

Comparison of Community Similarity and Biodiversity Indexes of Water Birds between Miangaran Natural Wetland and Naseri Man Made Lagoon in winter 2016

Behrouz Behrouzi-Rad

Retired from Department of Environment, Wildlife Ecology specialist and Ornithologist, Theran, Iran.

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*Corresponding author: Behrouz Behrouzi-Rad, Retired from Department of Environment, Wildlife Ecology specialist and Ornithologist, Theran, Iran, E-mail: bbehrouzirad@yahoo.com

Abstract

Comparison of similarity of community and biodiversity indices of water birds between Natural Miangaran Wetland (NMW) and Naseri Man Made Lagoon (NMML) carried out by direct counting in winter 2016. In the (NMW), 32 species of waterbirds with a population of 8162 individuals and 30 species in the (NMML) with a population of 28595 individuals recorded. In the (NMML), the most frequent was Greater flamingo *Phoenicopterus ruber* with 18677 individuals and the Purple Heron *Ardea purpurea* with the least number of frequent. In the (NMW), Common Teal *Anas creca* was the most frequent species with 2569 individuals and the least frequent were *Botaurus stellaris* with 2 individuals. In the (NMW), four species of water birds, Little Gull *Larus minutus*, Re-necked Phalarope *Phalaropus lobatus*, Bridled Tern *Sterna anaethetus*, Terek Sandpiper *Tringa cinereus*, and the White-tailed Lapwing *Chettusia leucurus* were absent. There were no Yellow-legged Gull *larus cachinans*, Greylag Goose *Anser anser*, Red-wattled Lapwing *Hoplopterus indicus*, Little Ringed Plover *Charadrius dubius*, White Stork *Ciconia ciconia*, Bittern *Botaurus stellaris*, and Glossy Ibis *Plegadis falcinellus* in the (NMML). The number of water birds of (NMML) was 3.5 times the number of (NMW) water birds. The highest index of Margalf species diversity in (NMW) and (NMML) were 3.655 and 3.065, Simpson index were 0.885 and 0.558, respectively, and the index of species evenness were 0.375 and 0.189 respectively. Gamma diversity was 32 in (NMW) and 30 (NMML) in the winter 2016. Euclidean difference between water birds of two wetlands was 1343.62 and the similarity of the water bird's community was 53.58.

Keywords: Water birds population; Species diversity; Miangaran Wetland; Naseri lagoon;

Introduction

The history of water birds studies in the world's wetlands reaches a century, but the flourishing of these studies dates back to the year 1942, when the International Wetland and Waterfowl Research Bureau (IWRB) established for the conservation and management of wetlands and water birds [1] In Iran, counting and studies of water birds in wetlands have been initiated since 1960 by the Department of Environment of Iran. At that time, Iran

had 250 wetlands with an area of about 2.5 million hectares [2] which now all natural wetlands are either destructed or altered ecological [3] of the 250 wetlands, 24 wetlands with an area of 1481147 hectares have been registered at the Ramsar Convention list and are of universal importance [4] In the world until May 2016, 2240 wetlands have been registered in the list of the Ramsar Conventions in 169 countries with an area of 215240112 hectares [5]. In the Middle East, 391 areas are designated as Important Bird Area (IBA) [6,7] 105 regions, that is, about 26% of them are in Iran [8]. These habitats cover about 20% of the total of Iran. Of the 105 regions, 40 are wetlands, but the Naseri lagoon is not included in the list of Important Bird Area [5]. Since the survival of many rare and endangered species of water birds are dependent on the wetlands [9] the existence of clean wetlands will be necessary for the birds to achieve contamination and bioavailability. In recent years, Iranian wetlands, including Khuzestan province wetlands, have suffered severe drought and pollution and reduced the area, volume and depth of water and their ecological functions [2]. Naseri lagoon after the construction of Mirzakocheh Khan and Amir Kabir sugar fields has accumulated their wastewater and since it has a vast area (12,000 hectares) and a depth of more than 150 centimeters, it has created a new water habitat for water birds in Khuzestan. The purpose of this study was to compare the water birds among Miangaran natural wetlands and Naseri Man-made lagoon to answer the question of whether can man-made wetlands replace natural wetlands. From similar studies of water birds in the world's on the wetlands, one can: Andrews and Williams, [10], Amat and Green, [11], Paszkowski and Tone, [12], Wilhm and Dorris, [13], Zakaria and Rajpar, [14], Declerck and Meester, [15], Marques, et al. [16], Rutschke, [17], Ranter, [18] and Hussien, [19]. In Iran, the study can also be done by Behrouzi-Rad, [20, 21, 22, 23, 24], Behbash, et al. [25], Karimipour, [26] and Yazdani, [27]. The aim of this study was to compare populations and biodiversity indexes, to determine the similarity and differences between abundance, species diversity and population composition of water birds among Miangaran natural wetland and Naseri Man Made Lagoon.

