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PRELIMINARY STUDY ON BREEDING BIOLOGY OF THE PALM DOVE, *Streptopelia senegalensis*, AT SHARKIA GOVERNORATE, IN EGYPT

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ABSTRACT: This study was conducted in two districts (Zagazig and Huseinia) of Sharkia governorate to through some lights about the breeding features of the Palm Dove, *Streptopelia senegalensis*. In total, 32 nests were recorded in different habitats during the period of study. The total number of monitored nests (old and new) was differed from one year to another being 34, 54 and 37 nests for 2020, 2021 and 2022, respectively. The percentages of nests with eggs (active nests) were also differed from one year to another recording 62.16%, 79.4% and 87.03% for 2020, 2021 and 2022, respectively. The average number of eggs/active nest (clutch size) was relatively similar for the years of study ranged between 1.72 to 1.77 eggs/nests. The mean period of eggs incubation was ranged between 15–16.7 days. Hatchability % of the eggs laid was differed according to the season of the year, whereas the highest value was recorded in summer season (86.39%) while the lowest was occurred in autumn (72.67%). Fledging period was prolonged during winter and autumn and shortened during summer and spring. The highest breeding success was recorded in spring season (95%) and the lowest one was occurred in winter season (79.05%). Numbers of fledges were less than the number of hatched chicks and differed according to the season of the years recording the least numbers in Winter and the highest numbers in Spring and Autumn. The number of clutches per each monitored pairs per a year was differed from one pair to another and from one season to another for the same pair, however, it was irregular in most cases due to different consideration.

Key words: Breeding biology, Palm dove (*Streptopelia senegalensis*), Sharkia Governorate, biological aspects.

INTRODUCTION

The palm Dove, *Streptopelia senegalensis* is a very common bird in Europe, North Africa, Central Asia and increased in some other countries since 1990 **(Moali *et al.*, 2003; BirdLife International, 2014)**. This bird can be found in the agrobiogeocenoses of districts, cities, towns and villages. In Egypt, this is one of birds that resident and common breeder. Other names of Palm Dove includes Laughing Turtle Dove, Laughing Dove and Senegal Dove while the Palm Dove in India called the Little brown dove **(Bhoye and Bahiram, 2021).**

This is a bird pest that Feeds on grain's crops (wheat, rice, corn and barley), seed's crops (sunflower, gorma melon, pumpkin and legumes), causing a degree of damage to these crops. This bird feeds also on small termites and beetles that found on ground**;** in general, they are terrestrial foraging on the ground in cultivated crops and grasslands **(Browne and Aebischer, 2003; Adang, 2008; Gibbs *et al.*, 2010).**

Description of palm dove adult is length about 25 - 27 cm and average weight of 84 grams, It is possible to differentiate between Palm Doves as compared to other Doves, weak and with longest tail and the head and other parts of body are pinkish, shading to orange on the belly **(Beaman and Madge, 2010; Gibbs *et al.*, 2010; Bhoye and Bahiram, 2021).**

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The world's Palm Dove population is fated to be between 2.4-8.2 million adult individuals **(BirdLife International, 2022),** while around the Arabian Peninsula that population of Palm Doves exceed 2 million pairs, and it found anywhere in Arab of country from sea level until altitude 3,000 m or furthermore **(Jennings, 2010)**. In Arabia, it is generally related with population such as towns, villages, oases and fields throughout most of the region **(Al-Sirhan *et al.*, 2022).**

The breeding biology such as incubation period, clutch size, fledging period, number of clutch and success of nest of the Palm dove was studies in different countries under different conditions by many others (**Rao 2014 and Brahmia *et al.*, 2015)**. The breeding season of Palm Dove is occurring along the year in most tropical regions and in some other countries **(Gibbs *et al.*, 2010).**

The objectives of this study were to provide a basic understanding of the Palm Dove, *Streptopelia senegalensis* breeding biology at some regions of Sharkia Governorate, east of Cairo.

MATERIALS AND METHODS

To study the breeding biology of the Palm Dove, *Streptopelia senegalensis* in some districts of Sharkia governorate**;** Zagazig and Huseinia regions were chosen for this study. Continuous inspection of many areas of the studied regions was carried out to exist the adult birds or their nests. The study was conducted during 2020 to 2022. A total number of 32 nests were found to occupant different habitats in areas of study which distributed as follows: 6 nests on trees of Banana and Casuarina, 18 nests in human houses, 8 nests in water station. Some of these nests were pursued along the period of study to record the numbers of clutches along the year and some other nests were neglected because the pair birds were left the habitats and did not lay any other clutches. New and active nests which were existed during the seasons of study were included. The chosen nests were checked every two days once during the early morning and other once an hour before sunset.

