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Research Article

INCUBATION SHARING OF NORTHERN BALD IBIS (*Geronticus eremita*) PARTNERS

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Abstract: *This study related out during the incubation period of northern bald ibises. Northern bald ibises in Birecik are free-living in nature during the breeding period (February–June) in 2013-2015. Pairs share the incubation between the two sexes. Females were incubated for 177.08 minutes per day on average while males were incubated for 240.99 minutes per day. This incubation period is statistically different (P< 0.0001) with males staying 23-32% longer than females. Females and males stayed in incubation together for only a short time. According to observations made (n=79), couples stay together on nests for 20.52 minutes on average. During the observations made all day long it was realized that eggs are left alone for only 0.40 minutes on average. Incubation periods did not vary according to years. According to the observations made in 2013 (n=100) period for staying in the nest was not different than observations of years 2014 and 2015 statistically (P>0.05). According to 2014 (n=128) and 2015 (n=88) results no statistical difference could be observed between incubation periods (P >0.05).The excess eggs during incubation are protected by northern bald ibises which do not have any nest (altruism). From time to time-synchronized behaviors can be observed in the population.*

Keywords: *female sitting time, male sitting time, breeding, Geronticus eremita, synchronized behavior*

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1. Introduction

The aim of this study is to reveal the incubation sharing periods of the partners. It was aimed to contribute to the rescue of the northern bald ibis, which is endangered.

Although the Northern Bald Ibis *Geronticus eremita* (Linnaeus, 1758), was listed as a critically endangered (CR) species, globally, by IUCN; recently changes as endangered (EN) in 2018[1]. The number of those living freely in nature is less than 1000. The northern bald ibis in different zoos and stations has been originated from Morocco [1- 4].

The northern bald ibis population living in the cliff in the Atlantic Ocean coasts in North Africa (Morocco) is the greatest one [5, 6]. A total of 262 chicks hatched in 2013 in Souss-Massa National Park and Tamri in Morocco and only 148 chickens have reached the maturity to be able to leave the nest by flying. According to the evaluation in 2014, there is a population consisting of 524 individuals in the Souss-Massa region. 192 chickens were raised in the incubation sustained by 115 couples in this region in 2014. It has been determined that 1.6chickenson averages have been raised in these nests participating in reproduction [7].

The second population takes place in Turkey. The interest in the northern bald ibis in Anatolia shows a difference from other regions of the world. Northern bald ibis is seen as holy in Birecik and they are not hunted. Also those from Birecik have always been helpful in the issue of the protection and reproduction of them since before [8 - 12]. The population living in Birecik (Şanlıurfa) for centuries is accepted as semi-natural today [1, 13]; because the population sustains its existence thanks to the contributions made by the people. Northern bald ibis spending the winter in cages is set free in the reproduction periods (March-June) [14]. 185 Northern bald ibises have been set free from cages in 2015 [13]. The number of Northern bald ibises taken to the cages at the end of the reproduction period has risen to 209.52fledgling attended to the population reproducing in 2015 [13].

A northern bald ibis colony accustomed to migration with the help of the people has been formed in Europe. The adults that have spent the winter in Toscana (Laguna di Orbetello) in Italy migrate to Germany and Austria for reproduction [15]. This colony consists over of 100 individuals – in the year 2016[1].

Knowing the route of migration is realized in the birds via instinct and learning. As in storks, it is known that northern bald ibises are also known to migrate to the south at the end of the reproduction period. They fly to Africa (Somali, Ethiopia) in which they will spend the winter [11]. In a study conducted with storks in North Europe; it has been observed that the young storks not knowing the routes of migration migrate from north to south instinctively. However, the experienced individuals migrate through South Eastern (Anatolia) as different from this route [16]. As in storks, it has been detected that the young individuals head towards the south in the absence of the experienced northern bald ibises knowing the routes of migration. It has also been determined that although the adult northern bald ibises know the places where they will spend the winter head towards Africa (Somali, Ethiopia), young northern bald ibises head towards Saudi Arabia [17].

It has been revealed in the observations conducted in cages that the experienced individuals of the northern bald ibises are more successful in incubations. It has been determined that whether there is loyalty to the spouse does not affect the number of offspring breeding [18].

The loyalties of the northern bald ibises to their partners could not be completely determined in the ones living freely. It has been estimated that the northern bald ibises living freely may show seasonal loose monogamy. It is specified that monogamy is observed in the northern bald ibises living in cages [19].

The mating behaviors are observed in northern bald ibises during the reproduction period. These behaviors rapidly decrease together with the making of the last egg [20]. Mating is carried out mostly (65%) after the mutual feather cleaning of the couples. Male and female northern bald ibis stand side by side after mating and they erect their beaks upwards simultaneously. Female ones get on the back of the males and show mating trials [20].

