



Article

Survey and Population Density of Rodent Species in Abydos Area, Sohag Governorate, Egypt

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Abstract

The aim of this work is to identify the rodent species spread and study their population density in the Abydos Temple area, south of Sohag Governorate, during 2021/2022. The experiment revealed the identification of four types of climbing rats the *Rattus rattus frugivorus*, *Rattus rattus Alexandrinus*, *Arvicanthis niloticus*, and *Rattus rattus*. Also, the results showed that the population density increases during the summer and spring seasons and decreases during the winter and autumn. This is due to the abundance of nutrients during that period, the availability of temperature and humidity that help rodents to adapt during the summer and spring seasons, the high sexual ratio during that period, and the lack of these conditions during the winter season. Identification of rodent species in the study to be used in a future plan in the control strategy and to develop integrated control programs for rodents in tourist and archaeological systems, public places, universities, and modern constructions in Egypt.

Keywords: Abydos Temple, *Rattus rattus frugivorus*, *Rattus rattus alexandrinus*, *Arvicanthis niloticus*, *Rattus rattus*

1. Introduction

Rodents are found in many areas, including urban and rural areas, and cause many economic losses and various health problems (Dolbeer, 1999). Rodents cause much damage, such as damage to crops, trees, furniture, infrastructure, and electrical outlets, and the spread of many diseases. (Witmer et al., 1998). In Egypt, environmental changes such as desert reclamation and the spread of inhabited areas in the desert and agricultural lands have caused a significant increase in the spread of rodents. (El-Sherbiny, 1987, Desoky, 2007 & Abdel-Gawad (2010). No country is free from problems caused by rodents, which cause a lot of economic losses, and lead to malnutrition, famine, and damage to the general appearance and crops, as it is estimated that a fifth of foodstuffs each year are not eaten by humans because of the damage caused by rodents (Howard and marsh, 1976). The present work aimed to identify the rodent species and their population density in the study area.

2. Materials and Methods

This study was conducted in the south of Sohag Governorate around the Temple of Abydos during 2021/2022 years. 20 modern traps were placed to be used in control and to be confined in archaeological and tourist areas such as Bait Stations, Snap, and glue traps. They are broadcast twice a week at 6:30 pm, and collected at 7:30 am.

The captured rodents were classified and recorded. The Percentage of every species was estimated as a percent of total rodents captured during the year dominant percentage (D %). Dominant percentage = Number of rodent species/ Total rodents captured*100

Trap index = No. rodent captured / Total traps distributed.

3. Results and Discussion

Table 1. Seasonal distribution of rodent species in the Abydos area during 2021 / 2022.

Season	<i>R. r. frugivorus</i>			<i>R. r. alexandrinus</i>		
	No.	%	Trap index	No.	%	Trap index
Winter	48	85.71	0.1	3	5.36	0,006
Spring	60	77.92	0.125	10	12.99	0.02
Summer	68	73.12	0.142	16	17.20	0.03
Autumn	44	69.84	0.092	10	15.87	0.02
Total	220	76.39	0.115	39	13.54	0.02

Table 2. Seasonal distribution of rodent species in the Abydos area during 2021 / 2022.

