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Breeding biology of Slender-billed Gull (*Larus genei* Breme 1839) in West Azerbaijan province, Iran

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Abstract

From April 2014 to March 2015, we investigated Slender-billed Gull breeding biology in multiple temporal islands located in the Shahid Kazemi dam, Bukan, West Azerbaijan province, Iran. During the study period, we monitored a single breeding colony of the Nazargah Island (0.026 sq km) of Shahid Kazemi dam. The breeding colony started nesting and laying in early April, and the first chicks were hatched on 18 May. On the same Island, Common black-headed Gulls also starts nesting much earlier on 21 March, and the first chicks hatch on 30 April. Armenian Gull and Common black-headed Gull also breed simultaneously. More than 400 breeding nests of Slender-billed Gull as well as 200 nests for black-headed Gull and 300 nests for Armenian Gull were recorded. Of about 400 breeding nests of Slender-billed Gull, 123 nests were numbered by flags, and measurements were carried out from nesting to fledging.

Keywords: Breeding biology, clutch size, nest site selection, Shahid Kazemidam

Introduction

The Slender-billed Gull (*Larus genei*) breeding colonies have been recorded from Senegal through the Mediterranean to E Kazakhastan and NW India at isolated localities (del Hoyo *et al.*, 1996). This species breeds from late-March to May in dense monospecific or mixed-species colonies up to many thousands of pairs (del Hoyo *et al.* 1996). Coasts of land-locked seas (Richards 1990, Snow and Perrins 1998), sand-spits, beaches, lagoons (del Hoyo *et al.*, 1996) and islands with mudflats and marshes in shallow tidal waters (Snow and Perrins 1998), are the main habitat features that selected by the species for breeding. Using frequent meadows and moist grassland by tidal inlets (Snow and Perrins 1998), and brackish or freshwater lagoons or delta marshes during breeding season is also reported (Richards 1990, del Hoyo *et al.* 1996, Snow and Perrins 1998). The species breeds colonially with pairs nesting as close as 20-50 cm

(Urban *et al.*, 1986); large groups were often splitting into subcolonies with the group's center 10-50 m apart (Urban *et al.*, 1986). The nest is a deep scrape or shallow depression (Urban *et al.*, 1986, Richards 1990), preferably positioned on open mud, although some pairs may nest in *Salsola* or *Salicornia* (del Hoyo *et al.*, 1996, Olsen and Larsson 2003). Investigations about other similar species, such as Mediterranean Gull, also yielded relatively identical results. For example, estuaries (Snow and Perrins 1998), harbors, and coastal areas are favored for breeding (del Hoyo *et al.*, 1996, Snow and Perrins 1998) by this species. Nesting in the fields and grasslands also reported for Mediterranean Gull (del Hoyo *et al.* 1996, Snow and Perrins 1998). Distance to the water resource and the structure of the vegetation and distance to the nearest neighboring pairs are the most variables affecting the Mediterranean Gull breeding site selection (Snow and Perrins 1998, Burgess and Hirons 1992). Del Hoyo *et al.* (1996) reported that the minimum distance of the breeding nest from the neighboring pairs is 60 cm. This research reports the presence of a relatively large breeding colony of the Slender-billed Gull in Iran for the first time. Some peculiarities of the breeding colony also are discussed.

Material And methods

Study Area

From March 2014 to June 2015, we studied the Slender-billed Gull breeding colony on Nazargah Island, Shahid Kazemi reservoir (Fig. 1 and 2). The reservoir results from a dam constructed in 1971 on the Zarrine-h-Rood River to provide enough water for downstream agricultural and farm areas. When the maximum water level is reached during spring, islands closer to the mainland appear and form ideal habitats for different kinds of breeding birds. A total of four relatively large islands, including Seyed Najmeh, Seidabad, Nazargah, and Khoshe-Darreh, hosted considerable numbers of breeding birds such as Armenian Gull, Slender-billed Gull, Common blackhead Gull, Common tern, and lesser tern (Fig. 1).