Some biological aspects such as: number of laid eggs per clutch, number of clutches for a pair of birds per years, incubation period, hatchability, fledging period, number of fledges and fledgling success for each nest were studied. The obtained results were recorded for each nest along the period of study. A clutch is the total eggs a bird lays per each nesting attempt. Clutch size is the number of eggs laid in a single nest. Incubation period is the interval between the laying of the first egg and hatching of that egg within clutch according to **Rao (2014)**. A chick refers to the young or juvenile offspring

Hatchability was defined as the ratio of the number of nestlings hatched to the number of eggs laid **(Zduniak and Kuczynski 2003)**. The fledging period is the time between the day of the first egg hatching and the day which the bird possess true feather and able to leave the nest. The nestling period is defined as the interval of time the last chick of the brood remained in the nest according to **Rao (2014)**.

RESULT AND DISSCUTION

This study had been started at the beginning of 2020 by monitoring the Palm Dove birds whether in status of courtship or incubation of their eggs. The Laughing Dove birds are breeding around human habitation areas due to the presence of nesting materials and source of foods for their young.

In total 32 nests were recorded in different habitats along the period of study. Some nests were pursued for several clutches (12 nests) (Table 2) during the period of study and other nests were neglected because many factors such as migration of parents or due to predation and depredation. The number of monitord nests was differed from one season to another along the year and from one year to another (Table 1). In any season, a number of nests were monitored**;** this number may be increased (new nests) or decreased (predation, depredation and migration of parents) in the next season (Table 1). Note: the same nests which were monitored in a season were numerated again in the next season (if did not disappear). The results obtained could be discussed as follows:-

Table 1. Some biological aspects of the Palm Dove, *Streptopelia senegalensis* inhabits some different habitats under Sharkia governorate conditions during the breeding seasons of 2020-2022

Years	Seasons	No. of nests	No. Nests with eggs	No. nests With hatching	No. of eggs Total	No. of eggs Av./nest (clutch size)	Incubation period (in days)	Hatching No. hatched eggs	Hatching % hatchability	Hatching No. of fledges	Fledging period (in days)		Breeding success (%)
2020	Winter	10	9	7	17	1.89	16-18 (17)	13	76.47	10	14-18	(16.5)	76.92
	Spring	10	9	6	12	1.33	16 (16)	10	83.33	10	13-17	(15.5)	100.00
	Summer	7	5	4	10	2.00	13-15 (14)	8	80.00	7	14-16	(14.5)	87.50
	Autumn	7	4	3	7	1.75	16 (16)	5	71.43	5	15-16	(16)	100.00
2021	Winter	12	11	8	15	1.36	15-18 (17)	11	73.33	8	16-18	(16.8)	72.73
	Spring	15	14	12	28	2.00	13-16 (14)	20	71.43	17	15-17	(16)	85.00
	Summer	15	13	11	24	1.85	12-16 (14)	22	91.67	19	15-17	(15.4)	86.36
	Autumn	12	9	8	15	1.67	14-17 (15)	10	66.67	7	15-16	(16)	70.00
2022	Winter	13	11	8	20	1.82	15-18 (16)	16	80.00	14	15-17	(16.5)	87.50
	Spring	10	4	4	8	2.00	15-17 (15)	6	75.00	6	14-16	(15.5)	100.00
	Summer	8	5	4	8	1.60	12-15 (15)	7	87.50	7	14-17	(15.5)	100.00
	Autumn	6	3	3	5	1.67	14-17 (16)	4	80.00	4	16-17	(16.5)	100.00

Table 2. Number of clutches per some active nests (12 nests) of the Palm Dove, *Streptopelia senegalensis* during the four seasons of the studied years

Nests	Years	2020				2021				2022				Average no. of clutches/ nest / active season
No. of Nests	Habitat	Winter	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	
N 1	Houses	1	1	1	0	0	0	0	0	0	0	0	0	1.00
N 2	Water station	1	1	0	0	1	2	1	1	1	0	0	0	1.14
N 3	Water station	1	1	1	1	1	1	1	1	0	0	0	0	1.00
N 4	Water station	1	1	1	0	1	1	2	1	0	0	0	0	1.14
N 5	Water station	1	1	0	1	1	1	1	1	2	1	1	1	1.09
N 6	Water station	1	1	1	1	0	0	0	0	0	0	0	0	1.00
N 7	Houses	-	-	1	1	1	0	0	0	0	0	0	0	1.00
N 8	Houses	-	-	-	-	1	1	1	0	0	0	0	0	1.00
N 9	Houses	-	-	-	-	2	0	1	1	2	1	1	0	1.33
N 10	Houses	-	-	-	-	1	2	1	0	1	2	0	1	1.33
N 11	Water station	-	-	-	-	0	1	1	2	0	0	0	0	1.33
N 12	Houses	-	-	-	-	0	0	1	1	1	0	0	0	1.00
Average no. of clutches/ active season		1.00	1.00	1.00	1.00	1.12	1.28	1.11	1.014	1.4	1.33	1.00	1.00	