Materials and Methods

Study Area

The Naseri Lagoon is located 35 km far from Khoramshahr city with a geographical position of 30°38'5" N, 48°07'59"E with an approximate area of 12,000 hectares. The artificial Naseri lagoon is formed from Amir Kabir and Mirza Kuchak Khan wastes water at western part of Karoun River in the south of Ahwaz in 1999 figure 1. In spite of being young, vegetation of the phragmites australis has been created in different parts of the lagoon, and it is

habitat for waterbirds. The Izeh wetland or the Miangaran in the north of the city of Izeh in Khuzestan province is located 31°51' to 31°55' 57"N 49°50' to 49°54' 56"E. Its area is 6000 hectares [2]. The minimum depth of the wetland is 0.7 m and the maximum depth of the wetland is 3 m in the course of a flood [2], figure 1 and 2. According to the classification of the Ramsar Convention, [4] and Scott and Frazier, [28], the Miangaran or Izeh wetland is permanent freshwater wetland and Naseri lagoon is Man Made Lagoon figure 2. The distance between two wetland is about 200 km.

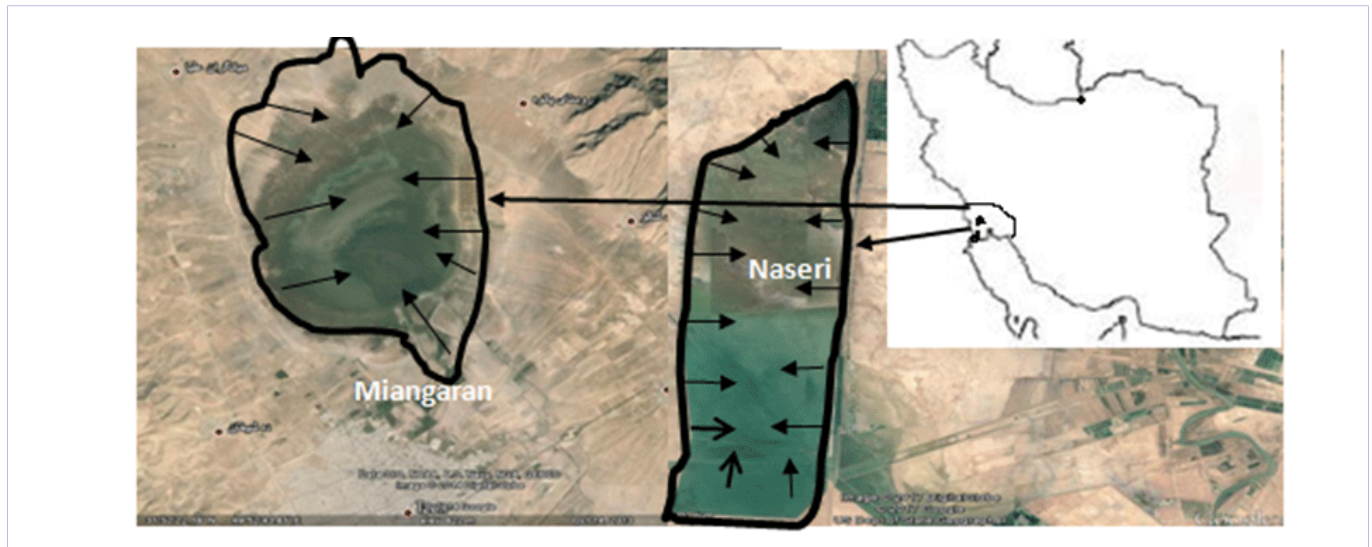


Figure 1: The route of counting of birds in Miangaran wetland and Naseri Lagoon (Google Earth, 2016)



Figure 2: Natural features of Miangaran wetland and Naseri lagoon (internet, 2016)

