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Seasonal Diversity and Population Status of Waterbirds In Khore Mosa

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ABSTRACT

The research was conducted in Khore Mosa Ramsar site in the Persian Gulf from April to September 2013. Total Count Method was used to obtain the census of the nests, breeding population of waterbirds on the islands and number of birds in Khore Mosa Creek. Maximum 9493 individuals were recorded belonging to 52 species, of which 10 species were breeders. The maximum breeding population of Lesser Crested Tern Sterna bengalensis, Swift Tern *sterna bergii*, Caspian Tern *Sterna caspia*, Bridled Tern *sterna anaethetus*, Western Reef Heron *Egrettagularis* and Crab Plover *Dromasardeola* were 321, 43, 2, 954, 24 and 8765 pairs, respectively. The number of breeding population on the Islands of Khore Mosa was low in comparison with breeding population of birds from this group observed in 2012.One globallythreatened and 8 Protected species were recorded namely, *Dalmatian Pelican Pelicanuscrispus* (VU), eight species of *Ardeidae protectedin* Iran. The Khore Mosa have been identified as an "important bird area" (as a part of Shadeghan marsh Ramsar Site) by Birdlife International proposed for protection as a part of the wildlife refuge of Shadeghanmarsh and suggested for to be classified as sensitive habitat for breeding seabirds.

INTRODUCTION

Colonial waterbirds are a conspicuous and important component of coastal wetland ecosystems(Almarez and Amat, 2004). Because of their diverse foraging and nesting habitat requirements, they serve as valuable indicators of the health of coastal wetlands (Enoder, 2009). In addition, their tendency to nest in groups facilitates the gathering of census Information normally not available for most wildlife species. Finally, waterbirds are important symbols commonly used by organizations and individuals to represent the high quality of life found on the coastal wetlands(Kiabi, 1996).On the other hands, several aspects of the ecology of waterbirds make them useful as bio-indicators(Enoder, 2009). Frist, waterbirds have been shown to track environmental variations, at short (months) and long (years) temporal scales, and at both species and community level (Redon et al., 2008; Almarez and Amat, 2004). Second, because many species are top predators, several contaminants often accumulate along the tropic chain, such species may be used as indicators of changes occurring at lower tropic level (Matsinosand Wolf, 2003; Burger and Eichhorst, 2005). And third, either the waterbirds themselves or their prey are exploited by humans (for example, hunt-ing and fisheries), so that hunting bags of waterbirds may be indicative of productivity in nesting or wintering areas (Miller et al., 1998) or breeding parameters of birds may inform on fish stock (Enoder, 2009). Also to monitor a group of birds implies that there is a need for information on the population status or health that can only be met by collecting data, because every species has a range of conditions under which it thrives. Removal of any component of those conditions and the species disappears or no longer successfully reproduces (Wetland International, 2007). Thus the continued presence of a species is an indication that the environmental conditions which it requires remain. By choosing to monitor a set of species that require high quality environments, specialized habitats, or conditions that a manager may want to promote a sense of the region's environmental health can be made. Since environmental or habitat health is often difficult for us to measure directly, due to the many factors (often unknown or ephemeral) that contribute to the conditions, it is often easier to measure the status of the breeding species that require them to develop an assessment. Although, it is widely accepted that the number of waterbirds using a site is a good indicator or that site's biological importance (Wetland International, 2007), and they are also important indicators of the ecological condition of their habitats (Enoder, 2009)... On the other hands, migratory waterbirds are one of the most remarkable components of global biodiversity. This study was designed to obtain information on the presence, breeding species, breeding population and species diversity of waterbirds on the Khore Mosa Creek in 2013, because it is suggested classification as sensitive habitat for breeding waterbirds (Behrouzi-Rad, 2008). Although the islands of Khore Mosa (Dara, Boneh, GhabreNakhoda, Tiff, Sandy and Nedelgar) still supports substantial waterbird foraging and nesting populations, recent surveys suggest that population size has been reduced from historic levels.For these reason and identifying the sensitive habitats of waterbirds of Persian Gulf, I counted the nests and non-breeding population waterbirds in the Khore Mosa.In Iranian Borders in spring and summer 2013.

