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Reproduction Success in the Birecik Northern Bald Ibis (*Geronticus eremita*)

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Abstract

This study investigates the population of Birecik Northern Bald Ibis during their reproduction period in 2012 (February-July). Northern Bald Ibis (*Geronticus eremita*) is considered a species that could soon become extinct; 152 individuals (July 2012) are in Birecik (Turkey) as semi-wild. Birecik Northern Bald Ibis reproduces freely in their habitat of Firat riverside, in March-July. They are nourished from both feed and natural sources in this period.

They start the reproduction activities in March. Copulations take place not only before and during the incubation period, but also after the chickens leave the nest. The copulations turn into an activity that has different functions. The couples carry out the incubation together.

They build their nests in wood rather than rocky places. Although they prefer mass reproduction, there is also separate nesting (9%) and they incubate in wooden nests rather than in rocky places (91%).

The incubation activity was carried out in 26 nests during the reproduction period in 2012. The incubation was successful in 22 nests and unsuccessful in 4 nests. Although the numbers of chickens change between 1 and 3, the nests with 2 chickens predominate (76%). Forty-five chickens hatched and three chickens were lost within the first week.

It is required to make some improvements in the voliyer and nutrients in Birecik. Support efforts are required for the egg and chickens during the reproduction period for the survival of the species. The number of Northern Bald Ibis can reach into hundreds with improvements to be made.

Keywords: Northern Bald Ibis, reproduction, incubation, copulations, number of chickens.

INTRODUCTION

Northern Bald Ibis (*Geronticus eremita*) is a species that lives in only two habitats in the world [1, 2, 3]. The western population lives in Morocco. The eastern population lives in Palmyra (Syria) [4] and Birecik (Turkey) in the Middle East [5,6]. Seven individuals were found living freely in Palmyra in 2002 [7].

The use of pesticide during the 1960s in Birecik caused a rapid decrease in the number of Northern Bald Ibis. The pesticide was used for malaria and migrant crickets [5,8].

The Northern Bald Ibis living in Morocco and the Middle East are genetically different [9,10]. The difference is also apparent in the body size [6].The seven individuals living in Syria probably have their origins in the Northern Bald Ibis population in Birecik (Turkey). Furthermore, six Northern Bald Ibises were handed over to Syrian authorities in 2010 [36]. Birecik Northern Bald Ibis birds are the last living representatives of the species. They are always in Birecik in a semi-natural manner. It is necessary to take precautionary measures due to the reduction in their numbers [5, 11]. The Northern Bald Ibises are not hunted as they are considered holy by the locals [8].

The Northern Bald ibises have been protected in voliyer in Birecik since 1977 [5, 8, 12, 13]. Eleven individuals were in the voliyer for the first time. The Northern Bald Ibis came from the winter quarters (from Africa) until 1989. After this date, there is no evidence indicating that the Northern Bald Ibises come with migration. This situation is considered to be extinction in the nature.

The Northern Bald Ibises are a species that hardly reproduce. They reach sexual maturity at the age 3 or 4. They exhibit seasonal monogamy [14].The couples build their nest together [15]. The couples exhibit harmonic behaviors during the copulations [16]. They produce 2-4 eggs [17]. The incubation period is 27 or 28 days [18].The parents and chickens of the Northern Bald Ibises pay attention to the nest cleaning as is observed in the different species [19].There are fights on occasion among the neighboring Northern Bald Ibises [20]. The chickens in the same nest hatch at 2 or 3 day-intervals [17].

The efforts to increase the population of Birecik Northern Bald Ibises are also discussed in different studies [21, 22].

Northern Bald Ibises in Turkey

Birecik Northern Bald Ibises live only in Turkey. They have been bred in cages since 1977. The last Northern Bald Ibis which could migrate was seen in 1989. If the conditions in the breeding station is governed in accordance with scientific methods, Northern Bald Ibises can be fed and bred better. The fact that the population of Northern Bald Ibis is only 152 requires increasing the number of eggs and nestlings with the help of the experts. Each year, dozens of eggs and nestlings perish. Keeping 152 individuals in two cages together can bring serious risks. Our hope is to see hundreds of Northern Bald Ibises flying freely in the sky

MATERIALS AND METHODS

The Northern Bald Ibises in the reproduction station in Şanlıurfa, Birecik constitute the material of the research. The reproduction station is located at the valley near the Fırat (Euphrates) riverside, 3 km north of Birecik (Figure 1, 2). There are 2 voliyers in the station. The nests are located in the steep, rocky locations between the two voliyers. The observations are carried out in the cage and nature. Binoculars, telescopes, cameras and camcorders are used without interrupting their activities.