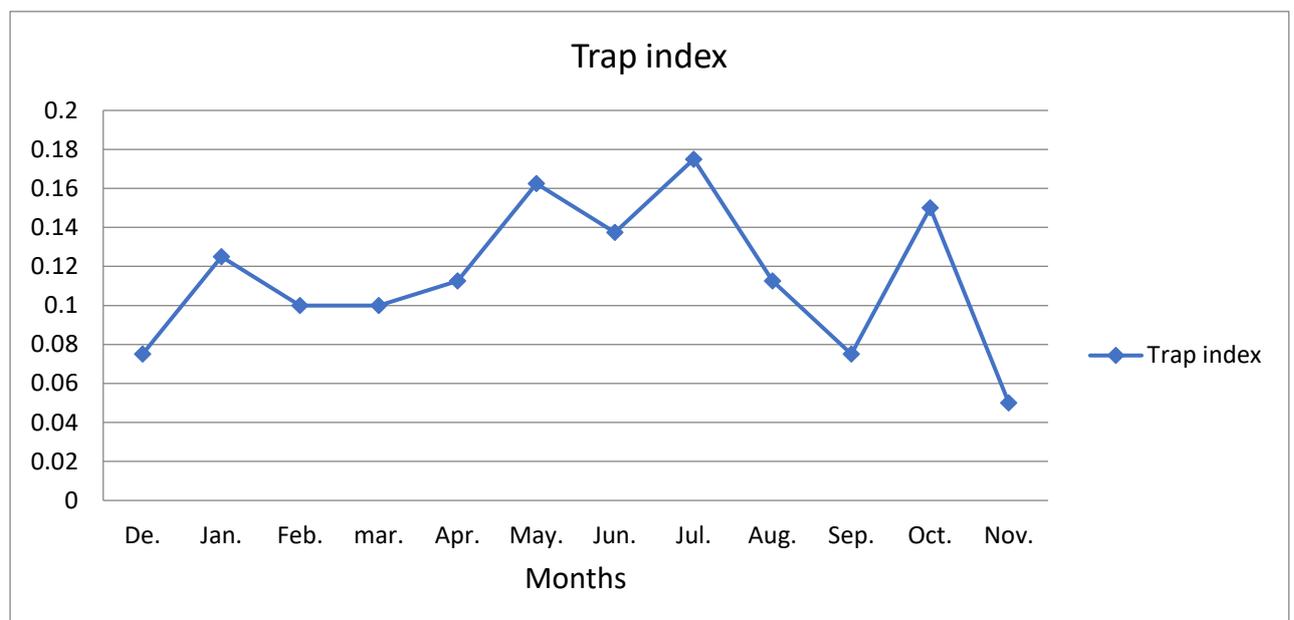
Season	<i>A. niloticus</i>			<i>R. rattus</i>		
	No.	%	Trap index	No.	%	Trap index
Winter	2	3.57	0.004	3	5,36	0.006
Spring	3	30.90	0.06	4	5.19	0.008
Summer	4	4.30	0.008	5	5.38	0.01
Autumn	8	12.70	0.017	1	1.59	0.002
Total	17	5.90	0.008	12	4.17	0.006

Table 3. Monthly fluctuation, trap index and sex ratio of *R. r. frugivorus* in the Abydos area 2021/2022.

Months	No. Of Rodent	Trap index	Sex Ratio	
			Males %	Females %
Dec.	12	0.075	58.33	41.67
Ian.	20	0.125	60	40
Feb.	16	0.1	75	25
March	16	0.1	68.75	31.25
April	18	0.1125	66.67	33.33
May	26	0.1625	88.46	11.54
June	22	0.1375	54.55	45.45
July	28	0.175	35.71	64.29
Aug.	18	0.1125	61.11	38.89
Sep.	12	0.075	58.33	41.67
Oct.	24	0.15	25	75
Nov.	8	0.05	62.5	37.5

Table 4. Maturity status of *R. r. frugivorus* in the Abydos area 2021/2022.

Months	Maturity status					
	Males		Females		Total	
	Immature %	Mature %	Immature %	Mature %	Immature %	Mature %
Dec.	42.86	57.14	40	60	41.66	58.33
Ian.	25	75	37.5	62.5	30	70
Feb.	41.67	58.33	50	50	43.75	56.25
March	27.27	72.73	20	80	25	75
April	25	75	33.33	66.67	27.78	72.22
May	30.43	69.57	33,33	66.67	30.77	69.23
June	33.33	66.67	30	70	31.82	68.18
July	40	60	27.78	72.22	32.14	67.85
Aug.	18.18	81.81	28.57	71.43	22.22	77.78
Sep.	14.28	85.71	0.00	100	8.33	91.67
Oct.	33.33	66.67	22.22	77,78	25	75
Nov.	40	60	0.00	100	25	75

Figure 1. Monthly distribution of *R. r. frugivorus* in the Abydos area 2021/2022.