Material is carried instead of the nest while the nest owners sustain their partner relations until the beginning of the incubation. Carrying the material is under the responsibility of the males. The female sits in the nesting place and ensures the establishment of the brought material. 98% of the materials carried to the nest are brought by the male. The carried materials are herbal materials such as thick and thin branches, grass, and straw. In addition; plastic bags, paper, and different packing materials are also carried to the nest out of the rubbish thrown by the people [21].

Finding and carrying the nest material is an effort necessary to be spent. Males are responsible for finding and bringing the material. Stealing materials from neighbor nests during and after the establishment of the nest is an observed behavior. Nest owners do not leave the nest alone before and after incubation so much. It has been determined during the day-long observations conducted before incubation that the nest is left alone for only 19 minutes in total. The material in the nests left alone for a few minutes is pillaged at that moment by the neighbors [21].

It has been determined that incubation lasts for 27-28 days for the bald ibises living freely. The offspring of the same nest hatch from the egg at intervals of 2-3 days. Hatching of the offspring from the egg may take two days [22]. Female and male northern bald ibises share tasks and grow the offspring together. The offspring leave the nest after they are 45-50 days old [23].

2. Materials and Methods

The northern bald ibises living in the Birecik district of Şanlıurfa province (37.0197 N, 37.9759 E) have formed our study material. The population conducting their mating (March-June) in nature is kept in "Northern BaldIbis Production Station" for eight months. Food supply is also during the period they are in nature. The northern bald ibises set free from cages at the beginning of the reproduction period (end of February- early March) proceed to the prepared and naturally existent nest places and start reproduction acts.

Observations have been carried out two days per week during the reproduction period of the northern bald ibises. The studies were carried out between the years 2012-2015. Observations have been sustained without any interval for 6-10 hours during the day (Table 1). No night observations. Observations have been carried out at a distance of 50-100 m to the nests in the Station of Production. Observations were made from outside the breeding station so that the northern bald ibises would not be affected by the researcher. Five nests neighbor to one another has been regularly observed.

Table 1. Time of observations

Year	Date(hour)	Time of observations (minutes)	Number of nest / incubation observed (n)
2013	04April2013(08.27-17.00) 10 April 2013(09.00-17.00) 11 April 2013(06.55-17.00) 17 April 2013(09.30-17.00) 18 April 2013(07.08-15.55)	513 480 605 450 527	5
2014	05 March 2014(09.20-17.00) 06 March 2014(07.15-16.30) 12 March 2014(09.47-15.45) 13 March 2014(06.55-16.00) 19 March 2014(09.36-17.00) 20 March 2014(06.47-16.00) 26 March 2014(09.50-17.00) 27 March 2014(06.40-16.00)	460 555 358 545 444 553 430 560	5
2015	12 March 2015(07.12-15.00) 18 March 2015(09.55-17.00) 19 March 2015(07.05-15.00) 25 March 2015(09.17-17.00) 26 March 2015(07.03-15.00) 01 April 2015(09.48-17.00) 02 April 2015(07.08-15.00) 08 April 2015(09.15-15.00)	468 425 475 463 477 432 472 345	3

Northern bald ibises are taken to cages at the end of the breeding season (June - July). Brooding station interested-Veterinarians wear colorful plastic rings on the feet of northern bald ibis. In addition, blood is taken from northern bald ibises (for genetic studies and gender determination at Department of Biology of the Middle East Technical University, Ankara-Turkey) [24].

When determining the sex of the northern bald ibises (four years, 2012 - 2015) always the same individuals were observed): First, sexual behavior is investigated (for example, the position in copulation). Second, head patterns of northern bald ibis were examined [25 - 27]. Thirdly, take into account the colored rings on their feet.

We compared our results for sex determination with the blood analysis of northern bald ibises (see Acknowledgement). The results of both studies were the same.

Our sex determination studies were compared to the studies by Yeniyurt [28] and Özkınacı and Yeniyurt [29]. Our results of sex determination matched theirs.

The reproduction activities realized in nests have been recorded via binoculars, telescope (Nikon FIELD SCOPE ED), camera (Fujifilm FinePix S2Pro), and Digital video camera (Canon MVX150i). Evaluation and statistical studies have been conducted afterward.

Mean and standard error values were given as descriptive statistics in the analysis of the data. Two-Way analysis of variance and Bonferroni Multiple Comparison tests were used in statistical evaluations of parameters. The results were considered statistically significant for $P<0.05$.