Figure1. Reproduction Station of Northern Bald Ibises-Birecik(Turkey) and carved rock nest, built wooden nest (middle), (voliyer1-left, voliyer 2-right)

Figure 2. Voliyer 1(in the front), carved rock nest, built wooden nest (in the middle) and voliyer 2(right)

The researches started in January 2012. The observations were carried out all day every week during the reproduction period (March – June). The research is still ongoing.

RESULTS AND DISCUSSIONS

The number of Northern Bald Ibises increased from 126 (March 2012) to 152 (July 2012) after 35 years. The Northern Bald Ibises are released from the voliyer to nature at the end of February. The period corresponds to the date that the Northern Bald Ibises come from their winter quarters to Birecik. After this date, reproduction begins. They reproduce in nests that they build in different places and hunt freely. The Northern Bald Ibises generally reproduce together. Birecik Northern Bald Ibises prefer the box nests in the reproduction station for the incubation (Figure 1, 2).

The semi-wild Northern Bald Ibises are feed twice per day (07.00, 16.00). The feed prepared by the keepers are given outside the voliyer.

They are taken into the voliyers again in the middle of June, because they start to migrate. It is necessary to take them into voliyers in order to prevent their extinction during migration.

Reproduction Activities

The Copulations

The copulations start in March. After the chickens hatch, the copulations end. When the juveniles leave the nest, the couples have copulations again in their nests. The copulations take place at noon and in the afternoon (12.25–16.00). The individuals not participating in the reproduction and the new couples have copulations in the empty nests. They do not have copulations near the chickens. There can be 1 to 60 minute-intervals between the copulations (n=22). Some couples can have copulations up to 5 times in an hour. The same individuals can have copulations seven times in the same nest (the nest located in a rock) in a single day. Sometimes, they fail to climb back for copulations. The individual that climbs holds still. It generally kneels down, but sometimes it does not, it can even stand still. The individual climbing the back takes the bill of its couple between its own bill. The one on top generally takes the middle and top of the bill of the one on bottom between its bill while using the root of the bill. Thus, it shakes the bill while chirping. The copulations goes on for 15-60 seconds (n=22). At the end of copulations, the one on top slides down. The one at the bottom stays still. They can stay together calmly after the copulation. Sometimes, they clean each other feathers. They mutually clean the places they cannot reach themselves such as the head. They can stay together raising their bills after the copulation.

The cloacae are not generally united in the copulation in April, May and June. Therefore, there is no sperm transfer here. The copulation of couples made after the chickens leave is different from the real copulation. The copulation in which the cloacae are not united is not considered the real copulation. Meanwhile, the actions in the real copulation are exactly exhibited. Thaler et al. [23] named this kind of copulation as “show copulation.” This behavior is common among the new couples or the couples that have not raise a chicken.

The nest owners remain in the nest after the juveniles leave. The foreigners can use the nest for copulation when the nest owners are not there.

There can also be copulation outside the nests in the sides where they search for food.

It is determined that they have coitus with different purposes:

- To fertilize the egg,
- To maintain the relation of couples. The couples have copulation even after the chickens leave the nest,
- The copulation between the individuals that have not raised a chicken may help forming a relationship between the couples,
- To achieve dominance against its couple,
- It could be a game,
- To learn the copulation behaviors,
- It cannot be determined if there are any copulation trials between the individuals of the same sex.

However, the one on top can be at the bottom in the next copulation (n: 6).