Data collection

Concerning the area of Nazargah Island (4600 m^2) we could estimate the density and abundance of the nests by multiple transects. We measured the following habitat variables on 123 randomly selected nests: main material composition, nest diameter (NDI), nest depth (NDEP), distance from colony edge (DCE), distance to the colony center (DCC), distance to the nearest *L. genei* breeding nest (DNL) and distance to the nearest other species nests (DOS). In addition, vegetation cover (VPC in %) was measured in 1-meter radius circular plot around each nest. The three later parameters were compared with measures realized on N randomly selected plots. On the same 123 nests sample, clutch size, length, and width of each egg were measured with a digital caliper. By regular weekly visits from early April to late May, we recorded our direct observations about the marked nests. Volume and shape index of eggs were then calculated using the following formulas:

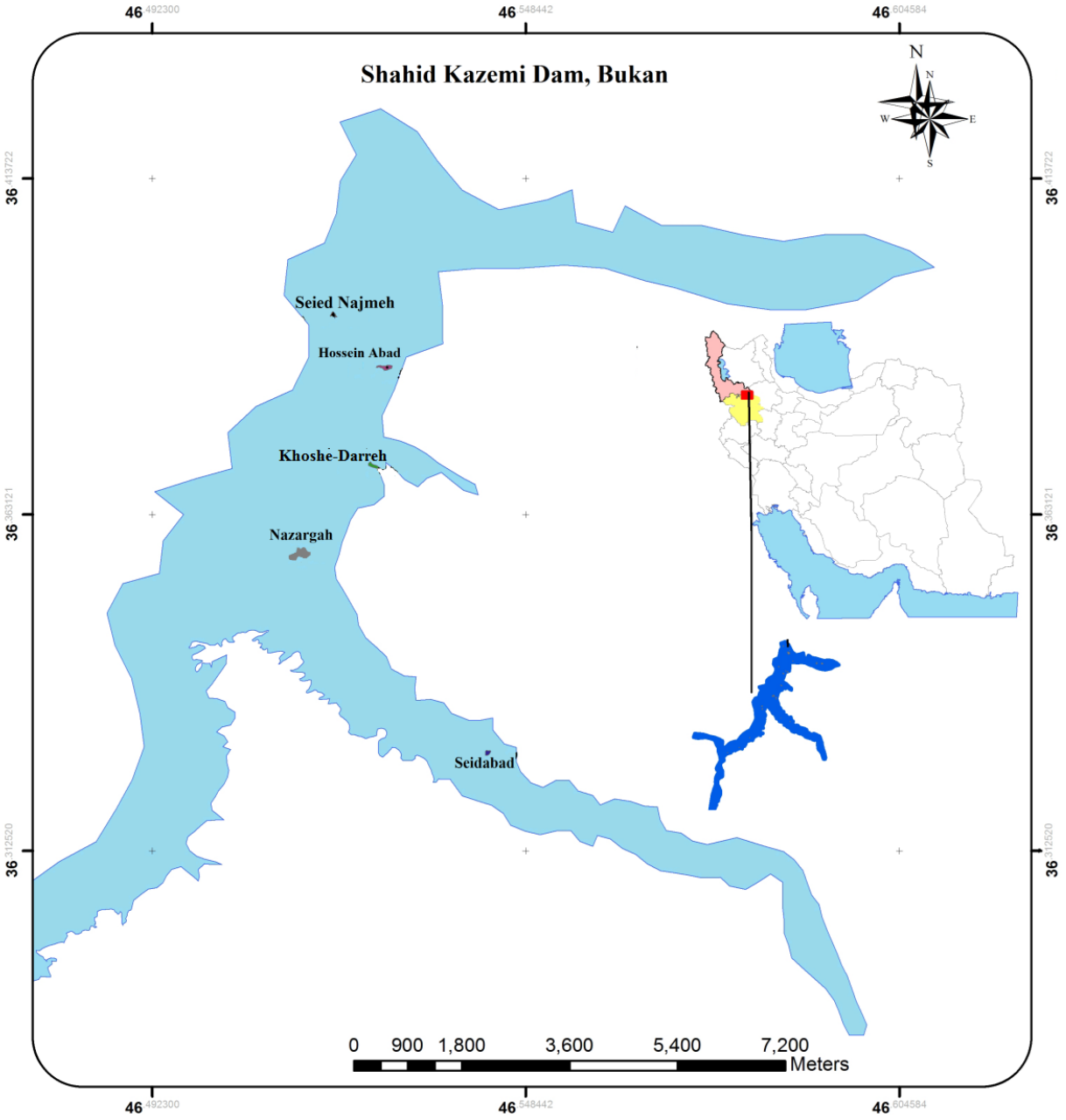

Figure 1: Shahid Kazemi reservoir, Bukan, and the location of the main islands

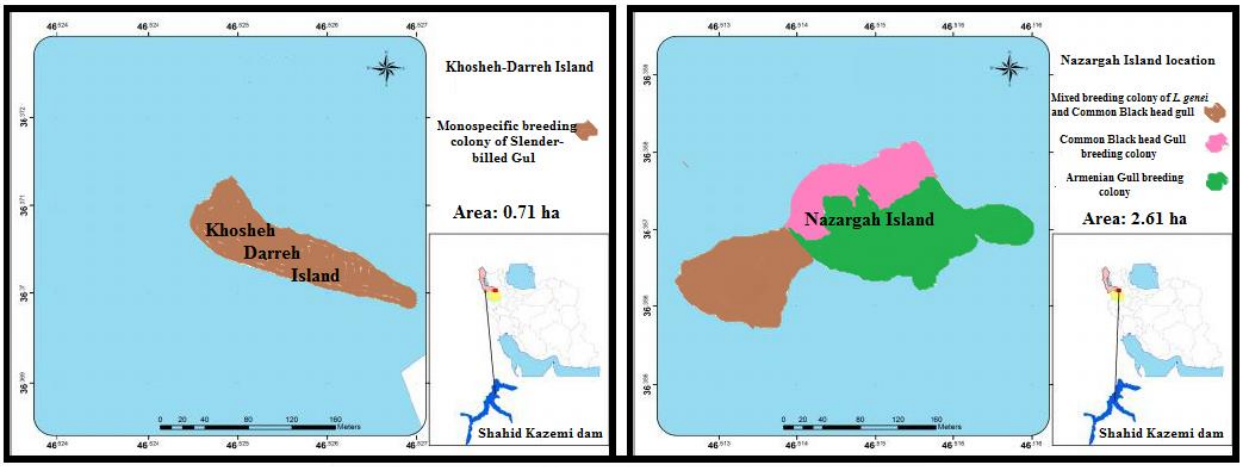

Figure 2: Colony surface occupied by the species in two Islands of Shahid Kazemi reservoir

Figure 3: Slender -billed Gull and its offspring in the nest (right) and defense of chicks by adults (left) in the study area as well as a dead chicken and eggs.

Table 3: Main breeding parameters of the Slender-billed Gull *Larus genei* at Nazargah Island of Bukan dam (Urumyeh, North-western of Iran)

Num. of nests	Num. of eggs	Eggs failed	Nestling failed	Post-Nestling failed	Total failed
400	992	40 (4.03%)	57 (5.57%)	42 (4.23%)	139 (14.01%)

Results and Discussions

Phenology and morphological peculiarities