This research article can be evaluated with the article below. "Assessment of the incubation period for each sex of Turkish semi-wild northern bald ibis (*Geronticus eremita*)" [30].

3. Results

The northern bald ibises lay 1-3 eggs. Incubation lasts 28 days. As before the incubation, partners share tasks in the incubation. Incubation periods have been compared to the observations belonging to the three years (2013-2015). The start of incubation takes place on different dates in March. It is seen that environmental temperature is the determining factor in this change. During the cold March, incubation starts late. The incubation start date is affected by two factors. Average incubation periods in 2013 showed significant change according to the weeks in incubation and the parameter of sex interaction ($F=4.538$; $P<0.001$). These changes are statistically meaningful changes.

The comparative change of the incubation periods in the nests observed in 2013 according to the sex of the nest owner and the number of weeks incubation has lasted are seen in Table 2. It could be comparatively seen in this table that males remain in incubation for a longer time. According to the average of all incubations, males have remained in incubation for a minimum of 115.00 minutes and a maximum of 295.70 minutes. Females have remained in incubation for a minimum of 99.57 minutes and a maximum of 255.00 minutes on average. The period in which spouses have remained in incubation together has been a minimum of 3.71 minutes and a maximum of 13.13 minutes (Table 2). Leaving the nest alone during the incubation is too rare.

Table 2. Time of partner staying in the incubation (minutes) (in the day)

Year	Week	Sex	n (number of observations)	Mean	Standard deviation	Standard Error
2013	1.	Female	7	99.57	126.166	47.686
		Male	7	115.00	144.903	54.768
		Female + Male	7	3.71	5.219	1.973
		Empty	7	0.29	.756	.286
	2.	Female	8	255.00	84.834	29.993
		Male	8	290.38	77.772	27.497
		Female + Male	8	13.13	7.882	2.787
		Empty	8	0.00	.000	.000
	3.	Female	10	180.70	88.282	27.917
		Male	10	295.70	66.014	20.875
		Female + Male	10	12.10	7.520	2.378
		Empty	10	0.00	.000	.000
	4.	No data	-	-	-	

Table 2. Continued

Year	Week	Sex	n (number of observations)	Mean	Standard deviation	Standard Error
2014	1.	Female	8	125.13	110.755	39.158
		Male	8	176.00	174.515	61.700
		Female + Male	8	14.88	26.680	9.433
		Empty	8	0.50	.926	.327
	2.	Female	8	193.88	62.670	22.157
		Male	8	250.88	100.249	35.443
		Female + Male	8	5.00	5.880	2.079
		Empty	8	1.75	1.389	.491
	3.	Female	8	227.75	79.857	28.234
		Male	8	266.00	90.571	32.022
		Female + Male	8	1.00	1.414	.500
		Empty	8	0.75	.707	.250
	4.	Female	8	205.50	78.733	27.836
		Male	8	283.63	95.169	33.647
		Female + Male	8	4.38	4.809	1.700
		Empty	8	1.50	1.309	.463
2015	1.	Female	7	120.14	46.820	17.696
		Male	7	237.29	63.269	23.913
		Female + Male	7	93.71	87.112	32.925
		Empty	7	0.00	.000	.000
	2.	Female	6	174.17	46.808	19.109
		Male	6	285.17	42.410	17.314
		Female + Male	6	10.67	4.633	1.892
		Empty	6	0.00	.000	.000
	3.	Female	6	210.67	63.143	25.778
		Male	6	232.83	58.742	23.981
		Female + Male	6	8.50	9.160	3.739
		Empty	6	0.00	.000	.000
	4.	Female	3	133.67	75.182	43.406
		Male	3	137.00	56.027	32.347
		Female + Male	3	74.33	118.424	68.372
		Empty	3	0.0	.000	.000

The average periods of remaining in nests during incubation in 2014 did not show any significant change when compared to the parameter of weeks and sex interaction (F=1.195; P=0.305).

The comparative change of the incubation periods in the nests observed in 2014 according to the sex of the nest owner and the number of weeks incubation has lasted are seen in Table 2. Male has undertaken the maintenance of incubation for a minimum of 176.00 minutes and a maximum of 283.63 minutes in different weeks. On the other hand, females have remained in the incubation for a minimum of 125.13 minutes and a maximum of 227.75 minutes. Female + male have remained in the incubation together for a minimum of 1.00 minutes and a maximum of 14.88 minutes. Leaving the eggs alone in the incubation is too short. This period has changed between 0.50 – 1.75 minutes.

When the average periods for remaining in incubation in 2015 have been examined, it has been observed that the parameters of weeks and sex interaction (F=4.278; P <0.001) have significantly changed.