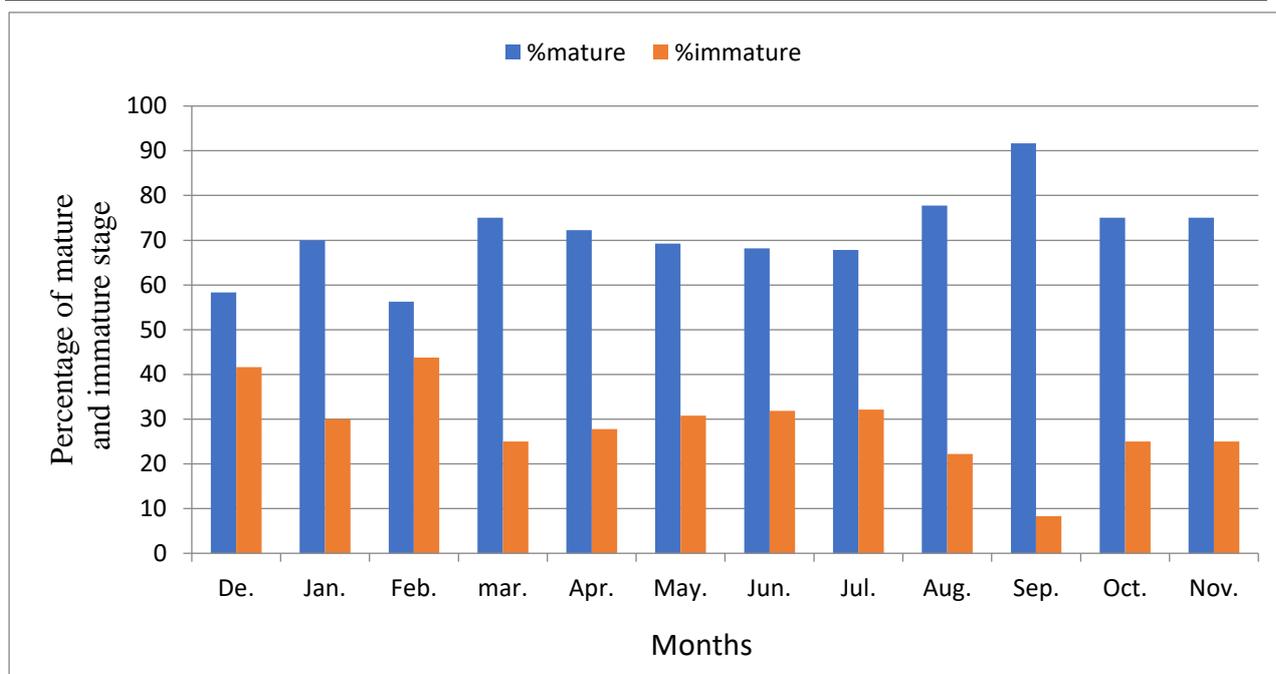


Figure 2. Maturity status of *R. r. frugivorus* in the Abydos area 2021/2022.

The experiment showed that there are four types of mice, *R. r. frugivorus*, *R. r. alexandrinus*, *A. niloticus* and *R. rattus*. From Table 1, 3,4 these species ranked first in terms of abundance, with the total number of rodents caught reaching 76.39% during the year 2021:2022, with the highest population density according to the trap index in summer at 0.142% and the lowest in autumn at 0.092%. The data was recorded the highest population density was 0.175% in July, and the lowest was 0.05% in November. This may be due to the rodents staying in their shelters, avoiding the cold weather during November, and going out to their shelters to bring their food during the month of July. From Table 3,4 and Figure 1,2, the sex ratio shows that the number of males exceeded the number of females in all months except July and October. From Table 3,4 and Figure 1,2, the mature stage exceeded the immature stage. The highest density of immature rodents was obtained in February 43.75%. This may be due to the high pregnancy rate in these months and in the previous months, which gives an opportunity to increase the number of immature animals (Salit, 1972). Differences in the species composition of rodents depend mainly on location, proximity, type of habitat, and configuration between determinant and preferred food as previously mentioned by several authors (Abdel-Gawad, 2010; Desouky, 2007 and Desouky et al. (2014) who attributed the increase in the number of rodents in those areas to increase food and prevention, especially because of the preferred trees as a shelter adjacent to the area.

