

SEASONAL POPULATION DENSITY OF EGYPTIAN FRUIT BAT, *ROUSETTUS AEGYPTIACUS* AND INSECT BAT, *PIPISTRELLUS DESERTI* IN FOUR EGYPTIAN GOVERNORATES

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ABSTRACT: *In this study, a survey of Egyptian fruit bat, Rousettus aegyptiacus and insect bat, Pipistrellus deserti was conducted at Gharbia, Beheira, Ismailia and Qaliobia Governorates along two successive years (2013 and 2014) to throw the light on the seasonal variation of these animals. The total collected number of Egyptian fruit bat, R. aegyptiacus were 123.1, 144.0, 101.5 and 111.4 bats, respectively in the previously mentioned governorates, with average seasonal numbers of 30.78, 36.03, 25.38 and 27.85 bats / m², respectively. Beheira Governorate occupied the highest numbers of the Egyptian fruit bat, followed by Gharbia, and Qaliobia, while Ismailia Governorate recorded the least numbers. The obtained results showed that Autumn season was the most favorable one for R. aegyptiacus activity, followed by Summer, and Spring, while Winter season was the least favorable season for bat activities. In addition, the obtained results revealed that the total collected number of insect bat, P. deserti was 138.0, 122.8, 132.7 and 147.8 bats in Gharbia, Beheira, Ismailia and Qaliobia Governorate, respectively, with average seasonal numbers of 34.5, 30.7, 33.18 and 36.95 bats / m², respectively. Qaliobia governorate recorded the highest numbers of insect bat, but Beheira regions was the lowest one. Furthermore, the current study showed that Summer season was the most favorite one for P. deserti bat activity, while Winter season recorded the lowest favorite one.*

Key words: *Fruit bat Rousettus aegyptiacus insect bat Pipistrellus deserti, Survey*

INTRODUCTION

Egyptian fruit bats are one of the smallest of the Old World bats and they are unique in the fact that they mainly roost in caves, whereas the larger species roost in tall trees. Egyptian fruit bats are fungivorous, consuming large amounts of fruit everyday. Although the full extent of their diet is not yet known, it is known that they feed upon a variety of exotic fruits from tropical shrubs and trees. They have been known to fly vast distances in search of ripe fruit in season. Wild dates and figs are a certain favorite but they will consume any soft, pulpy fruit and also plant nectar. Korine *et al.*, (1998) considered the Egyptian fruit bat *Rousettus aegyptiacus* is an agricultural pest and the definition of these bats as pests should be based on a thorough investigation of the bat's natural diet, as well as the extent of the actual damage to fruit crops. Egyptian fruit bats are fungivorous, consuming large amounts of fruit each night. Wild dates tend to be a favorite, but they will consume

almost any soft, pulpy fruit. Most of their diets tend to consist of unripe and insect- and fungus-damaged fruit, which allows them to thrive in habitats where ripe fruit are not available year-round, Mickleburgh *et al.* (1992). In Egypt, the bats rest in large colonies in mosques, wells, old ruins, tombs, and desert houses. Egyptian bats become active shortly after dusk and have another peak of activity in the early morning. Today, bats are observed in many habitats in Egyptian governorates and so agreed efforts have been exerted by the Egyptian Government to control bats.

In Egypt, bat *R. aegyptiacus* exist in Great Pyramids, Giza, and holotype and has the common name in Egypt which khafash El-Fawakeh and Khafash El-Masri. Anderson (1902) mentioned that bats feed on sycamore, mulberry, dates and figs. In Egypt, few environmental studies have been carried out about the problems and harms caused by bats. The present work aims to

study the effect of some ecological conditions on the occurrence and the population density of bat species in different locations of Egypt (Gharbia, Beheira, Ismailia and Qaliobia Governorates) along two successive years.

MATERIALS AND METHODS

This study was carried out at different localities of Gharbia, Beheira, Ismailia and Qaliobia Governorates, along the two years of 2013 and 2014 to know the effect of the environmental conditions on the activity of bats as well as the population density .