Periods of remaining in incubation belonging to the three years (2013-2015) are comparatively seen in Table 2. The comparative change of the periods of remaining in incubation when compared to the sex of the nest owner and the number of weeks the incubation has lasted takes place in Table 2. The average period of the males remaining in the incubation in the nests in different weeks has been a

minimum of 137.00 minutes and a maximum of 285.17 minutes in 2015. The Female has remained in the incubation alone for a minimum of 120.14 minutes and a maximum of 210.67 minutes. Female + male have remained together in the incubation for a minimum of 8.50 minutes and a maximum of 93.71 minutes. It has been detected that the eggs were not left alone in the incubation in 2015 (Table 2).

The distribution of the periods for remaining in the incubations according to the weeks in 2013 on average takes place in Figure 1 comparatively. Females take place in the incubation less than males. It is seen that the periods of the males remaining in the incubation are close to each other in the second and third weeks of the incubation. However, it has been detected that females remain in the incubation longer in the second week when compared to other weeks. The periods (min.) of the female and male for remaining in the incubation together are too few. Incubation is left alone rarely (Figure 1).

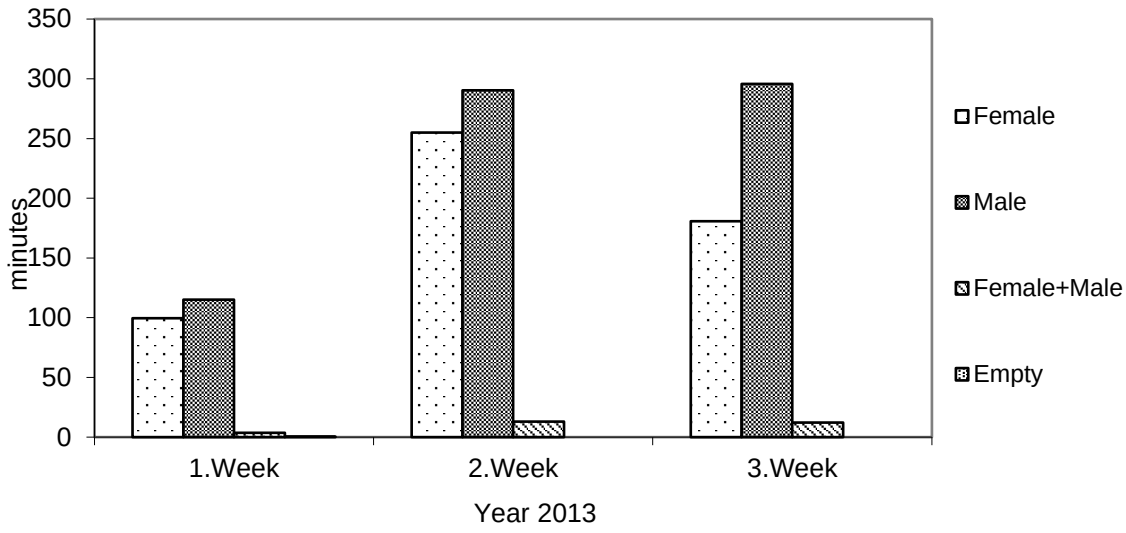

Figure 1. The year 2013 - histogram of the weekly average periods (minutes) of the partners for remaining in the incubation.

The weekly distribution of the average periods of the partners for remaining in the incubation in 2014 takes place in Figure 2 comparatively. Males remain in the incubation more when compared to their partners. Females and males and have remained in the incubation for longer periods in the proceeding incubation weeks. The periods of the partners for remaining in the nest together are too little when compared to the female and male remaining in the incubation alone. Incubation is left alone rarely. The difference of period for remaining in the incubation between females and males has also been observed in various weeks (Figure 2).