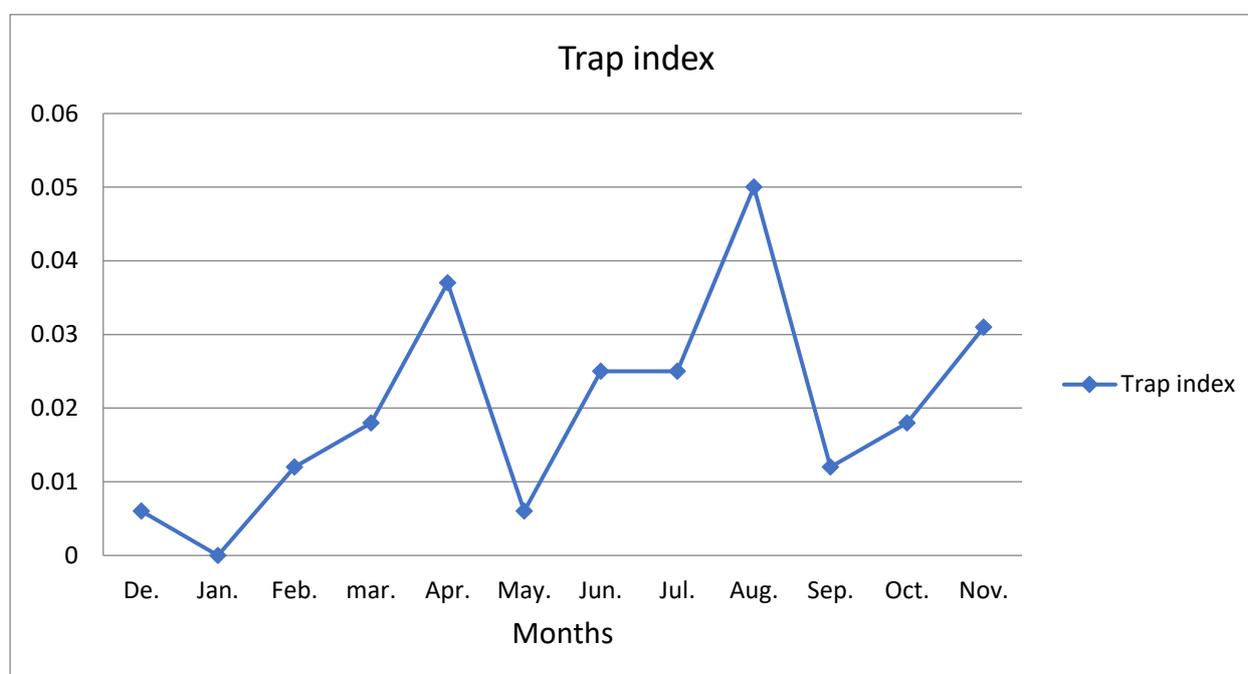
Table 5. Monthly fluctuation, trap index, and sex ratio of *R. r. alexandrinus* in the Abydos area 2021/2022

Months	Maturity status					
	Males		Females		Total	
	Immature %	Mature %	Immature %	Mature %	Immature %	Mature %
Dec.	0.00	100	0.00	0.00	0.00	100
Jan.	0.00	0.00	0.00	0.00	0.00	0.00
Feb.	0.00	100	0.00	100	0.00	100
March	50	50	0.00	100	25	75
April	40	60	0.00	100	33.33	66.67

May	0.00	100	0.00	0.00	0.00	100
June	33.33	66.67	0.00	100	25	75
July	0.00	100	50	50	25	75
Aug.	42.86	57.14	0.00	100	37.5	62.5
Sep.	0.00	100	0.00	0.00	0.00	100
Oct.	50	50	0.00	100	33.33	66.67
Nov.	33.33	66.67	0.00	100	20	80

Table 6. Maturity status of *R. r. alexandrinus* in the Abydos area 2021/2022.

Months	No. Of Rodent	Trap index	Sex Ratio	
			Males %	Females %
Dec.	1	0.006	100	0.00
Ian.	0	0.00	0.00	0.00
Feb.	2	0.012	50	50
March	3	0.018	66.67	33.33
April	6	0.037	83.33	16.67
May	1	0.006	100	0.00
June	4	0.025	75	25
July	4	0.025	50	50
Aug.	8	0.05	87.5	12.5
Sep.	2	0.012	100	0.00
Oct.	3	0.018	66.67	33.33
Nov.	5	0.031	60	40

Figure 3. Monthly distribution of *R. r. alexandrinus* in the Abydos 2021/2022.