Estimation of bird's population

For 3 months, they were referred to Naseri lagoon and Miangaran wetlands monthly, and waterbirds were identified by a binocular (40x10 Zeiss) and 60x15 telescopes and counted by total count method. This methodology is used by [29] in January each year to count waterbirds in the wetlands of the world. In Iran, since 1961, the Department of Environment of Iran has used

this method for counting waterbirds in wetlands. The counting of water birds of the Naseri wetland was carried out on January 18, February 20 and March 19, and the counting of water birds in the Miangaran wetland on January 19, February 21 and 20 March in 2016. All timings were taken from 8am to 16pm to create a timed similarity in the counting of birds in Miangran and Naseri Lagoon. In the Naseri wetland, I walked and stand on the lagoon wall on round of the wetland every 2-3 km, and counted

the water birds by binocular and telescope. In the Miangaran wetland, by moving around the wetland, every 2-3 kilometers standing and birds counted by binocular and a telescope figure 1 Two kilometers distance were selected due to the strength of the field of view of the binocular and the telescope and the lack of repeat counting of water birds. It took about 8 hours a day to walk around the wetlands and count the birds. Due to the large distance between two wetlands (200 Km), there was no possibility to count water birds in one day in both wetlands. That's why the birds are counted in two days. The biodiversity indicators measured by Past software [30]. The biodiversity indicators calculated in this study were Shanon-Winier, Simpson dominance, Margalef and Mehinick richness, evenness, α , β and γ diversity. The Birds Protection Status has been used by the Department of Environment law [31] and IUCN criteria [32] to state the conservation status. Alpha, Beta and Gamma diversity have been used by Whitaker, [33]: Alpha diversity is in-habitat diversity. In fact, the same kind of species found in a community. Beta diversity is a variation between the habitats and shows the difference in species composition and diversity variations from

one habitat to another. Gamma Diversity the richness of a range of habitats is called in a geographic region.

Results

During 3 months, 36774 individuals of 37 species of water birds (swimmer water birds 20 species, and 17 species of waders and wading birds) were identified and counted in two wetlands table 1 figure 6. The most species and number in the Naseri lagoon on February were 4811 individuals belonging to 30 species, and in Naseri lagoon, the highest number was recorded in March of the 28 species and the highest population was recorded in February 1355 individuals table 1 and table 2. Of the protected species, Greater Flamingo was counted with a population of 18577 individuals in Naseri lagoon and 88 individuals in the Miangaran wetland. The world endangered species *Botaurus stellaris* (Vu) with population of 2 individuals were counted in the Miangaran wetland. This species was not observed in Naseri lagoon. Alpha diversity of swimmer water birds waders and wading birds and all water birds in Miangaran and Naseri wetlands has been shown in figures 3, 4 and 5 respectively in winters 2016.

Table 1: Population and species number of water birds in Miangaran and Naseri wetlands

Birds	Miangaran						Naseri					
	species Number			Population			Species Number			Population		
	January	February	March	January	February	March	January	February	March	January	February	March
Swimmer water birds	12	17	15	1574	4069	1251	15	15	16	7694	12929	6204
Waders and wading birds	11	15	13	122	742	404	11	10	12	352	926	480
Total number	23	32	228	1696	4811	1655	26	25	28	8046	13855	6684
Total number in winter 2016		32			8162			30			28595	

Table 2: Number of water birds in Miangaran and Naseri in winter 2016

Species	Miangaran				Naseri			
	January	February	March	Total	January	February	March	Total
Great Crested Grebe <i>Podiceps cristatus</i>	7	124	18	149	28	6	5	39
Little Grebe <i>Tachybaptus ruficollis</i>	140	277	11	428	109	231	21	361
Great Cormorant <i>Phalacrocorax carbo</i>	28	448	20	496	11	180	53	244
Grey Heron <i>Ardea cinerea</i>	5	195	103	303	7	21	12	40
Purple Heron <i>Ardea purpurea</i>	0	2	2	4	0	0	1	1
Great White Heron <i>Cosmerodius albus</i>	1	13	5	19	31	5	5	41
Little Egret <i>Egretta garzetta</i>	11	122	98	231	20	18	14	52
Cattle Egret <i>Bubulcus ibis</i>	12	53	15	80	12	23	4	39