MATERIALS AND METHODS

Study Area

Khore Mosa Creek is an economically and environmentally strategic creek in the Persian Gulf. The depth of the water in some parts of this waterway is more than 40 meters providing the traffic for heavy marine shipping towards the economically important harbors of Mahshar and Bandar Imam Ports. In most portions of the creek, and particularly in the several small creeks connecting to it, the depth of water is shallower than 6 meters. The whole Khore Mosa and its creeks are included in the boundaries of the Shadegan Wetland Ramsar Site. Despite the intrusion of fresh water from the upstream marsh, water quality in the creek is originally saline and similar to Persian Gulf water (Behrouzi-Rad, 2013).KhoreMosalocated at 30° 10' N 49° 00' E, area of the creek is 123440 ha (Fig 1), consists of important part of Shadegan wetland. Shadegan wetland is a Wildlife Refuge, and Well-known as a Ramsar wetland of International value, (Scott 1995, Pandam 2002, Behrouzi-Rad 2013).KhoreMosa extends from Mahshahr port in the north, south to the Persian Gulf. This creek is 60 km totals in length. Khore Mosa creek and 25 small creeks around it are most important intertidal habitats of the Persian Gulf shoreline. There are 6 main islands in the Khore Mosa, named Ghabre Nakhoda (30°21'83"N 48°55'10"E),cover an area 4.2 to 500 ha. The second island is Dara and located at the entrance of Khore Mosacreek to Persian Gulf (30°06'06"N 49°06'06"E) and covers an area 160 to 200 ha. Third one is Boneh and located (30°08'25" N 49°09'21"E) 5 km far from west of Dara. This is the largest of the six islands, at low tide the area of the island is about 1500 ha. There is another small island (less than two hectare and about 100 ha in ebb named Nedelgar, without any vegetation cover (30°14'90'N 49°02'86"E)., fifth one is Tiff island with area 16 hectare (30° 24' 23"N 49° 05' 49" E) and sixth is Heidari island with area ten hectare(30° 25' 08" N 49° 08' 49"E). All six islands are flat, sandy and Shelly; 70 to 90% of area of the Dara, Ghaber Nakhoda, Boneh and Tiff islands covered by vegetation in February and March, but the Nedelghar and Heidari islandsare without any vegetation.

Estimation of bird's population

I organized six field trip to the Khore Mosa during six month (April- September, three days in each month). Nests of breeding species of waterbirds were counted directly on 20-24 Auguston the islands in 2013. The nests of Lesser Crested, White Cheeked, Caspian, and Swift terns (on sandy place of the islands without any vegetation) and Western Reef Heron (on short bushes) were counted easily, because they were visible,but for the Crab Plover, I counted holes (like tunnel) that had been made by this species for egg-lying. The nests of Bridled Tern were under the short bushes, and were counted by looking under the bushes. The waterbird abundance was estimated by direct count method as described