Nests

There are many of caves for building nests in the rocks near the reproduction station of the Northern Bald Ibises. It is known that Birecik, Syria and Morocco Northern Bald Ibises build nests in the caves of rocks all together [4, 5, 6, 7, 8, 24, 25, 26]. There are some advantages of building nests all together:

- The predatory animals are quickly recognized and other group individuals are warned.
- They can defend themselves collectively against predators (with noise, the large number of individuals is a deterrent)
- The individuals that have not grown in sexual maturity and that are unsuccessful in reproduction can help the juveniles.
- There is enough area among the rocky places for the juveniles and adults.
- They can see the activities in the neighboring nests, and this can contribute to successful reproduction as a stimulant and directive.

The population in Birecik is 126 (February 2012), 52 of these individuals participated in the reproduction and 74 did not participate. It can be said that the individuals that did not participate in reproduction, are the young individuals that have not reached sexual maturity.

Twenty-two out of twenty-six couples of Northern Bald Ibises building nests preferred the reproduction station (carved and built wooden nests) (Table 1).

Only one couple can shelter the nests prepared in the reproduction station. There are two types of nests in the reproduction station. One of them is the nest carved in the rocks. The number of these nests is seven. The other nest type is the one built of wood; here are 32 wooden nests and 22 -39 nests prepared in the reproduction station are used. The use percentage is 56,4%. Nineteen of thirty-two wooden nests are used during reproduction (Table 1). The use percentage is 59,3%. Three of seven nests carved in the rocks are used. The use percentage is 42,8%. The wooden nests have some advantages compared to the nests carved in the rocks:

-The wooden nests have wider space. The balcony in front of the nest increases the movement area. This place facilitates the adults coming to the nest and leaving.

- The wooden nests offer wider space for the chickens to wander freely.
- The wooden nests offer protection from sun, rain and wind.

-The wooden nests offer protection from temperature extremes. The gaps between the nest woods prevent the overheating by providing an air stream.

- Nest roof provides the opportunity for the individuals to settle.

Incubation

The Northern Bald Ibises start the couple relations at the beginning of March. They carry material to the nests they choose. The incubation starts with the egg. The first egg is made at the end of March [6, 16, 17]. The couples maintain the incubation together.

The chickens are hatched after the successful incubation in 22 nests in Birecik (Table 1). Although the incubation is carried out in the four nests outside the reproduction station, the chickens are not hatched in three nests. Predators likely caused the failure. It is also possible that this was the first incubation of the couples. Incubation failed only in one nest in the reproduction station (Table 1).

Chickens

As ŞAHİN states [16, 17], Birecik Northern Bald Ibises make 2-4 eggs. However, the number of chickens ranges between 1 and 3. The number of chicken is few due to various reasons. The fertilization, break and missing of the eggs cause the few number of chickens; 45 chickens hatched as a result of the incubation and 84% (n: 45) of the chickens are raised in the wooden nests (n: 38) (Table 2), while 11% (n:5) of the chickens are raised in the carved rock nests (n:3). Only two chickens are raised in the only natural nest outside the reproduction station (4%).

Table 1. Incubation in 2012 Birecik Northern Bald Ibises

Number (n)	Place				
	Reproduction Station of Northern Bald Ibises Carved Rock Nest (%)	Built Wooden Nest (%)	Northern Bald Ibis Valley (Natural nest) (%)	Castle (natural nest) (%)	Total (%)
Empty Nest (n)	4	13	-	-	17
Number of Unsuccessful Incubations (n)	-	1	2	1	4
Nest that raise chickens (n)	3(%14)	18(%82)	1(%4)	-	22(%100)
∑ Nest (n)	7(%16)	32(%75)	3(%7)	1(%2)	43(%100)

Table 2. Number of chickens in the Birecik Northern Bald Ibises 2012

Number (n)	Place				
	Reproduction Station of Northern Bald Ibises Carved Rock Nest (%)	Built Wooden Nest (%)	Northern Bald Ibis Valley (natural nest) (%)	Castle (Natural Nest) (%)	∑Total (%)
Nest-one chicken (n)	1	1	-	-	1x2= 2 (%4)
Nest-two chickens(n)	2(x2)	14(x2)	1(x2)	-	2x17=34(%76)
Nest-three chickens(n)	-	3(x3)	-	-	3x3= 9 (%20)
(Chicken Loss-n)	-	(3)	-	-	(3)
∑ Chickens(n)	5(%11)	38(%85)	2(%4)	-	45 (%100)

There are three chickens in each of the three nests. The first chicken losses happened in these nests. Within the first week, one chicken is lost in each of these nests. The sharing of these nests (n: 3x3) in the total number of babies (n: 45) is 20%. The number of the nests that have two chickens is 17. The sharing of these nests among the total number of chickens is 76%. There are two nests that have one chicken (4%).