Eurasian Bittern <i>Botaurus stellaris</i>	0	2	0	2	0	0	0	0
Glossy Ibis <i>Plegadis falcinellus</i>	0	2	1	3	0	0	0	0
White Stork <i>Ciconia ciconia</i>	27	93	20	140	0	0	0	0
Greater Flamingo <i>Phoenicopterus ruber</i>	0	53	35	88	5252	8756	4569	18577
Greylag Goose <i>Anser anser</i>	0	52	50	102	0	0	0	0
Shelduck <i>Tadorna tadorna</i>	0	23	0	23	25	45	8	78
Mallard <i>Anas platyrhynchos</i>	12	137	453	602	355	353	130	838
Common Teal <i>Anas crecca</i>	657	1456	456	2569	554	676	151	1381
Pochard <i>Aythya ferina</i>	456	786	45	1287	67	167	12	246
Shoveler <i>Anas clyptea</i>	0	33	60	93	34	45	0	79
Pintail <i>Anas acuta</i>	3	99	12	114	5	30	54	89
Black-winged Stilt <i>Himantopus himantopus</i>	17	30	24	71	52	65	35	152
Red-wattled Lapwing <i>Hoplopterus indicus</i>	0	7	0	7	0	0	0	0
White-tailed Lapwing <i>Chettusia leucurus</i>	0	0	0	0	4	0	12	16
Little Ringed Plover <i>Charadrius dubius</i>	20	150	100	270	0	0	0	0
Redshank <i>Tringa totanus</i>	12	32	11	55	14	37	13	64
Marsh Sandpiper <i>Tringa stagnatilis</i>	3	6	8	17	83	296	112	491
Terek Sandpiper <i>Tringa cinereus</i>	0	0	0	0	106	386	175	667
Red-necked Phalarope <i>Phalaropus lobatus</i>	0	0	0	0	23	13	0	36
Sanderling <i>Calidris alba</i>	12	22	8	42	14	67	90	171
Dunlin <i>Calidris alpina</i>	2	13	9	24	9	8	7	24
Slender-billed Gull <i>Larus genei</i>	1	23	11	35	495	1045	1035	2575
Little Gull <i>Larus minutus</i>	0	0	0	0	0	0	4	4
Yellow-legged Gull <i>Larus cachinans</i>	17	84	26	127	0	0	0	0
Common Black-headed Gull <i>Larus ridibundus</i>	0	10	0	10	346	480	72	898
Common Tern <i>Sterna hirundo</i>	17	38	10	65	0	0	8	8
Bridled Tern <i>Sterna anaethetus</i>	0	0	0	0	0	0	3	3
Eurasian Coot <i>Fulica atra</i>	180	360	30	570	345	850	85	1280
Common Morohen <i>Gallinula chloropus</i>	56	76	14	146	45	52	4	101
Total	1696	4811	1655	8162	8044	13855	6684	28598

Diversity and composition of the bird's species

Alpha-diversity was calculated in Naseri and Miangaran wetlands by past software are shown in figures 3, 4 and 5. Alpha diversity waders and wading birds were 32 in winter in 2016 in Miangaran and 30 in Naseri lagoon. Beta diversity between Miangaran and Naseri lagoon was 0.37 in winter in 2016, 0.21 on January, 0.10 on February and 0.22 on March. Birds' community of tow wetlands divided to tow group:

1- Aquatic swimmer water birds that are Semi-totopalmet. Of this group, 6904 individuals recorded in the Miangaran and

26837 individuals in Naseri. Anatidae species had the largest number with 4807 individuals in the Miangaran wetland. Common Teal was the most frequent with 2568 individuals. The Greater Flamingo in the Naseri wetland had the highest frequency with 18577 individuals table 2. Generally, the number of Miangaran wetland species was more than the Nasiri (32 > 30), but the number of swimmer water birds in the Naseri lagoon were more than the Miangaran (28595 > 8162), of which 18577 individuals belong to Greater Flamingo. Alpha diversity of waders and wading birds were more than swimmer water birds figures 3 and 4.