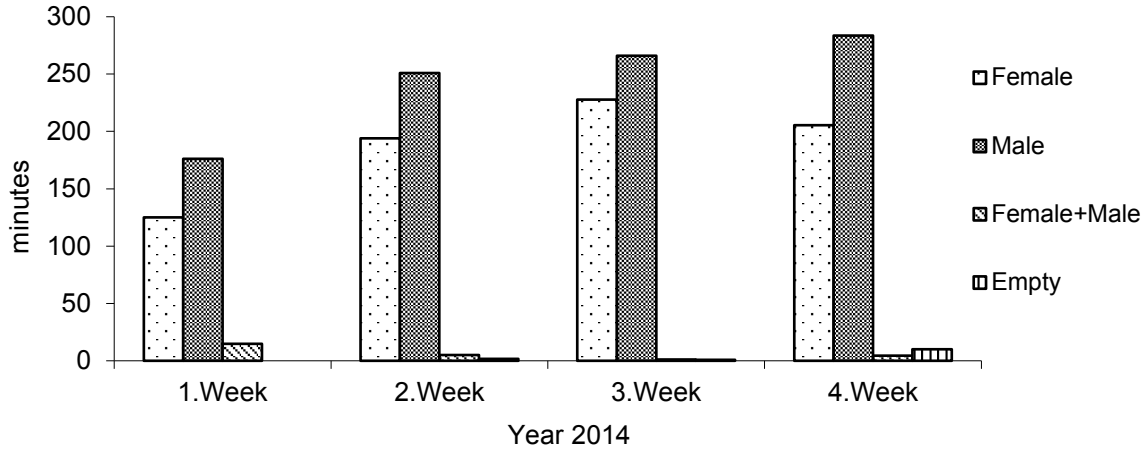

Figure 2. The year 2014 - histogram of the weekly average periods (minutes) of the partners for remaining in the incubation.

The weekly distribution of the average periods of the partners for remaining in the incubation in 2015 takes place comparatively in Figure 3. Males remain in the incubation more when compared to their partners. It is seen that the periods of the males remaining in the incubation decrease as of the second week. Females have increased their periods for remaining in the incubation for the first three weeks. The periods of the partners for remaining in the incubation together are too little when compared to the female remaining in the incubation alone and male remaining in the incubation alone. According to the previous years (2013-2014), it has been detected that females + males remained in the incubation for a longer time in 2015. It has been observed that the eggs have not been left alone (Figure 3).

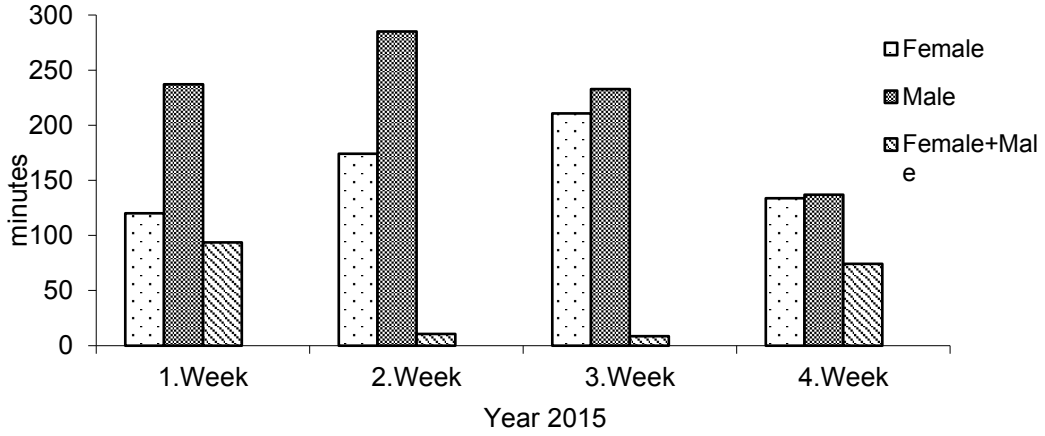

Figure 3. Year2015– histogram of the weekly average periods (minutes) of the partners for remaining in the incubation

3.1. Comparison of the Average Periods for Remaining in the Incubation According to Sex and Years

Average periods ($F=193.565$, $P<0.001$) of remaining in the incubation according to sex have shown a significant change and this is a statistically meaningful change. According to the parameters

of years (F=0.0125; P =0.988) and the interaction of sex and years (F=0.988; P =0.434); average periods for remaining in the incubation have not shown a statistically meaningful change (Average periods for remaining in the incubation has shown similarity with each other according to these parameters).

Descriptive statistical values are given below according to the parameters of sex (Table 3), years (Table 5), and the interaction of years according to sex (Table 7).

When the average of the data attained during the three years (2013-2015) in which observation has been conducted has been calculated, it has been seen that males remain in the incubation longer than their partners. Females have remained in the incubation for 177.08 minutes per day according to the results of the conducted observation (n=79). This value is 26% less than that of males. Males have remained in the incubation for 240.99 minutes per day. This value is clearly longer than that of females. It is rare for the male and female to remain in the incubation together; because there has not been any need for remaining together. Partners are seen in the incubation together for 20.52 minutes on average (n=79) during the day. The nest is not seen empty very much (Table 3).