Monthly samples of bats were trapped from agricultural areas, mosques and desert houses. The bats were collected five days per month from each tested region. Bats were trapped by specific nets Fig. (1) and counted then it computed as the numbers of animals per one square meter that used for the population dynamics study. Collected bats were transferred directly to the laboratory in the same collection day in wire mesh cages (25 x 25 x 35 cm). All animals had access to water and guava fruits for acclimatization for 3 weeks. Trapped bats were counted, aged, sexed and identified according to Koch, 2001 and housed individually in wire mesh hold cages (90 x 50 x 50 cm).

The obtained data was statistically analyzed using analysis of variance

(ANOVA) at 5 % probability. The measurements were separated using Duncan's Multiple Range Test (DMRT) through CoStat software program (Version 6.400) 1998-2008.

RESULTS AND DISCUSSION

Egyptian fruit bat description:

The Egyptian fruit bat was originally described from a specimen collected at Great Pyramid of Giza in Egypt by Kwiecinski and Griffiths (1999) and Mickleburgh *et al.* (1992) where it was relatively large, robust bat with a short tail, a fox-like face, noticeably large eyes, and dark, rounded, naked ears. The fine, sleek fur varies in colour from grayish-brown to dark brown, lighter on the belly, and often with a pale yellow or orange collar around the neck, Kwiecinski and Griffiths (1999), Albayrak *et al.* (2008). The wings have rounded tips and are dark brown in color, becoming lighter brown in more northerly parts of the range, and the wing membrane itself attaches to the first toe of the foot. The fur, which is longer on the forehead and upper parts of the body, extends onto the tops of the forearms and legs, and slightly onto the wing membrane Kwiecinski and Griffiths (1999). The male Egyptian fruit bat is substantially larger than the female, Albayrak *et al.* (2008). Up to six subspecies are recognized, Mickleburgh *et al.*, (1992).

Sweep Net



Fig. (1): Bat collection net

Seasonal population density of Egyptian fruit bat, *Rousettus aegyptiacus*

Survey and population density of the collected bats:

1- Seasonal density of Egyptian fruit bat *Rousettus aegyptiacus*

In this study, the distribution and survey of bats were recorded on some Egyptian regions, Table (1). The obtained results showed that the Egyptian fruit bat, *R. aegyptiacus* population varied according to the time of collection and the tested region. In winter season, the highest abundant of *R. aegyptiacus* was observed in Beheira region (22.5 individuals), but the lowest population was recorded in the same period in Ismailia region (15.0 bats). On the other hand, the number of collected bats during winter season in Gharbia and Qaliobia governorates was 18.6 and 17.7 individuals, respectively. The same trend in winter season was noticed in case of spring seasons, where the population of *R. aegyptiacus* was 22.5, 26.4, 18.5 and 19.5 bats in Gharbia, Beheira, Ismailia and Qaliobia Governorates, respectively. However, the number of trapped bats during summer season recorded, 36.4, 40.2, 29.8 and 34.2, but in autumn season the number of collected bats was 45.6, 55.0, 38.2 and 40.0 individuals, respectively, Table (1).

The mean number of collected *R. aegyptiacus* in winter was 18.45 (the lowest number), this number increased gradually in spring, summer and autumn (21.73, 35.15 and 44.7 individuals, respectively). The current data indicated that the autumn season was the most favorable time for the Egyptian fruit bat, *R. aegyptiacus* activity, and the lowest favorable time was winter season. Also, Beheira Governorate harbored more average abundance of bats (36.03 bats), followed by Gharbia (30.78 bats), Qaliobia Governorate (27.85) and the lowest region was Ismailia Governorate (25.38 bats) and this may be due to the difference in ecological factors and different collection habitats. The total number of Egyptian fruit bat, *R. aegyptiacus* recorded, 123.1, 144.0, 101.5 and 111.4 bats, respectively, with an average number of 30.78, 36.03, 25.38 bats at Gharbia, Beheira, Ismailia and Qaliobia Governorates, respectively.

Statistical analysis of data in Table (1) indicated that there were significant differences in the trapped numbers of *R. aegyptiacus* between Beheira and other governorates, while there were no significant differences between Gharbia and Qaliobia as well as Ismailia and Qaliobia. Moreover there were significant differences in the average seasonal numbers of the Egyptian bat between autumn and other seasons (summer, winter, spring).