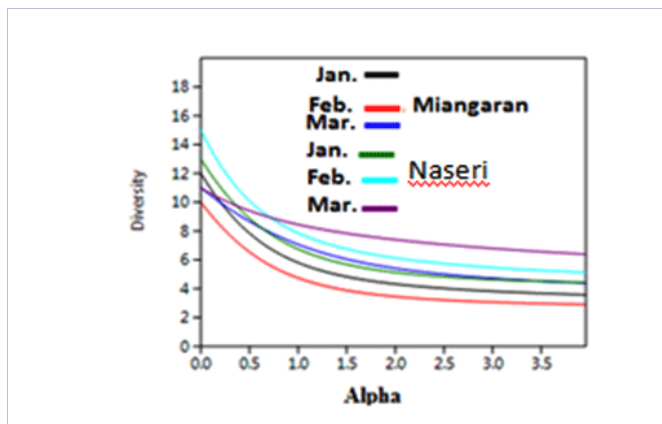


Figure 3: Alpha diversity of swimmer water birds in Miangaran and Naseri

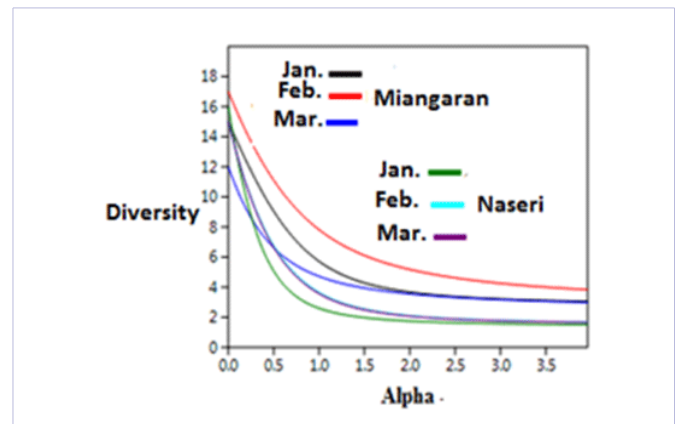


Figure 4: Alpha Diversity of waders and wading birds in the Miangaran and Naseri Lagoon

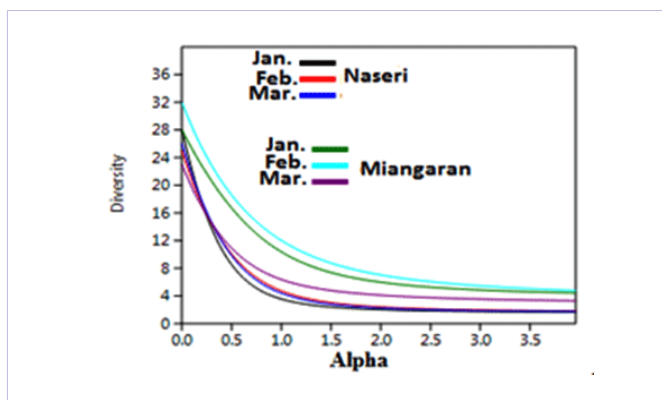


Figure 5: Alpha diversity of water birds in Miangaran and Naseri wetlands in winter 2016

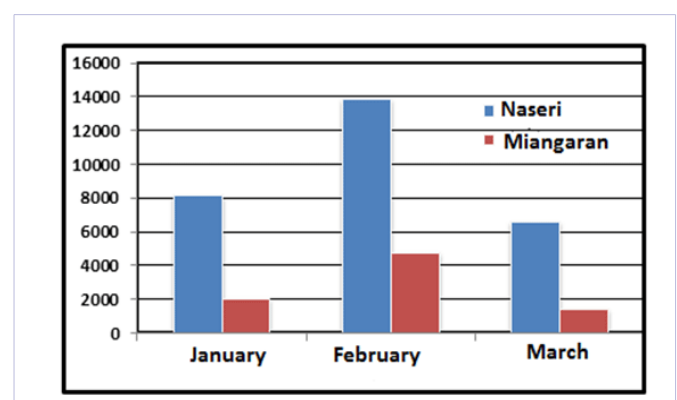


Figure 6: Number of water birds in Naseri and Miangaran in winter 2016

2. Waders and wading birds are half-dipped in their fingers and do not swim in the water, but easily flock on muddy beaches on the shores of the wetlands, and feed on bent hoses, aquatic insects, and other aquatic animals [34]. From this group 1258 individuals counted in the Miangaran and 1758 individuals in the Naseri lagoon in winter in 2016. There were 639 individuals from Ardeidae species in Miangaran, and 1585 individual's waders in Naseri lagoon. Water birds population was 28595 individuals in the winter belonged to 30 species in the Naseri lagoon and 8162 individuals belonged to 32 species in Miangaran. The population of water birds in Naseri lagoon was 3.5 times the size of the birds of the Miangaran wetland, but the number of species was 2 species less than the Miangaran.

The Simpson species diversity index in Naseri lagoon was found to be the most similar index in March (0.858) and in January (0.775) and at least in March (0.507) and maximum in February (0.585), in the Miangaran wetland maximum in February (0.858) Jakard in both wetlands in February was 0.448 and 0.717 respectively, the highest evenness in Naseri was 0.492 in March and 0.242 in Miangaran wetland in January 2016. The remaining biodiversity indexes of two wetlands are shown in table 3. The percentage of similarity and Euclidean difference between the water birds of the two wetlands of Miangaran and

