figure 1)

In site I, a total of 13 species with 968 individuals were recorded. Among them, *Grus grus* (Common Crane) was highest with 696 individuals followed by *Bubulcus caromandus* (Eastern Cattle Egret) with 96 individuals, *Egretta garzetta* (Little Egret) with 47 individuals while the least number of only one individual of *Ciconia nigra* (Black Stork) was revealed in this study site. In site II, a total of 10 species with 602 individuals were recorded. In this study site, the highest number of 386 individuals was also that of *Grus grus* (Common Crane) while the lowest number of six individuals of *Phalacrocorax niger* (Little Cormorant). A total 11 species with 327 individuals was revealed in Site III. *Plegadis falcinellus* (Glossy Ibis) represented the highest number of 172 individuals while *Actitis hypoleucos* (Common Sandpiper) and *Vanellus inducus* (Grey-headed Lapwing) were the lowest with two individuals for each (Table 3) (Figures 2 and 3).

Throughout the study period (from July 2018 to January 2019), *Grus grus* (Common Crane) was highest with 1082 individuals (154.54 ± 161.27) followed by *Bubulcus coromandus* (Eastern Cattle Egret) with 202 individuals (28.86 ± 13.81), *Plegadis falcinellus* (Glossy Ibis) with 178 individuals (25.43 ± 17.48) while the least number only one individual (0.14 ± 0.35) of *Ciconia nigra* (Black Stork) was evaluated in the study areas. (Table 4) (Figure 2).

Among the 13 species, *Grus grus* showed the highest relative number (0.5704) followed by *Bulbulcus caromandus* (0.1065), *Plegadis falcinelus* (0.0938) and the lowest relative number (0.0005) was that of *Ciconia nigra*. During this study

Table 1: List of the waterbird species recorded form three study site during from July 2018 to January 2019.

S no	Order	Family	Genus	Species	Common name	Local name	Status
1	Gruiformes	Gruidae	Grus	*Grus grus*	Common Crane	gyo-gyar-gaung-mae	WV
2	Ciconiiformes	Ciconiidae	Ciconia	*Ciconia nigra*	Black Stork	hnget-kyar	WV
3	Pelecaniformes	Threskiornithidae	Plegadis	*Plegadis falcinellus*	Glossy Ibis	khayu-sok-anet	R
4	_	Ardeidae	Ardeola	*Ardeola bacchus*	Chinese Pond Heron	byaing-auk	R
5	_	_	Bubulcus	*Bubulcus caromandus*	Eastern Cattle Egret	kywe-gyaung-byaing	R
6	_	_	Mesophoyx	*Mesophoyx intermedia*	Intermediate Egret	thar-ya-waddy byaing	R
7	_	_	Ardea	*Ardea alba*	Great Egret	byaing-ngan	R
8	_	_	Egretta	*Egretta garzetta*	Little Egret	byaing	R
9	Suliformes	Phalacrocoracidae	Phalacrocorax	*Phalacrocorax niger*	Little Cormorant	aw-yaw	R
10	Caradriiformes	Charadriidae	Charadrius	*Charadrius dubius*	Little Ringed Plover	ta-laing-gaung	R
11	_	Scolopacidae	Actitis	*Actitis hypoleucos*	Common SandPiper	ye-nyaunt	R
12	_	Venellidae	Vanellus	*Vanellus cinereus*	Grey-headed lapwing	tit-ti-du	WV
13	_	_	_	*Venellus inducus*	Red-Wetted Lapwing	tit-tae-du	WV
WV= winter visitor, R= resident, L/M = local migrant							

Table 2: Percentage composition of waterbird species recorded in orders.

S No.	Orders	Number of Family	Number of Genus	Number of Species	Composition (%)
1	Gruiformes	1	1	1	7.69
2	Ciconiiformes	1	1	1	7.69
3	Pelecaniformes	2	6	6	46.15
4	Suliformes	1	1	1	7.69
5	Caradriiformes	3	3	4	30.77
Total		8	12	13	100

Table 3: Relative number of bird species and individuals recorded from each study site during July 2018 to January 2019.