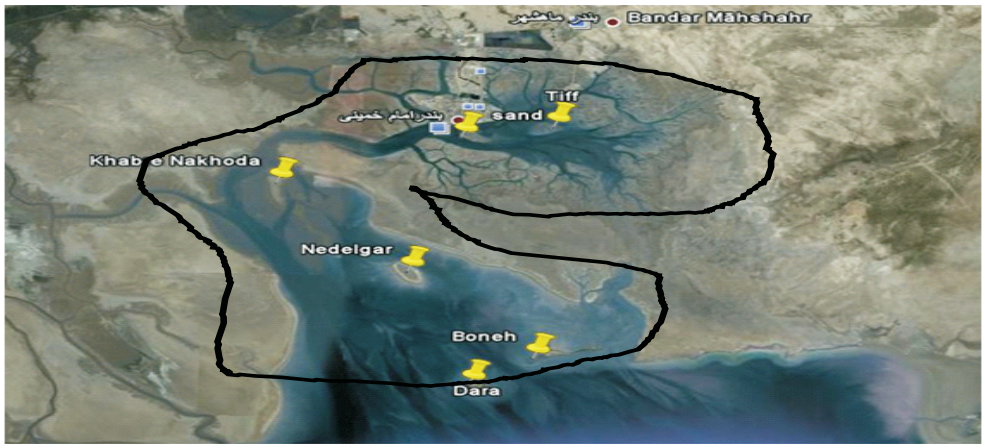

Fig. 1. Location of Khore MosaCreek

by (Wetland International 2007; Conway, 2005).). Observations were made three days a month in the low tide in April- September 2013. For watching, counting, and identifying birds, wide-range binoculars, spotting scope and telescopes were used. The birds were identified by studying their characteristic features in accordance with the identification keys evolved by Ali (1969), King et al. (1978), Sonobe & Usui (2000), and Grimmett et al. (2001). The threats to waterbirds were identified through direct observation, interview with key informants and secondary sources
.

STATISTICAL ANALYSES

Statistical analyses species diversity, percentage similarity, evenness and species richness between waterbirds communities, in six month were measured by Simpson's, Shannon- Wiener, Menhink, Margalef and Brilouin indexes as fallow (Krebs, 2001).
Simpson's index Diversity:

$$1 - D = 1 - \sum_{i=1}^{s} \frac{n_i(n_i - 1)}{N(N-1)}$$

Where: 1-D= Simpson's index of Diversity,ni= Number of individual of species i in the sample. N= Total number of individuals in the sample = $\sum$ ni, S= Number of species in the sample

Shannon-Wiener index as: H'= $\sum$ (pi)(log2pi), Where: H'=Index of species diversity, pi=proportion of total sample belonging to ith species.

Marghalef index: $= \frac{s-1}{\ln N}$

S= Number of species and N= total number of all individuals.

Menhink index: = $\frac{s}{\sqrt{N}}$

S= Number of species and N=total number of all individuals in sample.

Brilouin Index: $\hat{H} = \frac{1}{N} \log\left(\frac{N!}{n_1!\, n_2! n_3! \ldots}\right)$

Where: H=Brilouin index, N= Total number of individuals in entire collection.n1= Number of individuals belonging to species 1, n2= Number of individuals belonging to species 2 and Evenness index=

$$\frac{D - D_{min}}{D_{max} - D_{min}}$$

Where: D= Observed index of species diversity, Dmin=minimum possible index of diversity given S and N, Dmax= Maximum possible index of diversity given S species and N individuals.
Percentage similarity: $P = \sum \text{minimum } (P_{1i} P_{2i}$

Where: P=Percentage similarity between sample1and2, P1i=Percentage of species i in community Sample 1, P2i = Percentage of species i in community sample 2.