Naseri in the winter in 2016 is shown in table 4. The Euclidean difference between the two wetlands was (1342.62) and the highest Euclidean difference among the two birds' communities was (1132.38) and the lowest Euclidean difference between the months of February and March were (62.51). The percentage of similarity between the two birds' communities in winter was 53.58, the highest percentage of similarity was found between the two birds community in January and March (96.33) and the lowest percentage of similarity between February and March (79.52). The correlation coefficient of the water bird's community among two wetlands in winter is shown in table 5. There was a significant difference between the water birds' community of Miangaran wetland in January with the community of February and March in Naseri lagoon at the level of 1% (0.985 and 0.998). There was a significant difference between the correlation coefficient of the waders and wading birds communities in February and March (0.541 and 0.954) with the waders and wading bird's community in March, at a level of 1%. The Kendall statistical test showed that there was a significant correlation among the community of Naseri lagoon birds and the Miangaran birds' community in the February and March. Also, the statistical test of Spearman showed that there was a significant correlation between the community of Naseri lagoon birds and the Miangaran birds' community in February table 6.

Table 3: Diversity indexes of water birds in Miangaran and Naseri in winter 2016

Bio-indices	Miangaran			Naseri		
	Jan	Feb	March	Jan	Feb	March
Dominance-D	0.242	0.142	0.166	0.44	0.415	0.492
Simpson_1-D	0.757	0.858	0.833	0.559	0.585	0.507
Shannon_H	1.853	2.487	2.34	1.483	1.558	1.271
Evenness_e^H/S	0.277	0.375	0.37	0.169	0.189	0.127
Brillouin	1.825	2.469	2.301	1.47	1.552	1.261
Menhininck	0.558	0.46	0.688	0.289	0.212	0.342
Margalef	2.959	3.655	3.643	2.78	2.517	3.065
Equitability_J	0.591	0.717	0.702	0.455	0.484	0.381
Fisher_alpha	2.762	4.601	4.788	3.339	2.958	3.738
Berger-Parker	0.387	0.302	0.275	0.652	0.632	0.682
α Diversity	23	32	28	26	25	28
β Diversity	Dec-Jan	Jan-Mar	Dec-Mar	Dec-Jan	Jan-Mar	Dec-Mar
	0.162	0.055	0.098	0.019	0.132	0.111
γ Diversity		32			30	

Table 4: Similarity and Euclidian difference of water birds in Miangaran and Naseri in winter 2016

Wetlands	Month	Miangaran		Similarity %		Naseri			
		Jan	Feb	March	Total				
Miangaran	Jan	100							
	Feb	94.14	100						
	March	97.84	92.41	100					
	Total	96.84	91.33	95.84	100	Jan			
		Jan	60.16	55.79	61.26	61.59	100	Feb	
Naseri	Feb	59.12	56.38	59.15	60.65	82.39	100	March	
	March	60.11	78.55	61.28	60.84	96.23	79.59	100	
	Total	57.93	54.08	59.24	58.53	86.4	72.15	86.26	
	Euclidian Difference								
	Miangaran	Jan							
Jan		0	Feb						
Feb		4239.52	0	March					
March		2888.42	1359.2	0	Total		Naseri		
Total		3995.11	281	1109.72	0	Jan			
Naseri	Jan	4502.17	916.49	1735.24	936.42	0	Feb		
	Feb	3331.03	1114.35	2445.64	1343.55	1138.32	0	March	
	March	4915.42	835.61	2055.12	1020.26	586.33	562.41	0	
	Total	5328.35	51116,85	2442.8	1343.62	1115.26	112.15	533.16	

Table 5: Correlation of water birds in Miangaran and Naseri in winter 2016(by Pearson Test)

Wetland name	Correlations							
			Miangaran			Naseri		
			January	February	March	January	February	March
Miangaran	January	Pearson Correlation	1					
		Sig. (1-tailed)						
		Species No.	37					
	February	Pearson Correlation	0.626**	1				
		Sig. (1-tailed)	000					
		Species No.	37	37				
	March	Pearson Correlation	0.541**	0.954**	1			
		Sig. (1-tailed)	000	000				
		Species No.	37	37	37			
Naseri	January	Pearson Correlation	004/0	038/0-	049/0-	1		
		Sig. (1-tailed)	0.492	0.412	0.386			
		Species No.	37	37	37	37		
	February	Pearson Correlation	0.041	0.230	0.130	0.989****	1	
		Sig. (1-tailed)	0.405	0.446	0.470	000		
		Species No.	37	37	37	37	37	
	March	Pearson Correlation	0.830	0.390	0.280	0.985**	0.998**	1
		Sig. (1-tailed)	0.313	0.410	0.435	000	000	
		Species No.	37	37	37	37	37	37

