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Species composition and relative abundance of water birds in Lawkanandar wildlife sanctuary and its environs, Nyaung U Township, Mandalay Region

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Abstract
Species compositions and relative abundance of water birds were studied in Lawkanandar Wildlife Sanctuary during February 2018 to January 2019. Line transect count method was carried out. A total of 30 species were observed. The largest number of 30 species was recorded in December 2018 and the lowest 6 species in August 2018 and the largest number of individuals was found in March 2018 and the lowest was observed in July 2018. Relative abundance indicated two species as very common, 21 species as common and seven species as uncommon. Regarding the species composition in different orders, Charadriiformes (43.33 %) showed the highest composition and the lowest was in Anseriformes and Gruiformes (6.67 % each). In this studied, the species composition and abundance of water birds at Lawkanandar Wildlife Sanctuary and also the number of bird species were partly recorded. Thus, this research provides the conservation of bird species for further.

Keywords: Composition, Abundance, Water birds, Lawkanandar Wildlife Sanctuary

1. Introduction
Birds can be used to identify the most biologically rich area, as well as environmental changes and problems. In general, a place that is rich for other forms of biodiversity. Thus, birds can be used as indicators to locate the important areas. Studying birds can tell us about the habitats on which we all depend. The bird watching industry has now become a major economic force, globally and Asia [1].

Water birds are the heralds of health and resilience of wetlands, which are a critical natural resource for humankind's welfare and even its very survival. During last for decades, both the scientific community and society at large have recognized the importance of wetlands for preparing vital ecosystem services including water purification, flood and draught control and biodiversity conservation. However, now the world is facing threats from climate change more than ever, making wetlands even more essential for migrating the effects of extreme climatic events that endanger regional communities and ecosystem.

Southeast-Asia is a region of high bird diversity with 1327 bird species [2]. Myanmar is recognized the greatest diversity of bird species in southeast –Asia. The Avifauna of Myanmar includes 1114 species of which six are endemic, two have been introduced and ten are rare of accidental. One species listed is extirpated. Of these 51 species are globally threatened. Eight of these species are critically endangered, twelve endangered species [3].

The abundance of bird species depends on food availability and suitable habitat[4]. Relative species abundance and species richness describe key elements of biodiversity [5] (Hubbell, 2001). It is refers to how common or rare a species is relative to other species in a given location or community [5, 6].

Lawkanandar Wildlife Sanctuary is situated in Nyaung U Township, Mandalay Region. It lies in the central Dry Zone of Myanmar. Ayeyarwady River Bagan section is one of the Key Biodiversity Area in Myanmar Central, especially Bagan Environ. Therefore, the present study aimed to investigate the water birds of Lawkanandar Wildlife Sanctuary especially on species composition and abundance.

2. Materials and Methods
2.1 Study area
Lawkanandar Wildlife Sanctuary is situated near the eastern bank of Ayeyarwady River. It lies at 21° 06' N to 21° 07 'N latitude and 94° 50' E to 94° 52' E longitude. A total area of Sanctuary is 0.4367 km^2.

2.2 Data collection
This study was carried out between February 2018 and January 2019. Direct counting point count method was used. The field survey were conducted in the morning (between 6:30 to 10:30 am) and in the evening (between 3:30 to 5:30 pm) when the activities of birds were prominent. Birds were collected twice per month. Birds were observed using the seeker Coated Optics binoculars (20× 50) COMET and photographs were taken with a Nikon Coolpix-900 Camera for further identification. Birds were identified by Symithes [7] and Robson [8]. Bird's nomenclature was bases on Robson[8] and Avibase [9] - Bird checklists of the world, Myanmar.

2.3 Analysis of data
The recorded data was analyzed as follow after Bisht *et*

al[10]:

Relative abundance

$$= \frac{\text{No. of individuals of a specie}}{\text{Total no. of individuals of all species}}$$

The average relative abundance was categorized adopted by Bisht *et al.* [10]
uC = uncommon having relative abundance of less than 0.0100
C = common having relative abundance of 0.0100 and above but less than 0.0500
vC = very common having relative abundance of 0.0500 and above.