RESULTS AND DISCUSSION

In total, fifty three species of waterbirds, belonging to 12 families, have been identified in Khore Mosa complex in April-September 2013 (Table 1). Of this 12 species (26.92%) were terns and gulls, 8 species (15.38%) wading birds, and 26 species (50%) shorebirds and 4 species 7.7% other waterbirds (Table1). Sternidae was the dominant family with 8 species, that had been bredon the 5 islands in Khore Mosa (Table 2).The number of individuals per month varied from 985 in September and 9499 individuals in August in Khor Mosa (Table 1, Fig.2).The highest number of species gathering (44 species) occurred in August and the lowest number of species (31 species) was observed in April 2013, (Tables 1 and 2).The total number of waterbirds increased from April to August (Fig2). A peak of waterbird population was observed during August, with a maximum of 9499 individuals and September had the lowest population of the waterbirds,985 individuals. During August, Lesser-crested Tern constitutes 36.12% (3429 individuals) of total population (9499) counted. The species like Bridled Tern, Slender-billed Gull, Black-headed Gull, Hering Gull and Western Reef Heron also had comparatively higher population. For some species, there were only few records (<10 individuals), namely, Jack Snipe, and Dalmatian Pelican. Birds such as, Little Egret, Grey Heron, Great White Egret, Black-headed Gull, Slender-billed Gull, Crab Plover, Lesser Crested Tern, Bridled Tern and Swift Tern were present in all six months with a peak numbers in August(Figures 2 and 3). According to our result, and those of Scott (1995) and Evans (1994), Khore Mosa is utilized by a wide variety of waterfowl during the migration seasons and in winter, and is especially important for breeder terns, Crab Plover and Western Reef Heron. At migration seasons in spring and in summer the island is visited by a great number and variety of shorebirds, including Herons, a variety of waders and indeed most of the bird familiar as winter visitors to Persian Gulf coasts. Most of these birds migrate across the Persian Gulf, and the coasts and the islands of Khore Mosa serves as stop-over points. Mudflats at around of this creek are important staging and wintering area for a wide variety of shorebirds, gulls and terns (Table 1), including up to 1746 Black-headed Gull, 1412 Slender-billed Gull, and 1406 Hering Gull, 331 Lesser Black-backed Gull 16 Common Curlew, 30 Whimbrel (Table1).

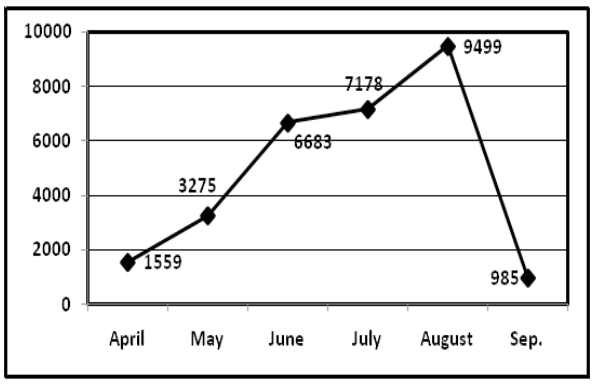

Fig.2: Population recorded in Khore Mosa from April to September 2013

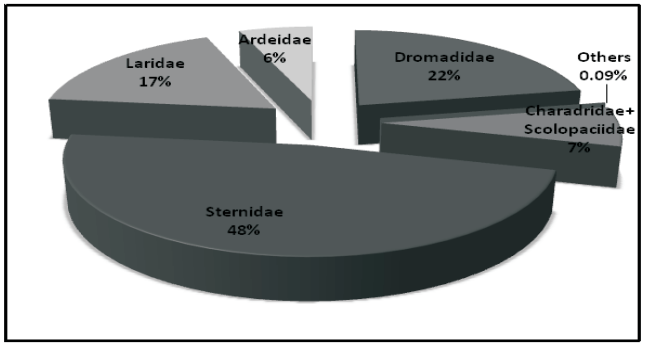

Fig. 3: Monthly percent contribution of various families of water birds in Khore Mosa

Table 1: Water birds of 53 species recorded at Khore Mosa complex on April to Sep.2013.