**Correlation is significant at the 0.01 level (1-tailed).

Table 6: Correlation of water birds in Miangaran and Naseri in winter 2016 (by Kennedale and Spearman Test)

Correlation								
			Miangaran			Naseri		
			January	February	March	January	February	March
Test Kendall's	January	Correlation Coefficient	1					
		Sig. (1-tailed)	0					
		N	37					
	February	Correlation Coefficient	0.682**	1				
		Sig. (1-tailed)	0	0				
		N	37	37				
	March	Correlation Coefficient	0.507**	0.642**	1			
		Sig. (1-tailed)	0	0	0			
		N	37	37	37			
Miangaran	January	Correlation Coefficient	0.128	0.168	0.187	1		
		Sig. (1-tailed)	0.144	0.079	0.066	0		
		N	37	37	37	37		
	February	Correlation Coefficient	0.196	0.246*	0.246	0.701**	1	
		Sig. (1-tailed)	0.053	0.021	0.025	0	0	
		N	37	37	37	37	37	
	March	Correlation Coefficient	0.186	0.210*	0.182	0.596**	0.797	1
		Sig. (1-tailed)	0.062	0.04	0.072/0	0	0	0
		N	37	37	37	37	37	37
Test Spearman's	January	Correlation Coefficient	1	0.851**				
		Sig. (1-tailed)	0	0				
		N	37	37				
	February	Correlation Coefficient	0.851**	1				
		Sig. (1-tailed)	0	0				
		N	37	37				
	March	Correlation Coefficient	0.614**	0.798**	1			
		Sig. (1-tailed)	0	0	0			
		N	37	37	37			
Miangaran	January	N	37	37	37			
		Correlation Coefficient	0.165	0.238	0.245	1		
		Sig. (1-tailed)	0.164	0.078	0.072	0		
	February	N	37	37	37	37		
		Correlation Coefficient	0.276*	0.351*	0.295	0.840**	1	
		Sig. (1-tailed)	0.049	0.017	0.038	0	0	
March	N	37	37	37	37	37		
	Correlation Coefficient	0.258	0.291*	0.236	0.751**	0.928**	1	
	Sig. (1-tailed)	0.061	0.040	0.08	0	0	0	
	N	37	37	37	37	37	37	

**Correlation is significant at the 0.01 level (1-tailed).
*Correlation is significant at the 0.05 level (1-tailed).

Discussion

The Miangaran is located 3 km far from the city of Izeh and is a natural wetland. Water supply sources are surface waters and waste water from the city of Izeh. Its area is 6000 hectares [2,28]. The Naseri lagoon has been formed for about 3 decades and covers an area of 12,000 hectares. It is located 17 km far from Khorramshahr city [3,21]. Since the formation of Naseri lagoon, it has chosen as a wintering habitat by water birds table 2. In 2007, 194464 individuals of 29 species of water birds were counted [25]. This number increased to 28595 individuals and 30 species in 2016, while the number of water birds in the Miangaran in 2007 was 46581 of 44 species and in 2016 it decreased to 8135 individuals of 32 species. Two species of water birds were present in both lagoons. The Common Tern population in Miangaran was 8 times greater than the Nasiri Lagoon ($8 < 65$). The Bridled Tern was not seen in the Miangaran, but 3 individuals counted in the Naseri lagoon. Because it often lives on the island or sea coasts, coastal wetlands or near the Persian Gulf [34], the population of 7 species of Anatidae in the Miangaran and Naseri were 4790 and 2711 respectively (1.7 times). The water physico-chemical parameters of Naseri lagoon do not permit the presence and of a large variety of plankton [25] Grey Lag Goose feed in addition to water filtration in grass around wetlands in rangelands of wheat grasses. There is not a grass around the Naseri lagoon due to the salinity of the land. The Waders in the Naseri lagoon were more than Miangaran ($1758 > 1268$). This was due to the presence of a large, damp ground of water near the Naseri lagoon, which led to the attraction of these birds to the lagoon. The waders feed on the bent hoses on beaches of the wetland or on wet muddy grounds [14]. Of the 13 species of herons in Iran, six species were counted in the Miangaran with a population of 637 individuals and four species with a population of 173 individuals in Nasser. The herons are species that stand on the margin of water and wait for the food and catch a fish or other aquatic animals [34]. These conditions are provided on the margins of the Miangaran wetlands, but the conditions of the Naseri lagoon due to the uniform wall and up to 3 meters are not suitable for fishing. Biodiversity indexes of water birds of Miangaran wetlands were more than the Naseri lagoon table 3. The reason is the low population of water birds in the Miangaran and more species in it. The biodiversity indicators depend on the population and number of species. The dominance index in the Naseri wetland was more than the Miangaran. This is due to the presence of the Greater Flamingo (18577 individuals versus 88 individuals). The evenness of the Naseri water birds was more than Miangaran in every three months (on January, $0.277 > 0.1679$, on February ($0.375 > 0.1779$) and on March ($0.370 > 0.127$) table 3. The evenness is related to the distribution of the population among the number of species, and the distribution of the species of waterbirds in the Miangaran is more balanced than the Nasser. There was a difference in the composition of the population of the species and the families of water birds in the two wetlands. These differences appear to be due to the increased security in the Naseri lagoon, its larger