3. Results

Altogether 30 species (640 individuals) of water birds confined to six orders including in seven families and 21 genera were identified and recorded during the study period from February 2018 to January 2019 (Table 1, 4 and Figure 1). Based on observation of twelve monthly study period, *Egretta garzetta*, *Bulbul ibis*, *Nycticorax nycticorax*, *Phalacrocorax niger*, *Amaurornis phoenicurus* and *Charadrius hiaticula* were found every month of study period (Table 2).The analysis of data on residential status reveal that out of 30 species 18 were residents. The remaining 12 species were winter visitors. Of these, three species, *Threskiornis melanocephalus*, *Anhinga melanogaster* and *Vanellus duvaucelii* were placed near threatened, one species, *Gallinago nemoricola* was placed in the vulnerable and other 26 species were least concern (Table 2). The highest percent composition was found in Charadriifomes (13 species, 43.33%) followed by Pelecaniformes (nine species, 30%), Suliformes (three species, 10%), Anseriformes and gruiformes (two species, 6.67% each) and Ciconiformes (one species, 3.33%) (Table 4 and Figure 2).

4. Discussion

The study area Lawkanandar Wildlife Sanctuary is situated in Central Dry Zone, Nyaung U Township, Mandalay Region. It is suitable for diversity of bird species since it is situated near the Ayeyarwady River and it has favourable food, resting and nesting places such as trees, shrubs and reedbeds for birds and lest human disturbance.
Most of the water birds require flooding of waterlands for breeding[11]. Species composition of water birds in various areas of Myanmar were recently assessed by various authors. Yin Yin Hmwe [12] found 29 waterbird species in U- to wetland area. Khin Gyee Maung [13] recorded 64 species of water birds in Wetthigan Wildlife. Win Kyi [14] recorded 31 waterbird species of 29 genera to 14 families of six orders at Thabyu wetland, Danuphyu Township, Ayeyarwady Region. In the study period, a total of 30 species 21 genera of birds belonging to seven family and six orders were recorded in the study area during February 2018 to January 2019. Waterbird species depend on wetlands for feeding and breeding. Sibley [15] state that a bird's habitat is the specific environment or ecological conditions in which species live. Most habitat descriptions are based on vegetation which reflects the climate, soil type and other features of the local environment and which support the animal life in a given location. In this research, the dominated abundant bird species were recorded during December 2018 and the lowest number of species was recorded in August, 2018. In the case of individuals the highest number was recorded in January, 2018 and the lowest number was recorded in May 2018. It is due to may be water birds were recorded more in species (during December) and in individuals (during January) since the winter visitors come to take refuge from the coldness of winter in Northern hemiosphere. While in May and August the winter birds return their homeland and the number of waterbird species decrease, and the feeding was difficult for water birds due to the habitat coverage change.
Regarding the status of the bird species according to IUCN[3], *Threskiornis melanocephalus*, *Anhinga melanogaster* and *Vanellus duvaucelii* were placed near threatened (NT), Gallinago nemoricola was placed in the vulnerable (VU) and other 26 species were least concern (LC). In Myanmar, the number of species is 1078. In this observation of 30 species , 18 were resident whereas the remaining 12 species were winter visitors.
The composition of bird species is highly related to the vegetation structure of forest [16] (Robertson and Hackwell, 1995). In the study period , the highest composition was found in *Tadorna ferruginea* and the lowest composition was found in *Porzan pusilla.* In the other hand, the highest composition in different order was found in Charadriiformes and followed by Pelecaniformes Suliformes, Anseriformes and Gruiformes, and the lowest composition was found in order of Ciconiiformes.
In ecology, birds are of tremendous importance because of their key roles as pollinators and agents of seed dispersal. During the study period It was observed that increasing human population and interference in this study area are disturbing many shy and visiting bird species . Livestock farming is another leading problem that leads to habitat destruction. After agriculture, local habitants also depend on this study area for livestock. This leads to restrict the bird species and population.

5. Conclusion

On the whole, the relative abundance of species seemed to be associated with habitat structural complexity, the vegetation community, abundance of food sources and compatibility with the ecological conditions of the environment. Therefore site fidelity appeared as a tendency of annuals to remain in or return and reuse the habitat previously visited by the annuals. Thus the percent composition of bird species in orders at Lawkanandar Wildlife Sanctuary is sound avifaunal diversity. Its proper management will not only improve the situation for its resident species, but will also attract more migratory and vagrant species in future.