Species	April	May	June	July	August	Septem	Total	%
Dalmatian *Pelican Pelecanuscrispus*	0	0	0	2	2	0	4	0.01
Cormorant*Phalacrocoraxcarbo*	0	0	0	11	0	0	11	0.03
Greater Flamingo*Phoenicopterusruber*	0	0	0	12	0	0	12	0.04
Western Reef Heron *Egrettagularis*	121	97	167	321	241	140	1087	3.72
Little Egrat*Egrettagarzetta*	31	11	12	34	18	8	114	0.39
Great White Egret*Casmerodiusalbus*	6	7	4	19	27	4	67	0.22
Night Heron*Nycticoraxnycticorax*	0	0	11	9	16	2	38	0.13
Purpule Heron*Ardeapurpurea*	2	8	7	19	23	4	63	0.21
Grey Heron*Ardeacinerea*	21	12	24	51	85	87	280	0.95
Squqcco Heron*Ardeolaralloides*	0	0	5	5	4	3	17	0.05
*S*poonbill*Platalealeucorodia*	0	0	3	8	9	2	22	0.07
Hering Gull*Larussargentatus*	123	153	321	278	321	211	1407	4.82
Black-headed Gull*Larusribundus*	432	234	341	234	411	94	1746	5.98
Slender-billed Gull*Larusgenei*	73	155	231	321	616	16	1412	4.83
Lesser Black-backed Gull*Larusfuscus*	75	123	28	62	12	31	331	1.13
Common Gull*Laruscanus*	11	12	23	54	14	6	120	0.411
Great black-backed Gull*Larusmarinus*	6	8	4	10	6	9	43	0.14
Caspian Tern *Sterna caspia*	0	8	8	12	121	3	152	0.52
Gull-billed Tern *Gelochelidonnilotica*	18	21	14	19	76	1	149	0.51
Common Tern *Sterna hirundo*	20	20	21	41	56	3	161	0.55
White-cheeked Tern *Sterna repressa*	11	210	120	241	212	1	795	2.72
Gull-billed Tern *Sterna nilotica*	31	243	28	12	65	4	383	1.31
Lesser-cressted Tern *Sterna bengalensis*	153	250	3001	1524	3429	52	8409	16.48
Swift Tern *Sterna bergii*	20	30	240	263	321	14	888	3.04
Bridled Tern *Sterna anathetus*	12	60	220	1220	1326	2	2840	9.7
Oystercacher*Haematopusostralegus*	0	0	0	11	2	0	13	0.04
Avocet*Ricurvirostraavosetta*	22	16	11	22	45	4	120	0.41
Black-winged Stilt*Himantopushimantopus*	54	123	33	76	128	17	431	1.47
Ringed Plover*Charadriushiaticula*	0	0	0	12	10	0	22	0.07
Little Ringed Plover*Charadriusdubius*	0	5	4	27	2	0	38	0.13
Kentish Plover*Charadriusalexandrinus*	4	0	3	29	0	2	38	0.13
Grey Plover *Pluvialissquatarola*	4	0	0	0	4	2	10	0.034
Black-tailed Godwit*Limosalimosa*	0	4	0	45	0	0	49	0.16
Jack Snipe*Lymnocryptosminimus*	6	0	11	29	0	0	46	0.15
Bar-tailed Godwit*Limosalapponica*	6	3	0	43	14	0	66	0.22
Whimbrel*Numeniusphaeopus*	0	0	6	24	12	41	83	0.28
Eurasian Curlew*Numeniusarquata*	4	9	6	50	57	25	151	0.53
Red Shank*Tringatotanus*	12	11	2	80	29	32	166	0.56
Marsh Sandpiper*Tringastagnatlis*	0	2	36	6	2	0	46	0.15
Spotted Redshank*Tringaerythropus*	4	2	0	0	6	0	12	0.04
Terek Sandpiper *Tringacinerea*	0	0	0	53	10	0	63	0.21
Wood Sandpiper *Tringaglareola*	0	0	0	0	0	2	2	0.006
Common Sandpiper*Tringahypolacus*	0	6	0	31	115	16	168	0.75
Greenshank*Tringanebolaria*	1	3	6	1	6	8	25	0.08
Turnstone*Arenariainterpres*	0	1	8	16	0	0	25	0.08
Great Snipe *Gallinago media*	0	0	0	0	1	0	1	0.003
Common Snipe*Gallinagogallinago*	0	0	4	0	5	0	9	0.03
Little Stint*Caldrisminuta*	9	0	0	0	128	46	183	0.62
Temminck's Stint*Caldristemmenckii*	9	15	0	135	61	28	248	0.84
Curlew Sandpiper *Caldrisferruginea*	8	0	0	26	0	0	34	0.11
Dunlin*Caldris alpine*	0	3	0	74	7	30	114	0.39
Ruff*Philomachuspugnax*	0	0	0	13	6	7	26	0.08
Crab Plover*Dromasardeola*	250	1410	1720	1593	1438	28	6439	22.06
Total	1559	3275	6683	7178	9499	985	29179	-
Species number	**31**	**33**	**34**	**46**	**44**	**36**	**Total**	**-**