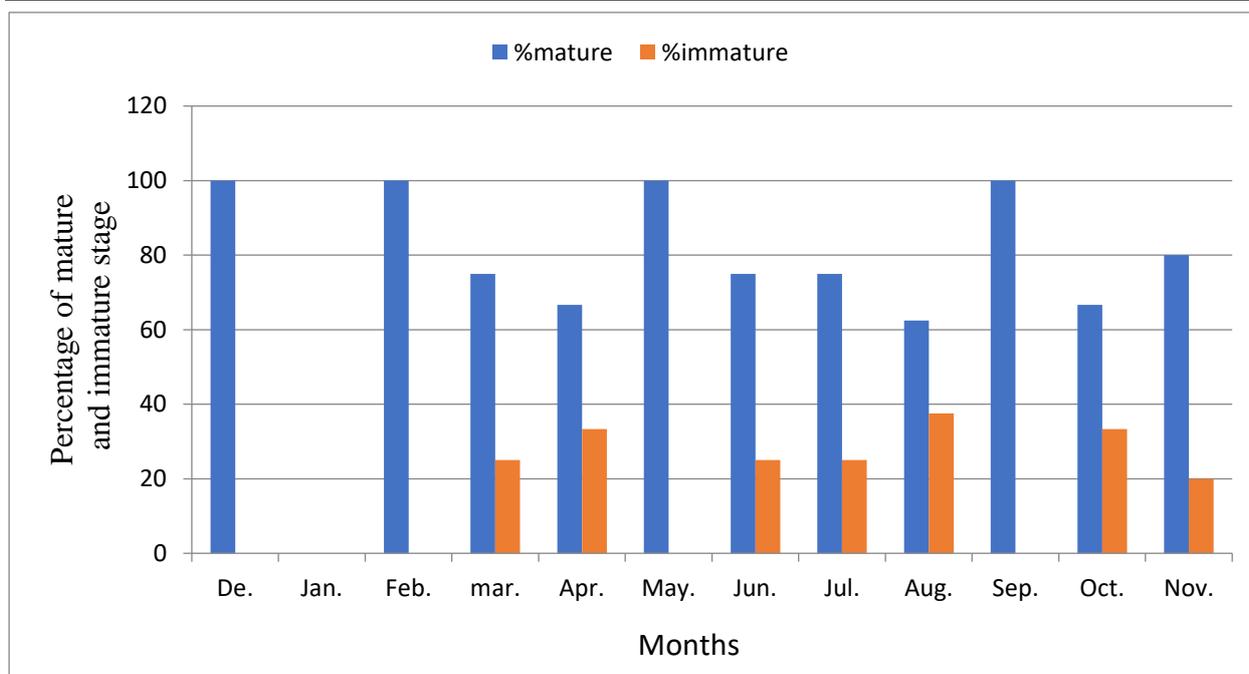


Figure 4. Maturity status of *R. r. alexandrinus* in the Abydos area 2021/2022.

From Table 1,5,6 *R. r. alexandrinus* ranked second in terms of abundance, as the total number of caught rodents reached 13.54% during the year 2021:2022. The highest population density was recorded according to the trap index in summer, 0.03%, and the lowest in winter 0.006, and the data recorded the highest density. Its population in August was 0.05%, and its lowest population density was in January at 0.0%

From Table 5,6 and Figure 3,4, the sex ratio shows that the number of males exceeded the number of females in all months except February and July when the number of males equaled the number of females.

The percentage of females was recorded in all months except for December, January, May, and September, as there were no females trapped

From Table 5,6 and Figure 3,4, the mature stage exceeded the immature stage

It may be because the immature stage prefers to stay in burrows and the parents come to their area to get food. These differences in rodent fauna in this region during the period from 2021 to 2022, are due to drains, agricultural lands, and palm trees. These results are similar to those obtained by Kansouh et al. (1990) in Giza who found that the maximum population density of *Rattus rattus Alexandrinus Rattus rattus frugivorus* has been recorded in homes surrounded by palm trees.

Table 7. Monthly fluctuation, trap index, and sex ratio of *A. niloticus* in Abydos.