6. Tables and Figures

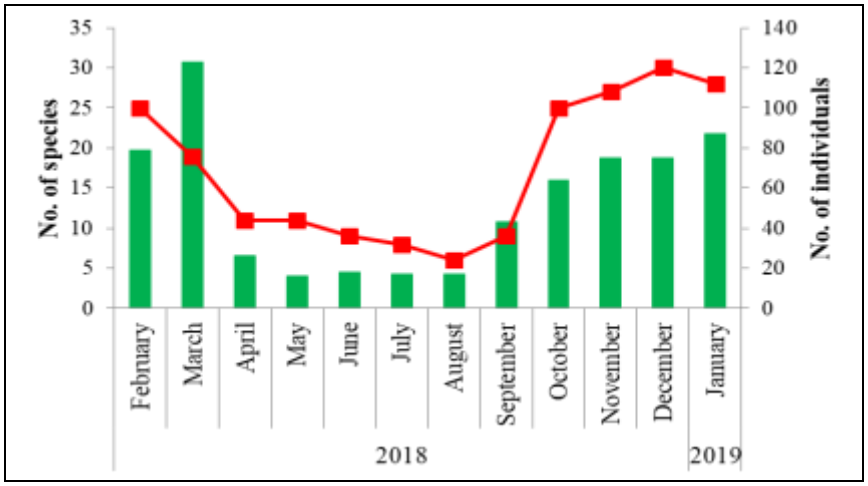

Fig 1: Relative occurrence of bird species and number of individuals at Lawkanandar Wildlife Sanctuary during February 2018 to January 2019

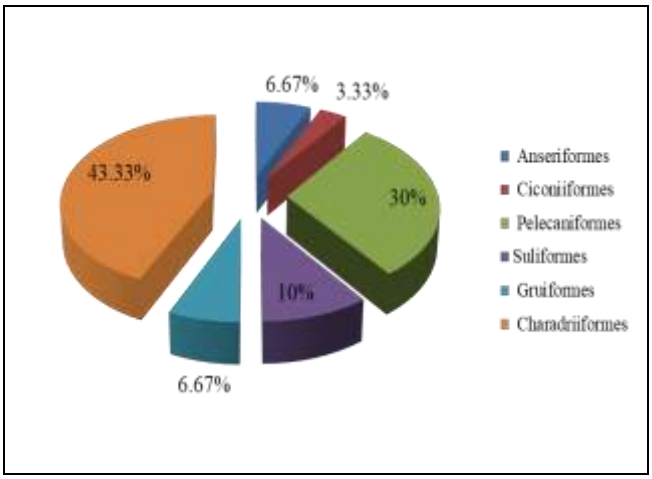

Fig 2: Percent composition of bird species in orders at Lawkanandar Wildlife Sanctuary during February 2018 to January 2019

Table 1: Bird species and number of individuals at Lawkanandar Wildlife Sanctuary during February 2018 to January 2019

Years	Months	Total no. of species	Total no. of individuals
2018	February	25	79
	March	19	123
	April	11	26
	May	11	16
	June	9	18
	July	8	17
	August	6	17
	September	9	43
	October	25	64
	November	27	75
	December	30	75
2019	January	28	87
Total number		208	640

Table 2: Occurrence and status of bird species at Lawkanandar Wildlife Sanctuary during February 2018 to January 2019

Sr. No.	Species	frequency	Composition (%)	Local Status	IUCN Status
1	*Anas zonorhyncha*	5	41.67	WV	LC
2	*Tadorna ferruginea*	6	50	WV	LC
3	*Anastomus oscitans*	5	41.67	WV	LC
4	*Threskiomis melanocephalus*	6	50	WV	NT
5	*Egretta garzetta*	12	100	R	LC
6	*Ardea alba*	8	66.67	R	L C
7	*Bubulcus ibis*	12	100	R	LC