A well marked seasonal variation in waterbird population was recorded during the present study period (Fig. 2).Simpson's species diversity varied between (S=0.133-0.2780). The most species richness was belonging to *Caradridae* and *Scolopaciidae* family with 24 species (Table 1). The Shannon's index of diversity was found highest(H=2.556) in three month and lowest (H=1.802) in June. The value of the evenness also was found highest in April (C=0.4041) and lowest in May and June (C=0.1783).Species diversity indexes and richness species had significant differences amongst month in spring and summer (Table 2). Furthermore, they had significant differences amongst month which defined as p>0.05. The bird communities of spring and summer were not more similar (S=27.57%-76.75%). The similarity index (S) was higher (S=0.7675) between June, July and August than between September and other months (S=0.2757-48.94). The spring birds community (S=0.4796-0.5938) was found more similar than the summer season(S=0.3129-7685). The value of similarity index of bird communities between the two seasons was found higher than the months belonging to same season. Fluctuation in number of individuals of bird species was found related to seasons (months) ($P \leq 0.05$) (Table 3). The fluctuation of species number was 31-46and population was 985-9499 individuals. Population of the water birds in August was ten times more than September (Tables 1, 2 and Fig. 2), because most of the breeding population leave the islands after breeding in September. The fluctuation of waterbirds population, and variation in species diversity serve as management tools for wetlands, because these changed depends largely on amount of food and security.

Table 2: Monthly variations in different diversity indices in Khore Mosain April-September 2013.

Month	April	May	June	July	August	September
Species number	31	33	34	46	44	36
Individuals	1558	3272	6677	7177	9493	983
Dominance_D	0.2153	0.278	0.278	0.1335	0.1837	0.133
Simpson_1-D	0.867	0.7847	0.722	0.8665	0.8163	0.9027
Shannon_H	2.19	2.556	1.802	2.556	2.556	2.159
Evenness_e^H/S	0.4041	0.1783	0.1783	0.2810	0.2253	0.2253
Brillouin	2.451	2.167	1.79	1.79	2.259	2.539
Menhinick	0.761	0.5596	0.4161	0.543	0.4415	1.148
Margalef	3.946	3.831	3.747	5.068	4.586	5.079

Table 3: Similarity of waterbirds community among six month in 2013.

	April	May	June	July	August	Sep.
April	100.00					
May	59.38	100.00				
June	47.96	57.21	100.00			
July	53.35	57.39	69.13	100.00		
August	50.37	49.58	76.73	76.85	100.00	
Sep.	48.94	35.25	27.57	34.72	31.29	100.00