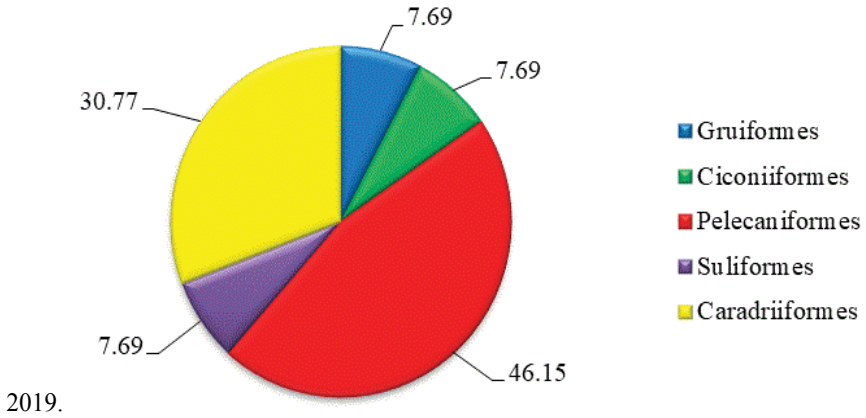
S No.	Scientific Name	Number of individuals			Total	Relative Abundance	Average Relative Abundance
		Site (I)	Site (II)	Site (III)			
1	*Grus grus*	696	386	0	1082	0.5704	vC
2	*Ciconia nigra*	1	0	0	1	0.0005	uC
3	*Plegadis falcinellus*	6	0	172	178	0.0938	vC
4	*Ardeola bacchus*	31	28	21	80	0.0422	C
5	*Bubulcus caromandus*	96	58	48	202	0.1065	vC
6	*Mesophoyx intermedia*	13	15	16	44	0.0232	C
7	*Ardea alba*	14	15	17	46	0.0242	C
8	*Egretta garzetta*	47	37	25	109	0.0575	vC
9	*Phalacrocorax niger*	4	6	3	13	0.0069	uC
10	*Charadrius dubius*	26	26	16	68	0.0358	C
11	*Actitis hypoleucos*	15	14	2	31	0.0163	C
12	*Vanellus cinereus*	7	0	2	9	0.0047	uC
13	*Venellus inducus*	12	17	5	34	0.0179	C
Total number of individuals		968	602	327	1897	_	_
Total number of species		13	10	11	_	_	_
uC = uncommon, C = common, vC = very common, uC = < 0.0100, uC = < 0.0100, vC = >0.0500							

Table 4: Monthly mean percentage of recorded waterbirds species from three study sties during July 2018 to January 2019.

S No	Scientific Name	Common name	Number of individuals							Total	Mean (%)
			July	Aug	Sep	Oct	Nov	Dec	Jan		
1	*Grus grus*	Common Crane	0	0	0	150	256	466	210	1082	154.57 ± 161.27
2	*Ciconia nigra*	Black Stork	0	0	0	0	1	0	0	1	0.14 ± 0.35
3	*Plegadis falcinellus*	Glossy Ibis	60	25	35	27	17	0	14	178	25.43 ± 17.48
4	*Ardeola bacchus*	Chinese Pond Heron	25	7	9	10	5	12	12	80	11.43 ± 6.02
5	*Bubulcus caromandus*	Eastern Cattle Egret	35	43	30	8	14	49	23	202	28.86 ± 13.81
6	*Mesophoyx intermedia*	Intermediate Egret	0	0	2	17	4	13	8	44	6.29 ± 6.16
7	*Ardea alba*	Great Egret	0	0	20	5	9	9	3	46	6.57 ± 6.48
8	*Egretta garzetta*	Little Egret	13	11	5	16	10	29	25	109	15.57 ± 7.93
9	*Phalacrocorax niger*	Little Cormorant	0	0	0	1	5	4	3	13	1.86 ± 1.96
10	*Charadrius dubius*	Little Ringed Plover	6	7	19	14	22	0	0	68	9.71 ± 8.15
11	*Actitis hypoleucos*	Common Sand Piper	1	0	2	2	9	8	9	31	4.43 ± 3.74
12	*Vanellus cinereus*	Grey-headed lapwing	0	0	0	3	4	0	2	9	1.29 ± 1.58
13	*Venellus inducus*	Red-Wetted Lapwing	2	0	0	5	12	9	6	34	4.86 ± 4.22
Total number of individuals			142	93	122	258	368	599	315	1897	_
			7	5	8	12	13	9	11	_	_

period, three species (uncommon), six species (common) and four species (very common) were showed respectively (Table 3).