Table 3. The time of staying in the incubation in 2013-2015 (minutes)

Sex	n	Mean	Standard Error
Female	79	177.08	8.47
Male	79	240.99	8.47
Female + Male	79	20.52	8.47
Empty	79	0.0	8.47

(n: Number of observations) (in the day)

The difference is meaningful (P < 0.0001) when the periods of the females and males for remaining in the incubation are compared. The period of the female for remaining in the incubation alone is much longer than the period for remaining in the incubation together (female + male) and the period for the emptiness of the nest and the difference is meaningful (P <0.0001) (Table 4). The average period of the male for remaining in the incubation is much longer than the period for remaining in the incubation together (female + male) and the period for the emptiness of the nest. The period of the male for remaining in the incubation is meaningfully different from the period for remaining in the incubation together (female + male) and the period for the emptiness of the nest (P <0.0001) (Table 4). It has been detected that the period for remaining in the incubation together (female + male) is not different from the period for the emptiness of the nest (P =0.5643) (Table 4).

Table 4. Multiple comparisons of the period for remaining in the incubation

Sex	Male	Female + Male	Empty
Female	P < 0.0001	P < 0.0001	P < 0.0001
Male		P < 0.0001	P < 0.0001
Female + Male			P = 0.5643

The periods of the northern bald ibises for remaining in the incubation could be seen in Table 5 in three different years (2013-2015). The average of the total of the values "female only" + "male-only" + "male and female together" + "nest empty" has been calculated while calculating the average value. The values of the averages of remaining in the incubation are close to one another among the years. The period of remaining in the incubation in 2013-2015 has changed between 108.83-110.51 (min.) (Table 5).

Table 5. Period of remaining in incubation (minute)

Years	n	Mean	Standard Error
2013	100	108.83	7.44
2014	128	109.91	6.58
2015	88	110.51	7.93

It could be seen in Table 6 with multiple comparisons that the difference between the periods of remaining in incubation in 2013-2015 (according to Table 5) is not meaningful (P > 0.05) (Table 6).

Table 6. Multiple comparisons of the period of remaining in the incubation

Years	2014	2015
2013	ns	ns
2014		ns
ns (non-significant); P > 0.05		

The average of the period of remaining in incubation according to the interaction of years and sex has been comparatively calculated in Table 7. Females remained in incubation between 2013-2015 minimum 161.41 minutes and maximum 188.06 minutes. Males remained in incubation alone minimum 235.45 – maximum 244.13 minutes per day. According to these periods, the male has remained in incubation 23-32% longer than his partner. Sometimes female + male remains in incubation together. It has been observed that the partners remain in incubation together generally during the shift changes. Remaining in incubation together has changed between minimum 6.31 – maximum 45.18 minutes. There is only a single individual in the nest except for the shift changes. It has been determined that the eggs remain alone so rarely during the incubation in the nests monitored in 2013-2015. Nest has been left alone for 0.00-1.13 minutes on average and the eggs have remained alone (Table 7).

Table 7. Periods of remaining in incubation in terms of year and sex (minute)

Sex	Years	N	Mean	Standard deviation	Standard Error
Female	2013	25	181.76	112.960	22.592
	2014	32	188.06	89.512	15.824
	2015	22	161.41	63.663	13.573
Male	2013	25	243.40	123.820	24.764
	2014	32	244.13	121.571	21.491
	2015	22	235.45	69.183	14.750
Female + Male	2013	25	10.08	7.921	1.584
	2014	32	6.31	14.207	2.511
	2015	22	45.18	71.835	15.315
Empty	2013	25	0.08	.400	.080
	2014	32	1.13	1.185	.209
	2015	22	0.00	.000	.000

The average of remaining in incubation belonging to the three years has been dealt with comparatively as a histogram in Figure 4. Females remained in incubation with periods close to each

other in three years (2013-2015). Females remained in incubation at the least in 2015 on average. Males remained in incubation as the least on average in 2015 and as the longest in 2014 (Figure 4). The period of the males remaining in incubation is close to each other although they are in different years. Male and female have remained in the nest together in restricted periods during the shift changes. It is seen in Figure 4 that the incubations have been left alone too rarely (Figure 4).