Table 4: Comparison of the Number of nests of waterbirds in 2003 , 2012 and 2013

Breeding species	Nests Number in 2003	Nests Number in 2012	Nests Number in 2013	Nesting place
Pelecanuscrispus	6 pairs only in 2010, not in 2003	6 pairs only in 2010, not in 2012	6 pairs only in 2010, not in 2013	Tiff island (Behrouzi-Rad 2013)
Egrettagularis	58	30	24	Dara, Boneh, GhabreNakhoda and Tiff Islands
Egrettagarzetta	2	0	0	GhabreNakhoda Island, (Behrouzi-Rad 2008)
Sterna Bengalensis	2681	550	321	Dara, Boneh, GhabreNakhoda islands
Sterna bergii	136	54	43	Dara, Boneh, GhabreNakhoda islands
Sterna caspia	137	0	2	Dara island
Sterna anaethetus	1874	1011	954	Dara, Boneh, and GhabreNakhoda islands
Sterna repressa	10	6	2	All islands
Sterna nilotica	12	8	3	Dara and GhabreNakhoda
Dromasardeola	1650	11701	8765	Dara and GhabreNakhoda
Himantopushimantopus	46	41	25	North part of the KhoreMosa
Avossetarecorvirostera	21	18	13	North part of the KhoreMosa
Total	**6627**	**13419**	**10152**	**-**
No.Species	**11**	**9**	**10**	**-**

Breeder Species

Four species, Bridled Tern, Lesser Crested Tern, Swift Tern and Crab Plover were dominating breeders in Ghaber Nakhoda, Buneh and Dara Islands in 2013. Total number of breeder species declined from 13419 pairs in 2012(Behrouzi-Rad, 2014) to 10152 pairs in 2013 on the islands (Table 4). Two tern species (Lesser Crested Tern and Swift Tern) breeds on sea-coasts, offshore islands (Ali and Ripley, 1969; Evans, 1994; Colin, 1975). In Persian Gulf these two species breeds in most offshore islands also on islands of Khore Mosa (Behrouzi-Rad, 2008). Bridled Tern breeds on low rocky or coral islands (Scott, 2007; Redon et al., 2008). In Khore Mosa islands also breeds on Ghabre Nakhoda, Boneh and Dara Islands under the short bushes. Crab Plover breeds in burrows on open sandy area not far from the sea on offshore islands (Porter et al., 2005; Tuck, 1974), in Khore Mosa this species made tunnel excavated in sandy ground on Dara and Ghabre Nakhoda Islands.

Threat and Conservation

Khore Mosa is part of Shadegan marsh and this wetland is Ramsar site (400 000 ha.) and wildlife refuge. Wildlife refuge of 296 000 ha, encompassing all the main wetland areas and the coastal mudflats in the south, was established in 1972 and has remained since then. Despite this status, it has no formal legal protection and no conservation measure are known to have been proposed (Evans 1994). In Khore Mosacree kpoaching is practiced particularly in the around of islands (Fig 4). Egg-collecting, chick and female harvesting when the females sited on eggs are serious treats to the breeding population of terns and Crab Plover (Fig.4) on Ghabre Nakhoda, Dara, and BonehIslands. Oil pollution has been reported on the beaches around Bandar Imam Port in the southeast (Pandam, 2003). This ecologically vital ecosystem is under constant threat due to ever-increasing anthropogenic pressures(Pandam, 2003). The rich prawn and fish resources of the Khore Mosacreek attracted powerful business interests. Intensive fishing activities and the use of mechanized boats affect the bird fauna (Behrouzi-Rad 2013). The most sensitive species appear to be terns, waders and other long distance migrants, which feed, in large flocks on the ground or water level. Disturbances can be energetically costly due to lost feeding time and increased escape activities.