There was a statistically significant difference between species during the study period as determined by one way ANOVA (F (12,78)=4.931, p=0.000) (p<0.001). *Gurs grus* (Common Crane) differed significantly form *Cinoia nigra* (Balck Stork) (mean difference=154.43, P<0.01), followed by *Plegadis falcinellus* (Glossy Ibis) (mean difference=129.14, P<0.05), *Ardeola bacchus* (Chinese Pond Heron) (mean difference=143.14, P<0.01), *Bubulcus coromandus* (Eastern Cattle Egret) (mean difference = 125.71, P<0.05), *Mesophoyx intermedia* (Intermediate Egret) (mean difference =148.29, P<0.01), *Ardea alba* (Great Egret) (mean difference=148.00, P<0.01), *Egretta garzetta* (Little Egret) (mean difference =139.00, P<0.05), *Phalacrocorax niger* (Little Cormorant) (mean difference=152.71, P<0.01), *Charadrius dubius* (Little Ringed Plover) (mean difference=144.86, P<0.01), *Actitis hypoleucos* (Common Sandpiper) (mean difference=150.14, (P<0.01), *Vanellus cinereus* (Grey-wetted Lapwing) (mean difference=153.29, P<0.01) and finally *Venellus inducus* (Red-wetted Lapwing) (mean difference=149.71, P<0.01) respectively (Table 5) (Figure 4).



2019.

Figure 1: The percentage composition of waterbird species in different orders during from July 2018 to January .

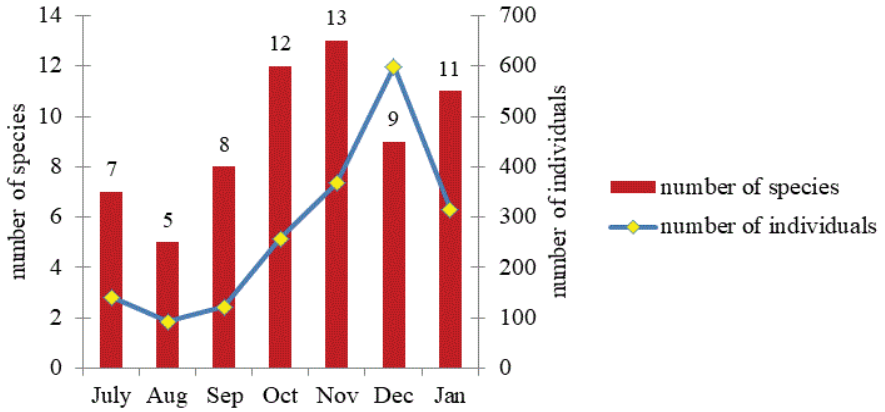


Figure 2: Monthly recorded number of waterbird species and individuals from three study sites during July 2018 to January 2019 .

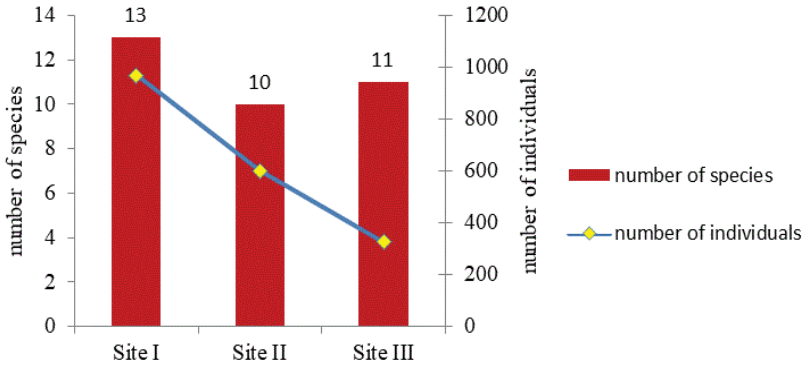


Figure 3: Comparison on the number of waterbird species and individuals recorded from Site I, Site II and Site III during July 2018 to January 2019 .