The first arrivals of Slender-billed Gull were recorded on 23 April, and the first eggs were recorded on 23 April, and nearly nesting was completed in late April. The first egg was hatched on 18 May, and nearly all eggs were hatched up to 9 June. The chicks stay in the nests for up to 5 days and form a creche afterward. Then, they can run to the water if they are threatened. The plumage is completed in one month, and the chicks are able to fly after that. The offspring's weight sour up from 26.81 grams (n=22, SD=2.92) up to 328.90 g (n=11, SD=17.49). The breeding success was estimated 0.86; details are presented in table 3. The highest mortality was recorded on nestlings and the lowest on eggs. The density of the Slender-billed Gull nests in the whole Island was estimated 0.015 nests per sq. meter, while in the area of the colony, it was estimated 5 nests per sq. meter (Fig. 2). In the first days, chicks feed on insects, worms, and small fishes. The morphological characteristics of the studied nests and some measured environmental variables are presented in Table 1. Spearman correlation analysis showed that there is a positive correlation between nest's diameter and depth and between distance to the nearest same species nest and distance to the colony edge, between distance to the colony center and vegetation percent cover around the nests, and between nest density and distance to the colony edge. Comparison between the mean amount of the recorded variables around the nests and the randomly selected points by Mann-Whitney U showed that there is a significant difference between the mean value of vegetation percent cover, nest density, and distance to the nearest nests (both belonged to the same or different species).

Clutch size and eggs morphology

The eggs are light to dark cream with black spots that change in color during the incubation period, which they become darker gradually. The mean clutch size was estimated 2.48±0.67 (n=123), and the maximum number of eggs was recorded up to four while some nests were recorded just with one egg. The egg's length and width were measured by digital caliper to the nearest 0.01 mm, and numbering each egg helped us record all laid eggs by one single female. Our data indicated no significant differences between eggs regarding their rank (Table 2).