size and easy food (due to waste water from the Naseri lagoon, it has a lower quality than the Miangaran wetland, and as a result, aquatic animals have less mobility, especially fish larvae are easier to catch). The highest diversity of Simpson species in the Miangaran was more than Simpson species diversity in Naseri lagoon ($0.858 > 0.585$). Shannon-winner diversity index was higher in Miangaran wetland than Naseri wetland ($2.487 > 1.558$). Evenness index of Naseri lagoon was more than Miangaran ($0.717 > 0.487$) table 3. These differences are due to the presence of more water bird species in the Miangaran, and the history of the presence of birds in this wetland dating back to the formation of the Naseri lagoon. Migratory waterbirds usually prefer to return to previously known habitats. This will continue as long as the previous wintering habitats persist [11] this is true of the Miangaran wetland waterbirds. At least the similarity between the waterbirds in two wetlands in February (56.38) and the maximum similarity between March and February (78.58) are the highest table 4. The data of tables 1 and 2, biodiversity indicators table 3, and Euclidean similarity and difference table 4 indicate the difference between the numbers of water birds in the two wetlands. The maximum similarity among the two wetland water birds was 53.58 table 4. The maximum Euclidean difference between January and March (4915.42) and the minimum Euclidean difference between birds in January and February (98.14) and maximum Euclidean difference in total waterbirds were 1343.62 table 4. These differences are due to the biological conditions of the two wetlands where Naseri was formed from the accumulation of cane wastewater, but the Miangaran is natural marsh. Spearman test showed that the correlation coefficient in March and February was 92.8 table 5. Kendall's test showed that the highest correlation coefficient between two wetland birds was in January and February (0.701) table 6. In a similar study by Behrouzi-Rad, [8], the difference between the water birds of the two natural Bazangan Lake and Shahid Yaghoobi Dam Reservoir in Khorasan Razavi province is expressed. But, the number, and diversity of water birds in the natural Bazangan Lake was higher than the Shahid Yaghoobi Dam reservoir, while the study found that the number of water birds in the wetland made up of cane sugar (Naseri lagoon) is higher. One of the reasons for this difference can be the physical and chemical properties of the Miangaran and the Nasser lagoon. Of course, the quality of waste water is not the same with natural water. On the other hand, Low security (due to the presence of fishermen and Hunters) and the small size of the Miangaran ($6000 < 12000$) have caused to have waterbirds population less than the Naseri lagoon. In a similar study published in 2012 in the Miangaran wetland [20] showed the density and diversity of waterbirds in the polluted area of the Miangaran wetland is less than that of the natural part. The results of previous studies confirm the information obtained from these studies, which may be due to inappropriate conditions of the Miangaran wetlands in 2016 compared to 2012, or the dehydration conditions of other wetlands of Khuzestan province caused the water birds, especially Greater Flamingos gather in the Naseri lagoon. In a similar study Declerck, et al.

[15], the extent and isolation of wetlands are effective in the diversity and number of water birds and in smaller wetlands, the number, and diversity of birds is lower than in larger wetlands. Their results confirm the results of this study. Area of the Nasiri lagoon is 12,000 hectares and the area of the Miangaran wetland is 6,000 hectares. Studies by Kloskowski, et al. [1], confirmed the difference between artificial and natural wetland water birds, which is similar to the results of this study. Information from this study and similar studies show that artificial wetlands can support natural wetlands in difficult conditions, but cannot replace them. Especially wetlands that consist of wastewater or sewage accumulation. These wetlands should be investigated in terms of water quality and microbial contamination because of the possibility of transferring contaminations from waterbirds from this lagoon to natural wetlands. To clarify this situation, microorganisms, especially pathogenic microorganisms, are necessary in Naseri wetland.

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