8	*Ardea intermedia*	8	66.67	R	LC
9	*Ardeola grayii*	8	66.67	R	LC
10	*Ardeola bacchus*	10	83.33	R	LC
11	*Ardea cinerea*	8	66.67	WV	LC
12	*Nycticorax nycticorax*	12	100	R	LC
13	*Microcarbo niger*	12	100	R	LC
14	*Phalacrocorax carbo*	7	58.33	R	LC
15	*Anhinga melanogaster*	5	41.67	R	N T
16	*Porzana pusilla*	5	41.67	R	LC
17	*Amaurornis phoenicurus*	12	100	R	LC
18	*Tringa ochropus*	5	41.67	WV	LC
19	*Tringa glareola*	3	25	WV	LC
20	*Tringa erythropus*	6	50	WV	LC
21	*Actitis hypoleucos*	6	50	WV	LC
22	*Gallinago gallinago*	5	41.67	R	LC
23	*Gallinago nemoricola*	6	50	R	VU
24	*Rostratula benghalensis*	4	33.33	R	LC
25	*Charadrius hiaticula*	12	100	R	LC
26	*Pluvialis fulva*	4	33.33	WV	LC
27	*Vanellus indicus*	10	83.33	R	LC
28	*Vanellus cinereus*	6	50	WV	LC
29	*Vanellus vanellus*	6	50	WV	LC
30	*Vanellus duvaucelii*	6	50	R	NT

Wv = Winter Visitor, R = Resident, LC = Least Concern, NT = Near Threatened, VU = Vulnerable

Table 3: Species composition of bird species at Lawkanandar Wildlife Sanctuary during February 2018 to January 2019

Sr	Species	Common name	Total no. individuals	Relative abundance	
1	*Anas zonorhyncha*	Chinese spot-billed Duck	37	0.0578	vC
2	*Tadorna ferruginea*	Ruddy Shelduck	145	0.2266	vC
3	*Anastomus oscitans*	Asian Openbill	11	0.0172	C
4	*Threskiomis melanocephalus*	Black-headed Ibis	18	0.0281	C
5	*Egretta garzetta*	Little Egret	31	0.0484	C
6	*Ardea alba*	Great Egret	21	0.0328	C
7	*Bubulcus ibis*	Cattle Egret	44	0.0688	vC
8	*Ardea intermedia*	Intermediate Egret	20	0.0313	C
9	*Ardeola grayii*	Indian Pond Heron	17	0.0266	C
10	*Ardeola bacchus*	Chinese Pond Heron	15	0.0234	C
11	*Ardea cinerea*	Grey Heron	18	0.0281	C
12	*Nycticorax nycticorax*	Black-crowned Night Heron	91	0.1422	vC
13	*Microcarbo niger*	Little Cormorant	32	0.05	C
14	*Phalacrocorax carbo*	Great cormorant	15	0.0234	C
15	*Anhinga melanogaster*	Oriental Darter	4	0.0063	uC
16	*Porzan pusilla*	Baillon's Crake	3	0.0047	uC
17	*Amaurornis phoenicurus*	White breasted Waterhen	17	0.0266	C
18	*Tringa ochropus*	Green Sandpiper	5	0.0078	uC
19	*Tringa glareola*	Wood Sandpiper	5	0.0078	uC
20	*Tringa erythropus*	Spotted Redshank	4	0.0063	uC
21	*Actitis hypoleucos*	Common Sandpiper	8	0.0125	C
22	*Gallinago gallinago*	Common Snipe	7	0.0109	C
23	*Gallinago nemoricola*	Wood Snipe	5	0.0078	uC
24	*Rostratula benghalensis*	Greater Painted Snipe	4	0.0063	uC
25	*Charadrius hiaticula*	Common Ringed Plover	19	0.0297	C
26	*Pluvialis fulva*	Pacific Golden Plover	6	0.0094	uC
27	*Vanellus indicus*	Red-wattled Lapwing	9	0.0141	C
28	*Vanellus cinereus*	Grey-headed Lapwing	8	0.0125	C
29	*Vanellus vanellus*	Northern Lapwing	8	0.0125	C
30	*Vanellus duvaucelii*	River Lapwing	13	0.0203	C

uC = Uncommon, C = Common, vC = Very common

Table 4: Occurrence of bird status and percent composition of bird species in orders at Lawkanandar Wildlife Sanctuary during February 2018 to January 2019

No	Order	No. of Family	No. of Genus	No. of Species	Migrants	Residents	Composition %
1	Anseriformes	1	2	2	2	0	6.67
2	Ciconiiformes	1	1	1	1	0	3.33
3	Pelecaniformes	1	6	9	2	7	30
4	Suliformes	1	3	3	0	3	10

5	Gruiformes	1	2	2	0	2	6.67
6	Charadriiformes	2	7	13	7	6	43.33
	Total number		21	30	12	18	100

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