Number of Monitored Nests

The total number of monitored nests (old and new) was differed from one year to another being 34, 54 and 37 nests for years 2020, 2021 and 2022, respectively. The numbers of nests with eggs (active nests) were also differed from one year to another being 27 (79.4%), 47 (87.03%) and 23 (62.16%) for the same afore mentioned years, respectively. It seems from the results that a proportion of nests were remained not active along the seasons (Table 1). Some nests with eggs (active nests) were hatched and the other no hatching was recorded. The numbers of nests with hatched eggs were 20 nests (74.07%), 39 nests (82.97%) and 19 nests (82.6%) for the years of 2020, 2021 and 2022, respectively. These results indicating that eggs of some nests did not hatch due to one or more of nest failure factors. **Hanane and Baamal (2011)** found through their study for three years of the study whereas found 137 monitored nests (71 in olive orchards and 66 in orange orchards). **Doniyorov (2022)** examined of 48 nests of laughing dove were found, 32 eggs, 20 offspring were studied. **Almalki (2023)** found in his study 43 nests tracked through this study, 17 (39.5%) were hatched (only 11 of 17 successfully fledged), 13 (30.2%) were subject to predation, and 13 (30.2%) were deserted. In total, 120 Laughing Dove nests were found and monitored. **Boukhriss and Selmi (2019)** cleared that the exposure period varied among nests, from 2 to 35 days, with an average (± SE) of 13 ± 2 days. The earliest egg laying occurred on March 16, while the latest one was on August 8. The age of the nest at its discovery varied between 4 and 28 days, with an average (± SE) of 22 ± 0.78 days.

Number of Eggs

The clutch size means the number of eggs laid in chain without any interruption **(Rao, 2014).** Data in Table 1 show that the average number of eggs per active nest (clutch size) was relatively similar for the years of study recording 1.72, 1.72 and 1.77 eggs/nest for 2020, 2021 and 2022, respectively. The average number of eggs/ nest for the different seasons of the years was differed also from one season to another recording the highest averages in summer and spring (1.81 and 1.77 eggs/nest, respectively) while the mean numbers of eggs/nest for the other two seasons were 1.69 and 1.69 eggs/nest in winter and autumn. These results agree with those of **Robertson (1990)** he found that highly number of eggs laid by Collared Doves, *Streptopelia decaocto* in May (Spring). **Browne and Aebischer (2004)** mentioned that mean clutch size of Turtle Dove, *Streptopelia turtur* was 1.9±0.1 eggs. **Browne *et al.* (2005)** showed that 16% of nests of Turtle dove, *Streptopelia turtur* included one eggs, 83% contained two eggs and 1% included three eggs, the mean clutch size was 1.84 eggs. **Hanane and Baamal (2011)** reported that clutch sizes of Turtle Dove one and two eggs were 7.8% and 92.2%, respectively. **Kabir (2012)** mentioned that the breeding season for Spotted Dove all the year, clutch size is 2 white eggs. **Doniyorov (2022)** found 32 eggs only in 48 nests of Laughing Dove and 20 offspring only were studied. **Almalki (2023)** cleared that the mean clutch size of *Streptopelia senegalensis* was 1.75±0.06 (range 1-3, n=67 nests). **Boukhriss and Selmi** (2009) found that approximately 90.5% of the nests of Palm Dove in Tunisia comprise two eggs.

Incubation Period

Data in Table 1 show that averages of incubation period were differed from one season to another of the years of study whereas the longest were in winter and autumn being 16.7 and 15.6 days, respectively, and the shortest were in spring and summer recording 15 and 14.3 days, respectively. The mean period of eggs incubation for the studied years averaging 15.75, 15 and 15.5 days for 2020, 2021 and 2022, respectively. **Browne *et al.* (2005)** demonstrated that incubation period of Turtle Dove was 14 days. **Kabir (2012)** mentioned that incubation period for spotted dove ranged between 12-16 days. **Attia (2013)** showed that the longest incubation period of Rock dove *Columba livia*, was 19 days during December whiles the shortest was during September & October with the same value 16.6 day. **Rao (2014)** reported that the incubation period of *S. senegalensis* was 13 to 15 days. **Doniyorov (2022)** said that the process of pressing eggs takes 13-14 days. From 9 to 11 days of this period, cracks appear in the egg shells. This means that they are trying to get the chicks out of the eggs. **Almalki (2023)** cleared that the mean incubation duration during the spring

season was 14.5 ± 0.56 days (range 13-17 days, n = 6).