2- Seasonal density of insect bat *Pipistrellus deserti*:

Results in Table (2) show that the total number of insect bat *Pipistrellus deserti* population recorded 27.4, 22.5, 24.5 and 29.9 bat at Gharbia, Beheira, Ismailia and Qaliobia Governorates during the winter seasons of (2013 and 2014) with the mean average of 25.98 insect bats. The recorded insect bat numbers during spring seasons of study were 33.5, 30.2, 34.2 and 36.63 individuals, with an average mean of 33.63, which remarkably increased during summer seasons and recorded 35.6, 32.5, 36.0 and 38.5 bats with mean average of 113.73 bats, respectively. On the other hand, this number of bats sharply decreased during autumn seasons and recorded 41.5, 37.6, 38.0 and 43.2 individuals, respectively.

In addition, the total collected numbers of insect bat, *P. deserti* was 138.0, 122.8, 132.7 and 147.8 bats in Gharbia, Beheira, Ismailia and Qaliobia, respectively, with average numbers of 34.5, 30.7, 33.18 and 36.95 insect bats, respectively, as previously mentioned.

Statistical analysis of data in Table (2) indicated that there were significant differences in the trapped numbers of *P. deserti* between Qaliobia and other governorates, while there were no significant differences between Gharbia and Ismailia. Moreover there were significant differences in the average seasonal numbers of the insect bat between summer and other seasons (autumn, winter, spring).

The obtained results were in agreement with those obtained by IUCN Red List (August, 2009), Nowak (1991), Skinner and

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Chimimba (2005), where the Egyptian fruit bat inhabits a variety of habitats, from arid to tropical areas, but is reliant on an adequate supply of fruit trees and on suitable roosting sites. Survey and population density conducted by Eissa (2007) clear that the insect bat, *Pipistrellus deserti* found only in Al-kalaa, Sultan Hassan areas (Cairo Governorate) and Mariotia, Dokki areas (Giza Governorate). The author also found that the fruit bat *R. aegyptiacus* collected in Berket El-Sabaa, Shebin El-kom areas (Menoufia Governorate) and Abou Kabeir and Hehia regions (Sharkia Governorate and Senhera, Shoubra Haris, (Qaliobia Governorate) and the population density of fruit bat *R. aegyptiacus* were over than the insect bat *P. deserti* number. The highest density for each species recorded through autumn. The distribution of foraging *Myotis dubentoni* and *Pipistrellus pipistrellus* bats

was investigated in UK in relation to the smoothness of the water surface and the extent of bank side vegetation, Warren *et al.* (2000). Both bat species significantly preferred sections of river with smooth water surface and tree on both banks. The authors added that the distribution of bats was correlated with high insect density associate with water surface.

Eissa (2007) also noticed that in Giza Governorate, the number of collected *Pipistrellus deserti* is large in comparison with that of Cairo Governorate and this may be due to the fact that this region is near to the agricultural region which increases the number of bats. Also, the average total number of collected bats in both regions is very large during spring as this the time of the emergence of large number of bat babies.

Table (1): Seasonal density of Egyptian fruit, bat *Rousettus aegyptiacus* at four regions in Egypt during 2013 and 2014 seasons

Season	Average no. of animals / m ²				Mean
	Gharbia	Beheira	Ismailia	Qaliobia	
Winter	18.6	22.5	15.0	17.7	18.45 c
Spring	22.5	26.4	18.5	19.5	21.73 c
Summer	36.4	40.2	29.8	34.2	35.15 b
Autumn	45.6	55.0	38.2	40.0	44.7 a
Total	123.1	144.0	101.5	111.4	-
Mean	30.78 b	36.03 a	25.38 c	27.85 bc	-
LSD 5%	3.39				4.42

Means in each column followed by the same letter (s) are not significantly different at 5% level.