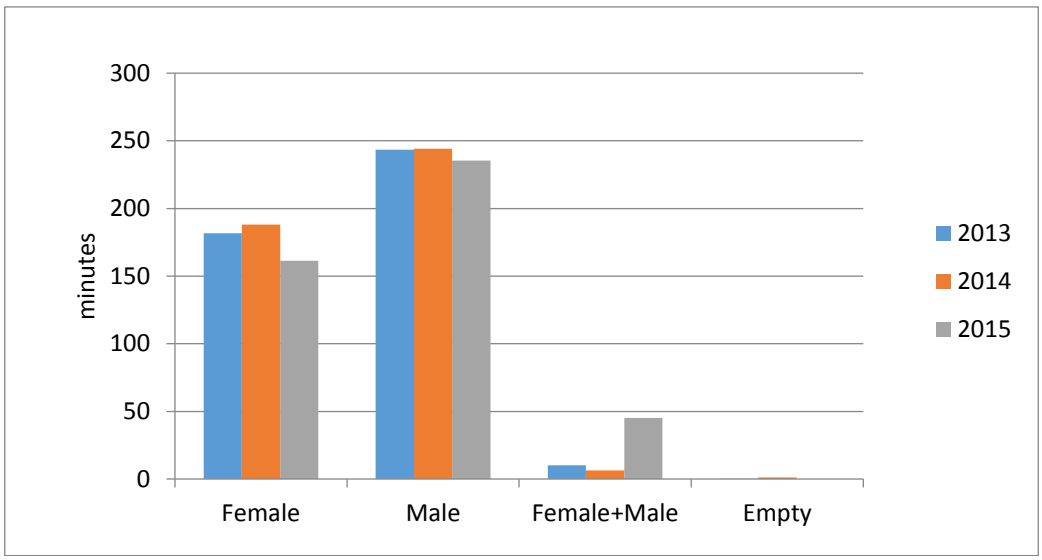

Figure 4. Comparison of the averages of the periods of remaining in incubation (by years)

3.2. Synchronized Behaviors

Northern bald ibises show similar behaviors at the same time before and during the incubation. Mating of the partners to each other in different nests, reproductions, carrying the nest material and the behaviors of starting a family occur within the same period. Shift changes are conducted simultaneously in incubation. At the same time, males or females undertake the mission of incubation from their partners. Shift changes are realized with similar behaviors such as "greeting", "hugging" and "giving a gift". Similar behaviors are observed in different nests at the same time.

4. Discussion

The division of labor for incubation between the two sexes has not previously been studied for the free-flying sex of northern bald ibis. Although northern bald ibises living in cages are marked, a study related to the incubation period of the partners has not been detected. In our study, the partners of northern bald ibises in Birecik reproducing in nature perform the incubation in turns. Males remain in the incubation longer. According to the three years observation average (n=79), males remained in the incubation for 240.99 minutes per day. Females remained in incubation for 177.08 minutes on average (n=79). According to Cramp&Simmons[31], males participated in incubation 26% more.

Partners are rarely together in incubation. The period of remaining in incubation together is 20.52minutes on average according to the observations in three years. It has been detected that eggs have been rarely left alone in incubation. According to the observations between the years 2013-2015 (n=79), eggs were left alone for 0.0 minutes on average (Table 3).

Partners owning nests remain on eggs in turns by sharing the tasks. According to the observations in 2013, the parameter of incubation weeks and sex interaction ($F=4.538$; $P<0,001$) showed dramatic change. In fact, a meaningful change has not been seen when the parameters of incubation weeks and sex interaction ($F=1.195$; $P=0.305$) in 2014 were examined. The parameter of

the interaction of the incubation weeks and sex ($F=4.278$; $P<0.001$) showed a drastic change in 2015. The period of remaining in incubation changed in 2013 and 2015 in different weeks depending on sex. However, the period of remaining in incubation for males or females did not show any difference in 2014 in different incubation weeks. The necessity for the sustainment of the studies in different years occurs for this situation to be able to be clarified.

It is expressed that the female is dominant in the nest during the making of the eggs, she makes show mating (getting on the back of male), she protects her nest against other individuals of the colony and she rarely leaves the nest alone [25]. According to our detections; the expression that female is dominant is considered regarding the female getting on her partner's back. It has been determined that males sometimes encourage and direct their partners to get on their backs with their own wishes. This situation could be considered as the sharing of dominance. Moreover, it is also thought that this stems from the wishes of the males for establishing and sustaining relations; because it has been detected that the nest owner males do not have any female partners establish partner relations with other males. It has been observed during this period that he encourages his partner to get on his back. It has also been recorded that this male tries to get on the back of his partner afterward and show reproduction activities. For this reason, the behavior of getting on the back of partners is considered as a tool for the establishment and sustainment of relations.

Pegoraro [25] specifies that female northern bald ibis protects her nest. According to the observations conducted between 2012 and 2015; the protection of the nest is seen as an action conducted by the male rather than female [32].