Forty-five chickens hatched in the 22 nests. There are 2.04 chickens per nests.

In Table 3, the total number of adult and chickens in 2012 is shown. There are 17 individuals, about which there is no certain information. Research will be undertaken to determine if these are adult or juveniles. It is expected that some of these individuals migrate south instinctively. It is considered that some of the hermit ibis birds migrate to Syria, south of Birecik. This situation also took place in the previous years. The colony in Syria is probably composed of these Northern Bald Ibises.

Table 3. The Number of Northern Bald Ibises inside and outside the Voliyer in 2012 (n-number)

The Northern Bald Ibis in voliyer in February 2012	126
April 2012 Chicken	+45
May 2012 The Chickens died or lost in the nest	-3
Total (∑)	171
The Northern Bald Ibis in Voliyer November 2012	152
The Northern Bald Ibis died or lost (adult, chicken)	-19

The fact that the nests of Northern Bald Ibises are on the same platform causes some disadvantages. One of these is the fighting with neighbors [20]. The separate wooden nests have a positive effect on the success of reproduction. The wooden nests are a great gain, especially when their number is few.

One of the eggs in the nest can be taken out to increase the number of chickens. These eggs can be put into an incubation machine. Manual chicken-raising can also be applied to Birecik Northern Bald Ibises in order to increase the number of chickens. The chickens hatched are successfully raised in the zoos [27, 28, 37, 38, 39].

It is expected that some of the individuals listed in the Table 3 instinctively migrate south. It is considered that some Northern Bald Ibises migrate to Syria, south of Birecik. This situation also took place in the previous years. The colony in Syria is probably composed of these Northern Bald Ibises. It can be expected that the Northern Bald Ibises migrate south as the adults and juveniles are lost each year. This behavior is instinctive. Only the experienced individuals know the migration route. The Syrian population has emerged as there are not any such individuals. Birecik Northern Bald Ibis chickens must be marked only after they are taken into voliyer.

The one on the top directs the tail downwards in the real coitus. The one on the bottom shakes its tail downwards and sideways so that the cloacae are united [6, 16]. This kind of copulations is not common when the chickens are around. The real coitus is observed before and during the incubation.

Thaler et al. [23] stated that the female birds climb to the back of males and exhibit behaviors in order to assert their dominance before making eggs. It is observed many times that Birecik Northern Bald Ibises exhibit these behaviors after the chickens left. The couples that are new and have not raised a chicken exhibit the same behaviors. The Northern Bald Ibises climb each other's backs in turn and exhibit coitus behaviors. However, the cloacae unification is not observed.

ŞAHİN lists the chickens / couple rate as 2,13 (in free breeders) [13] and 2,8 (in voliyer) [12]. The chickens per nest was 1,4-1,9 between 2001 and 2006 [22] this rate was detected as 2,04 in 2012. The chickens per nest in Morocco is 0,63-1,77 [29].

While 42 juveniles fly in Birecik (2012), this number is 42-110 in Morocco (1994-2006) [29]. The number of chickens per nest in Syria is 0-3 (2002-2006) [24].

The feed given to the Northern Bald Ibises in Birecik is different than the ones in Spain [30], Austria [31] and Morocco [32].

There are some deficiencies and mistakes in the voliyer in Birecik Northern Bald Ibises station [33, 34, 35]. The nutrition of the Northern Bald Ibis deficient and wrong. Fixing these makes the adults healthier [35].

It is required that the Birecik Northern Bald Ibises be sheltered in different stations and zoos and that they reproduced in case of an epidemic (such as bird flu), in which all the population might die [34, 35].

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