Hatchability

Hatching success was defined as the number of hatched chicks in proportion to the number of laid eggs **(Hetmanski and Barkowska 2007)**. Data in Table 1 cleared that hatchability % recorded different values according to the season of the year and from one year to another. The highest percentage of hatchability was recorded during summer (86.39%) while the lowest percentage for hatchability was recorded during autumn (72.67%). The result of Table 1 cleared also that hatchability was differed from one year to another of the study period recording 77.88%, 75.8% and 80.63% for 2020, 2021 and 2022, respectively. **Attia (2013)** reported that hatchability of rock dove differed according to the month of the year**;** whereas the highest value was recorded during February (87.5%), while the lowest value was in December (50%). **Rao (2014)** mentioned that hatchability in the first year of study was 56.52%, while in the second year was 50% he stated that sometime high wind velocity, heavy rainfall as well as predators may be affect the average hatching success. **Almalki (2023)** examined 48 nests through their study period, 17 (39.5%) nests were hatched.

Fledging Period and Breeding Success

Data in Table 1 cleared that the averages of fledging period were slightly prolonged during winter (16.6 days) and autumn (16.2 days) while it was shortened in summer and Spring to 15.13 and 15.7 days, respectively. Also, the averages of fledging period during the years of study were 15.63, 16.05 and 16 days for 2020, 2021 and 2022, respectively.

Breeding success is defined as "when one or more young from a clutch of eggs survives to fledging are occurs". The breeding success depends on many environment factors and the care of parents. It was found from the results of Table 1 that the highest breeding success was recorded in seasons spring and summer 95% and 91.29%, respectively. It was decreased to 90% in autumn**;** while the lowest breeding success was occurred in winter. Breeding success was also differed from one year to another during the study period being 91.11%, 78.52%, and 96.88% in 2020, 2021 and 2023, respectively. These results agree with **Browne *et al.* (2005)** who stated that nest survival rate averaged 0.771 ± 0.019 during the 15 day fledging period. **Kosicki (2011)** cleared that the differences in fledgling could result from different environmental conditions during a particular seasons. **Kabir (2012)** cleared that fledging period for spotted dove ranged between 12-13 days. **Rao (2014)** mentioned that the proportion of fledged from the hatched was 37.41% and the young fledges were left the nest after about 14 to 16 days and the breeding success of *S. senegalensis* in and around Sikar appeared to be exceptionally low for a period of 21 months, of the 45 eggs laid by *S. senegalensis* but only 09 nestling were fledged. **Boukhriss and Selmi (2019)** cleared that Among the 120 nests monitored, 40 were depredated, while 80 were successful to raise at least one fledgling. This gave an apparent nest success rate (i.e., proportion of successful nests) of 67%. This is probably because palm tree clumps provided refuges for nest predators, notably the Black Rat (*Rattus rattus*) which has been reported to be the main nest predator in the oasis habitat. The predatory activity of this rodent seemed more directed against eggs than nestlings, which may explain the observed increase in daily survival rate with nest age. **Almalki (2023)** found that the mean spring nestling duration was 18.25±0.62 days (range 17-20 days; mean=18.25±0.62, n = 4). Breeding success only 11 of 17 successfully fledged and nests failure because the domestic cats (*Felis catus)* noticed in this study fed on several Laughing Dove chicks. Moreover, some local people indicated that the Laughing Dove is considered a popular target of bird hunters and trappers. Many bullet shells were noticed close to doves' nest sites in areas. Furthermore, as an incidental observation, the Arabian Scops Owl (*Otus pamelae*) was observed once close to the doves' nests as a potential cause of nest failure. During owner observations there are some factors affected the breeding and fledgling success such as: like Hooded Crow as a predator and children of village as depredators.