The partners coming to undertake the shift remains at the side of the nest for a while before and after the shift change. This situation has been evaluated as remaining in the incubation together. The individual coming to undertake the shift to wait at the side of the nest is related to preparing his/her remaining partner to stand up. The individual remaining in the outer side of the nest after the shift change has been assessed as the wish for not leaving the nest. There is no need for remaining in the nest together; because the nest to be small is not convenient for the partners to remain together. If they remain in the nest together, the partners trying to pull the eggs to their own bottom may give harm to the eggs. Partners act very carefully and slowly during the shift change. This care they show is for the prevention of the negativities possible to occur for the eggs. The partners remaining in the nest together may cause the congeners to pay attention to the nest. Controversies with foreigners may occur in this situation.

Male spending so much time in the incubation ensures the female to wander around freely. Female does not spend time near the nest. She gains more time to be able to go to faraway places for the purpose of searching for food. Males remain in the incubation and decrease the controversies with the neighbor males; because threats and controversies generally occur among males.

It is seen that synchronized behaviors provide various benefits for individuals. Synchronized behaviors are frequently observed in the northern bald ibises showing the property of living gregariously. Synchronization contributes to the social togetherness of the northern bald ibises showing a gregarious lifestyle. Collective flights may prevent enemy attacks. Synchronized flights of lots of northern bald ibises make a dissuasive impact on the predators. Finding the food becomes easy during the search for food together. It also ensures easier finding of the nest materials. Searching for food collectively provides benefits with advantages in hunting. Starting to take food during the food time in northern bald ibis Production Station provides opportunities for the simultaneous benefit of all individuals from restricted food. Synchronized shift change may terminate the controversies possible to occur among the neighbors. The behaviors of the synchronized search for nest material provide an easier finding of nest materials. It is necessary to study how the neighbors or the groups are affected

by one another in synchronized behaviors (shift change, incubation, collective flight, and searching for food together).

Eggs remaining alone in the incubation for 1-4 minutes are considered a dangerous period. The non-incubating individuals come by themselves and remain on the alone eggs. In this way; eggs remain open for a little period and the damage of embryos is prevented. These behaviors could also be considered as the behaviors of self-devotion. It has been detected in 4-year observations that other non-incubating northern bald ibises do not give any harm to the eggs. In addition; the open eggs have been protected by other northern bald ibises. No hunter attach has been observed to the eggs and those in the incubation during the observations between the years 2012-2015. "Curious" youngsters coming to the roofs of the nests worry those in the incubation. However, the existence of other individuals that could not participate in reproduction may dissuade the predators that may come to the incubations. This may be considered as a behavior of self-devotion (altruism). Behaviors of self-devotion have been observed during the periods in which the eggs and offspring have been left alone in the nest. The northern bald ibis not having any nest protects the eggs and chicken belonging to others with self-devotion. Utilization is seen as single-sided. However; in the event of detailed assessment, it could be said that the individual showing behaviors of self-devotion will also get benefit from this situation; because, the experiences it has lived will help her/him be more successful when s/he owns his/her own eggs and offspring.

Şahin [11] has detected that incubation starts with the making of the first egg in the northern bald ibises reproducing freely in nature. The same situation is also observed in the northern bald ibises in Birecik northern bald ibis Production Station during the reproduction periods (2012-2015).

It has not been observed that the partners feed each other in the incubation [25]. Partner feeding could not be detected in incubation times or other times during the studies in Birecik.

The partner that is not in incubation takes place near the nest [25]. Sex is not specified in this detection. Females remain near the nest rarely in the northern bald ibises in Birecik reproducing freely. Males have more tasks in the protection of the nest. The nest owner female firstly tries to expel the foreigner when a foreign male comes to the nest during the times when the female is in incubation. She escapes if she cannot be successful in this fight [32]. The nest owner male comes in a few minutes and expels the foreigner. This situation is an indication of the fact that males are around their nests. However, females show such kinds of behaviors rarely.

The activities which do not provide direct benefit to the individual and which are even harmful, but which are an advantage for their congeners are defined as behaviors of self-devotion (altruism) [33]. Such kinds of behaviors also observed in different animal species are called altruism [34-35]. Northern bald irises show altruistic behavior as well.

5. Conclusion

The northern bald ibis partners cooperate and divide the labor at incubation. During the day, the male sits more in the nest than his partner. There is no difference between incubation weeks. In three different years (2013-2015), the period of sitting at the incubation is close to each other. In incubation, partners stay together for a short time. Eggs are not left alone.

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Conflict of interest

The authors declare no conflict of interest.

Authors' Contributions

Statistical evaluations (100%) were carried out by Ersin UYSAL.

Observations and preparation of the article (100%) were carried out by Ahmet KILIÇ.

Ethical Statements

The author declares that this document does not require an ethics committee approval or any special permission. Our study does not cause any harm to the environment.

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