CONCLUSION

From this monitoring study, several conclusions can be made: This approach, of utilizing several methods to gather observations, provided enough records to monitor the Khore Mosa complex waterbirds population. Considerable variation was noted in the number of waterbirds from April to September 2013 and breeding pairs from 2012 to 2013 (13419 to 10152 pairs). Waterbird population in August, 2013was higher due to the presence of large number of migratory breeder waterbirds. Highest diversity in summer months was attributed to the influx of migratory breeder waterbirds during this season. Least diversity in the spring months was ascribed tothe absence of migratory breeder waterbird species. Annual percentcontribution of dominant different families of waterbirds wererecognized as Sternidae>Laridae>Dromadidae>Ardeidae>Charadriidae>Scolopacidae> Others(Table1 and Fig. 3).Sharp increase in the waterbird count was observed from April to August, 2013. Lowest waterbird counted in September because of complete absence of breeder migratory waterbirds in the region. Identification of essential roosting and nesting habitat required for sustaining seabird populations in a given region of conservation is needed to be given concern. Conservation problems and threats faced by seabirds in the region have been discussed elsewhere (Scott, 2007 and 2008; Evan, 1994; Tuck, 1974; Basson et al., 1977), but briefly these are included in offshore pollution, commercial exploitation of prey on which seabirds feed, incidental take, human disturbance, habitat reduction, and releasing waste water in water bodies. Seabird's conservation is mostly a matter of island conservation. Waterbirds biology is useful indicators of environmental quality. Protection, management, and conservation of colonial waterbirds and seabirds can help conserve the broader landscape in which they occur. Wintering, breeding, and other non-nesting habitats are critical to the long-term conservation of seabirds and colonial waterbirds. The study has revealed that Khore Mosa Creek is particularly important for breeding tern's species, Crab Plover and Western Reef Heron, many timing their migrations to coincide with the rich productivity of this system. Annually tens of thousands of waterbirds (particularly Waders and Gulls migrate and use this coastal wetland as wintering habitat (Behrouzi-Rad, 2008).Total number of waterbirds regularly in winter eceed the Ramsar criterion for international importance (20,000 birds), and 14 species occur in number exceeding 1% of their regional flyway population (Pandam, 2003). A small group of the globally threatened Dalmatian Pelican *Pelicanus crispus*, 8 species of *Ardeidea* and *Greater Falamingo phoenicipterus* ruber are of particular note. Beside of waterbirds, within the *Khoremo sacreek*, the area between the Dara, Boneh and Nedelgar Islands up to the mouth of the creek is the breeding site of the Dolphins, Sousa plumbea (pandam, 2003; Behrouzi-Rad, 2008). Some investigators (Kiabi, 1997, and Ziaee 1995) have also claimed the likely presence of Duging Dugondugon in the Khore Mosacreek. The Marine Hawksbill Turtle Eretmodchely simbricata nests in the southern islands, particularly the Nedelgar (Behrouzi-Rad 2008).For these reason, the KhoreMosa have been identified as an "important bird area" (as a part of Shadeghan marsh) by Birdlife International proposed for protection as a part of the wildlife refuge of Shadeghan marsh and suggested for to be classified as sensitive habitat for breeding seabirds. However, the occurrence of 53waterbird species during the study period is, perhaps, an indication of the fact that the KhoreMosa complex Ramsar Site may not only become a favorable habitat for waterbirds but may also develop into an ideal place for birdwatchers, naturalists, tourists, and researchers, since the waterbirds are of great importance for their esthetic, sporting, bio-indicators and economic values.

1-The area is required to be stopped appropriately to check the illegal hunting to prevent further population loss of birds. Strengthen enforcement of existing restrictions on the hunting of migratory birds.

2-To give strict guidelines to the Petro-cemical Companies to stop the westwaterrelaising at least duringthe migratory seasons of birds.

3- Changes in the breeding population of birds at Khore Mosa complexare studied in relation to variouscauses of decline, to address remedial measures in a global conservation strategy.

4-Measurements of water chemistry should be taken on a regular basis to allow long-term monitoring of changes in nutrient levels and other parameters.

5-Anthropogenic factors are the root causes for wetland degradation and habitat destruction of waterbirds. Therefore, conservation education and awareness programmers are essential for local people, students,fishing community and visitors to the Khore Mosa. Publication of factsheets, checklists and pocket guide about biodiversity of KhoreMosa will help to widen the local knowledge among conservationists.It is recommended to initiate study of bird diversity and population statusimmediately with periodic monitoring in KhoreMosa for its conservation and management

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