Number of Fledges

Fledgling is the proportion of the chicks that fledge from a brood. As shown from the results

of Table 1 the numbers of fledges in most cases were less than the numbers of hatched chicks this may be due to some of the environmental factors (wind velocity, heavy rainfall, predators) and loss of parents care. The least numbers of fledges were recorded in winter season of all years of study. The highest numbers of chicks that fledged were recorded in spring and Autumn seasons of the studied years. **Rao (2014)** cleared that the percentage of fledged from total eggs laid (22.5 eggs) was 28.9%. He stated the success of fledgling depends on nestling deaths and predation**;** He added that heavy rainfall with high wind velocity and starvation are responsible for loss of fledgling success. **Boukhriss and Selmi (2019)** found that daily nest survival rate was negatively associated with the presence of date palm trees in the close nest tree environment, but it was positively related to nest age. Daily nest survival rate was higher during the post-hatching stage than during the pre-hatching stage. **Browne and Aebischer (2004)** mentioned that Turtle Dove nest success rate averaged 53% during incubation and 65% during the nestling stage, so that only 35% of nests successfully produced young.

Number of Clutches

The Palm Dove, like most pigeons, are multi-brooded. Some pairs of the monitored nests were continued to brood along the seasons of the years (whatever few clutches). Some other pairs did not lay any other clutches without any know reasons (may be due to environmental factors, predation, the parent got older…etc.). The numbers of clutches per one pair of the bird was differed from one pair to another. Data in Table 2 show that some nests (pairs) (N1 and N6) laid eggs (clutches) through the seasons of 2020 and disappear during the other two years of study period. The birds of nests N2, N3 and N4 continued to brood for two successive years**;** one clutch for each season in most cases and disappeared in the last year. The nest number five (N5) was the most active whereas the parents laid clutches in the whole period of study (3 years). The nests N7 to N12 were began late and did not regular for their brooding during the period of study. It was noticed generally that the number of clutches/season was one clutch only per each season in most cases. Some parents were clutched 2 times in a season (N2, N4, N5, N9, N10 and N11)**;** this observation was recorded in all season especially in Spring and Winter seasons (Table 2). These data go in line with those of **Biricik *et al.* (1989)** who discovered that the same pair might raise multiple broods in the same nest. **Robertson (1990)** reported that number of clutches laid by each pair of Collared Dove in a year depended on the number of unsuccessful nesting attempts**;** if a nest failed, the pair often re-nested quickly. **Jennings (2010)** mentioned that this dove species perhaps nest at any time through the year, but nesting activity usually peaks from February to July. **Almalki (2023)** said that the monthly Spring clutch distribution suggests 49.3% in March, 31.3% in April and 19.4% in May.

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دراسة أولية عن بيولوجي و تكاثر يمام النخيل *Streptopelia senegalensis* بمحافظة الشرقية بجمهورية مصر العربية

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أجريت هذه الدراسة في منطقتين (الزقازيق والحسينية) بمحافظة الشرقية وذلك لإلقاء الضوء علي بعض النواحي البيولوجية و تكاثر يمام النخيل *Streptopelia senegalensis*. تم تسجيل 32 عشًا في أماكن مختلفة خلال فترة الدراسة. واختلف العدد الإجمالي للأعشاش التي تم متابعتها (القديمة والجديدة) من سنة إلى أخرى حيث بلغ 34 و54 و37 عشا للأعوام 2020 و2021 و2022 على التوالي علما بأن الأعشاش التي تم متابعتها في أحد المواسم قد أعيد متابعتها في الموسم اللاحق (إلا لم تكن قد اختفت نهائيا). كما اختلفت نسب الأعشاش التي تحتوي على بيض (الأعشاش النشطة) من سنة إلى أخرى حيث بلغت 62.16% و79.4% و87.03% للأعوام 2020 و2021 و2022 على التوالي. وكان متوسط عدد البيض/العش النشط (حجم clutch) متشابها نسبيا لسنوات الدراسة حيث تراوح بين 1.72 إلى 1.77 بيضة/عش. تراوح متوسط فترة حضانة البيض بين 15 – 16.7 يوم. واختلفت نسبة فقس البيض علي حسب فصول السنة، حيث سجلت أعلى قيمة في فصل الصيف (86.39%) وأقلها في فصل الخريف (72.67%). تطول فترة رعاية الصغارخلال الشتاء والخريف وتقصر خلال الصيف والربيع. أعلى نسبة نجاح للتكاثر سجلت في فصل الربيع (95%) وأقلها كانت في فصل الشتاء (79.05%). وكانت أعداد الفراخ القادرة علي الطيران والإعتماد علي نفسها أقل من عدد الفراخ التي خرجت من البيض حديثا وتختلف حسب فصول السنة حيث سجلت أقل أعداد في فصل الشتاء وأعلى أعداد في فصلي الربيع والخريف. يختلف عدد مرات وضع البيض cluches لكل زوج مراقب في السنة من زوج إلى آخر ومن موسم إلى آخر لنفس الزوج، إلا أنه كان غير منتظم في معظم الحالات بسبب عدة اعتبارات مختلفة .

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