Table 1. Morphological and some environmental variables of the nests (n=123). The acronyms are NDI (nest diameter), NDEP (nest depth), DCE (distance from colony edge), DCC (distance to the colony center), VPC (vegetation percent cover in 1-meter radius circular plot), DNL (distance to the nearest *L. genei* breeding nest), DOS (distance to the nearest other species nests)

	NDI (cm)	NDEP(cm)	DCE (m)	DCC (m)	VPC (%)	DNL (m)	DOS (m)
Mean	18.12	4.91	3.55	5.70	12.28	0.35	1.01
SD	1.96	0.97	4.09	6.96	13.74	0.48	0.71
Median	18	5	2	3.50	7.50	0.20	0.75
Min	14	3	0	0	50	0.10	0.15
Max	22	7	15	40	0	2.5	3

In regards to fig. 2, most genei breed together. Then, it is surprising that DNL is so closed to DOS. Explain that

Table 2: Eggs morphological measurement in 151 nests

Parameter	The first egg (n=2)	The second egg (n=26)	The third egg (n=54)	The fourth egg (n=69)	Mean (±SD)
length (mm)	54.05±1.06	53.79±2.01	57.54±2.39	54.83±2.26	54.55±2.44
width (mm)	37.20±1.69	38.13±1.18	38.01±1.15	38.26±1.08	38.14±1.28
Weight (gr)	35.50±4.94	38.90±3.75	39.67±4.03	40.13±3.88	40.05±3.95
Volume (cubic cm)	36.40±2.60	38.10±2.93	38.48±3.83	39.03±3.03	38.67±3.32
Shape index	68.87±4.50	70.96±3.15	69.68±3.39	69.93±3.65	70 ±3.48

Although egg laying was continued after 9 June until 16 June in 26 nests, all laid eggs have failed. The most hatching failure was recorded in the nests that were established far away from the colony center. The synchronized reproduction of sea birds and its effect on reproduction success has already been resulted by different investigators (Findlay and Cooke 1982, Gochfeld 1980). The breeding success of the studied colony was relatively higher than the colony studied in North-western parts of the Mediterranean Sea, Spain, by Oro (2002). Oro (2002) studied a colony of about 400 breeding pairs for ten years and estimated breeding success equal to 0.71. Doxa (2013) reported Slender-billed breeding success as 0.81 in France while Dies and Dies (2000) estimated breeding success of this species in Albufera de Valencia of Spain during five years but in a relatively low sample size (n=23 nests) around 0.86 that is the same as a result that we obtained in our study. After completing our study, we found another breeding colony in Khusheh-Darreh Island with more than 2963 breeding nests in 0.007 sq km area.

Contrary to Nazargah Island, Slender-billed Gull breeds simultaneously with Common black-headed (270 nests), and Armenian Gulls, Khusheh-Darreh Island colony was monospecific. The nest density of the newly found breeding colony in Khusheh-Darreh was significantly higher than our study site in Nazargah Island, 0.41 comparing 0.015 per sq. meter, respectively. In the next breeding year, the study of this colony will gain valuable data to compare with the Nazargah colony (Fig. 1). We estimated that a total of over

3300 breeding pairs had been established in these two Islands of Bukan dam where is an ideal research opportunity about Slender-billed Gull breeding behavior and biology for the next years. We checked nestling mortality and failed eggs in Khusheh-Darreh and found that nestling's mortality and failed eggs are significantly lower than the Nazargah colony. The interactions between species on Nazargah Island may be at the origin of that results.

Nest site selection

There was a significant difference in the relative position (center *vs.* periphery) of the Slender-billed Gull nests compared to other species. Compared to a random sample, nests of Slender-billed gulls were placed on the sandy areas with lower vegetation cover (N=?, U = 416.5; $P < 0.05$; Mann-Whitney U-test). We found significant differences in DNL (distance to the nearest *L. genei* breeding nest), DOS (distance to the nearest other species nests) variables measured at nest sites and at random plots (N= ?U = 179; $P < 0.05$, N=?, U = 173.5; $P < 0.05$ respectively, Mann-Whitney U-test). Simultaneously, there was a significant difference between the elevation of the nests of Slender-billed Gulls and Common Blackhead Gull, which the later using even higher places with more vegetation cover (N=?, U = 164.0, $P < 0.05$; Mann-Whitney U test). Nests were settled close to the *Bromus tectorum*, *Stipa barbata* and *Euphorbia helioscopia.* The main vegetation used for nest building was *Bromus tectorum* and *Avena festoca*.

Table 1: Annual number of wildlife attacks in and around CNP, Nepal, during 2014-2018.

Year	Rhino	Wild Boar	Tiger	Sloth Bear	Elephant	Crocodile	Leopard	Total
2014	13	4	8	6	1	0	0	32
2015	16	5	1	4	0	1	0	27
2016	26	12	11	1	6	0	0	56
2017	11	4	2	6	4	0	0	27
2018	19	8	4	7	8	5	1	52
Total	85	33	26	24	19	6	1	194
%	43.8	17.0	13.4	12.4	9.8	3.1	0.5	100.0

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