Table (2): Seasonal density of insect bat , *Pipistrellus deserti* at four regions in Egypt during 2013 and 2014 seasons

Season	Average no. of animals / m ²				Mean
	Gharbia	Beheira	Ismailia	Qaliobia	
Winter	27.4	22.5	24.5	29.5	25.98 c
Spring	33.5	30.2	34.2	36.6	33.63 b
Summer	35.6	32.5	36.0	38.5	113.73 a
Autumn	41.5	37.6	38.0	43.2	40.08 b
Total	138.0	122.8	132.7	147.8	-
Mean	34.5 b	30.7 c	33.18 b	36.95 a	-
LSD 5%	2.31				7.23

Means in each column followed by the same letter are not significantly different at 5% level.

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***Rousettus aegyptiacus* الكثافة العددية الموسمية لخفاش الفاكهة المصري والخفاش الآكل للحشرات *Pipistrellus deserti* في أربع محافظات مصرية**

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تعتبر الخفافيش من الثدييات الاقتصادية الهامة التي انتشرت وزادت في الآونة الأخيرة في كثير من المناطق بمصر بأعداد كبيرة ، حيث تقوم بإحداث أضراراً شديدة لثمار الفاكهة ونباتات الخضر مما تطلب دراسة بيئة وانتشار هذه الحيوانات للوقوف على أفضل الطرق للحد من انتشارها ووضع الخطط لمكافحة هذه الآفة الخطيرة ، ولقد أجريت هذه التجربة في أربعة مناطق من مصر وهي محافظة الغربية (منطقة بسيون) ومحافظة البحيرة

(منطقة رشيد) ومحافظة الاسماعيلية (قرية أبو صوير) ومحافظة القليوبية (منطقة القناطر الخيرية) على مدار مواسم عامي ٢٠١٣، ٢٠١٤.

إتضح من النتائج المتحصل عليها أن أعداد خفاش الفاكهة *Rousettus aegyptiacus* الكلية التي تم اصطيادها هي : ١٢٣.١ ، ١٤٤.٠ ، ١٠١.٥ ، ١١١.٤ فرد في كل من محافظات الغربية والبحيرة والاسماعيلية والقليوبية على التوالي ، وكان متوسط الاعداد الموسمي هو : ٣٠.٧٨ ، ٣٦.٠٣ ، ٢٥.٣٨ ، ٢٧.٨٥ خفاش على التوالي ، حيث سجلت مناطق محافظة البحيرة اكثر المناطق تعدادا لخفاش الفاكهة واقلها مناطق محافظة الاسماعيلية. سجل فصل الخريف اعلى الفصول تعدادا لخفاش الفاكهة وكان موسم الشتاء اقل الفصول تعدادا لتواجد مثل هذه الحيوانات.

إتضح من التحليل الاحصائي للنتائج انه كانت هناك فروق معنوية في أعداد خفاش الفاكهة الكلية على مدار العامين بين محافظة البحيرة وباقي المحافظات ، كما كان هناك فرق معنوي في متوسط العدد الموسمي لخفاش الفاكهة في موسم الخريف وباقي مواسم العام .

اما بالنسبة للخفاش آكل الحشرات *Pipistrellus deserti* فقد دلت النتائج المتحصل عليها ان الاعداد المسجلة على وجه العموم هي ١٣٨ ، ١٢٢.٨ ، ١٣٢.٧ ، ١٤٧.٨ خفاش في المحافظات السالفة الذكر على التوالي بمتوسط موسمي مقداره ٣٤.٥ ، ٣٠.٧ ، ٣٣.١٨ ، ٣٦.٩٥ خفاش على التوالي ، وسجلت محافظة القليوبية أعلى المحافظات تعدادا للخفاش آكل الحشرات وسجلت محافظة البحيرة اقل الاعداد ، كما سجل فصل الصيف أعلى تعداد للخفاش آكل الحشرات وأقل الاعداد كانت في فصل الصيف.

إتضح من التحليل الاحصائي للنتائج انه كانت هناك فروق معنوية في أعداد الخفاش الآكل للحشرات الكلي على مدار العامين بين محافظة القليوبية وباقي المحافظات تحت الدراسة ، كما كان هناك فرق معنوي في متوسط العدد الموسمي لخفاش الحشرات في موسم الصيف وباقي المواسم الاخرى (الربيع والصيف والشتاء) .