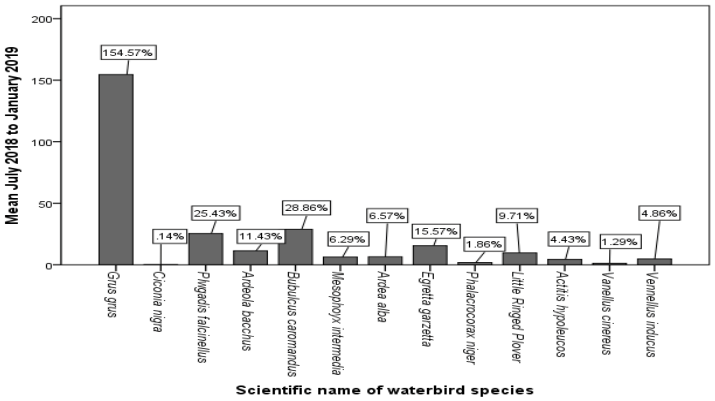


Figure 4: Mean percentage of waterbird species during from July 2018 to January 2019.

Table 5: One way ANOVA test of waterbird species during from July 2018 to January 2019.

ANOVA					
July to January					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	142245.8	12	11853.82	4.931	0
Within Groups	187504	78	2403.897	_	_
Total	329749.8	90	_	_	_

DISCUSSION AND CONCLUSION

To date, wetlands and farmlands habitat change drastically between years due to a variety of factors as urbanization, land use changes in agricultural practices which affect the abundance of farmland waterbird species. The present study indicated that the important of farmland waterbirds in Tada-U Region as site of wintering, resident and local migrant bird species. A total of 13 species with 1897 individuals were recorded from three study sites. Highest numbers of waterbird species were recorded from Site I. Moreover, one of the winter visitors, *Grus grus* (Common Crane) was also the most abundant in this study site. Because of Site I have a small, shallow pond at the edge of the field. So, Site I can be supported not only food but also water for waterbird species.

Analem et al. (2008) said that birds live in place where there is water or vegetation, and as well as Benton et al. (2003) described that a mosaic of different field can provide for a diversity of needs such as refuges, feeding areas and dispersal corridors which are priori expected to aid species persistence and biodiversity. By having these heterogeneous farmlands, birds are lured by many important stimuli such as fruits, seeds, flowers, insects, worms, arthropods etc. Moreover, Site II and III also provided favourable habitat for large number of species and individuals next to Site I. This result coincides with the Benton's report that habitat heterogeneity is associated with higher biodiversity in farmland landscape.

Monthly variations on the number of bird species and individuals showed that the highest number of species was recorded in December whereas the lowest species was in August. Because of, in December, not only local migrants but also winter visitors have been arrived abundantly. The time of their arrival coincided with the flowering time of chick pea, sunflowers and bread wheat, and therefore insects and worms flourished in these plantations on which insectivorous birds depend. But, the number of waterbird species increased in November.

On the other hand, lowest number of species and individuals were observed in August because most of plantation in farmland areas and tillage had not started except a few of irrigated sunflower plantations.

Berg et.al (2015) stated that rotational schemes and land-use changes are assumed to be the main drivers of population changes of several waterbirds. In the present study, the lack of rotational scheme and land-use changes directly influenced waterbird species richness and abundance (Batary et al. 2001).

With regard to the relative abundance, *Grus grus* indicate the largest relative abundance followed by *Bubulcus Coromandus* and the lowest was *Ciconia nigra. Grus grus* is a winter visitor species and large number annually arrived in the last week of October at this study area. On the other hand, *Ciconia nigra*, which is also a winter visitor species and only one individual was recorded on the tip of pole just beside the site I (Bibby et al. 2000, Garay et al., 1991, Graziele et al. 2009, Gregory et al. 2002).

Among the 13 species of waterbird species, *Grus grus* (Common Crane) were more frequently concerned wintering period from October to January. Moreover, they have the highest mean percentage (154.57 ± 161.27) rather than other waterbird species. So, the abundant frequency of *Grus grus* (Common Crane) are statistically significant difference from other waterbirds species. ($F(12,78) = 4.931$, $p=0.000$) ($p<0.001$) (Robson 2015, Ronaid et al. 2012, Simon et al. 2013, Smythies 2001, Atesire et al. 2014, Lee et al. 2018, Wuczynski 2016).

The present study contributes to the knowledge of bird diversity and abundance in farmlands and provides information not only for resident and local migrant bird species but also for unique wintering species as Common Crane..

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