Months	Maturity status					
	Males		Females		Total	
	Immature %	Mature %	Immature %	Mature %	Immature %	Mature%
Dec.	0.00	0.00	0.00	0.00	0.00	0.00
Ian.	0.00	100	0.00	100	0.00	100
Feb.	0.00	0.00	0.00	0.00	0.00	0.00
March	0.00	0.00	0.00	0.00	0.00	0.00
April	0.00	100	0.00	0.00	0.00	100
May	0.00	100	0.00	100	0.00	100

June	0.00	100	0.00	0.00	0.00	100
July	0.00	100	0.00	0.00	0.00	100
Aug.	0.00	100	0.00	100	0.00	100
Sep.	0.00	100	0.00	0.00	0.00	100
Oct.	33.33	66.67	0.00	100	20	80
Nov.	0.00	100	0.00	100	0.00	100

Table 8. Maturity status of *A. niloticus* the in Abydos area 2021/2022.

Months	No. Of Rodent	Trap index	Sex Ratio	
			Males %	Females %
Dec.	0	0.00	0.00	0.00
Ian.	2	0.012	50	50
Feb.	0	0.00	0.00	0.00
March	0	0.00	0.00	0.00
April	1	0.006	100	0.00
May	2	0.012	50	50
June	1	0.006	100	0.00
July	1	0.006	100	0.00
Aug.	2	0.012	50	50
Sep.	1	0.006	100	0.00
Oct.	5	0.031	60	40
Nov.	2	0.012	50	50

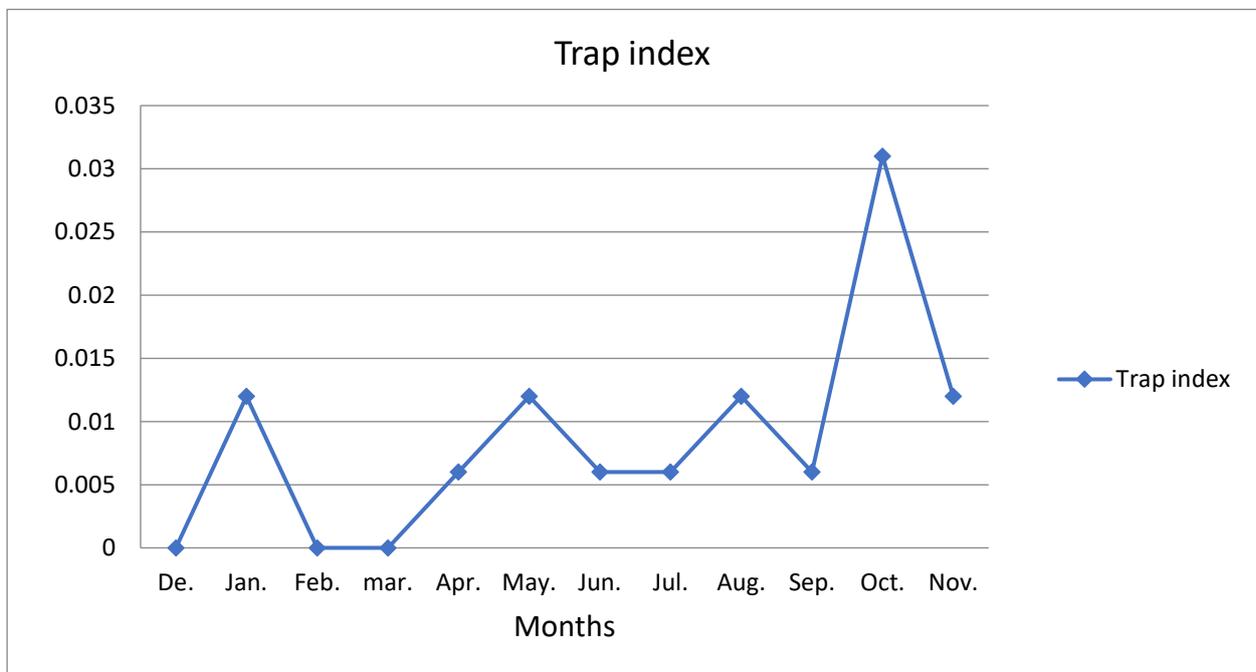


Figure 5. Monthly distribution of *A. niloticus* the in Abydos area 2021/2022.

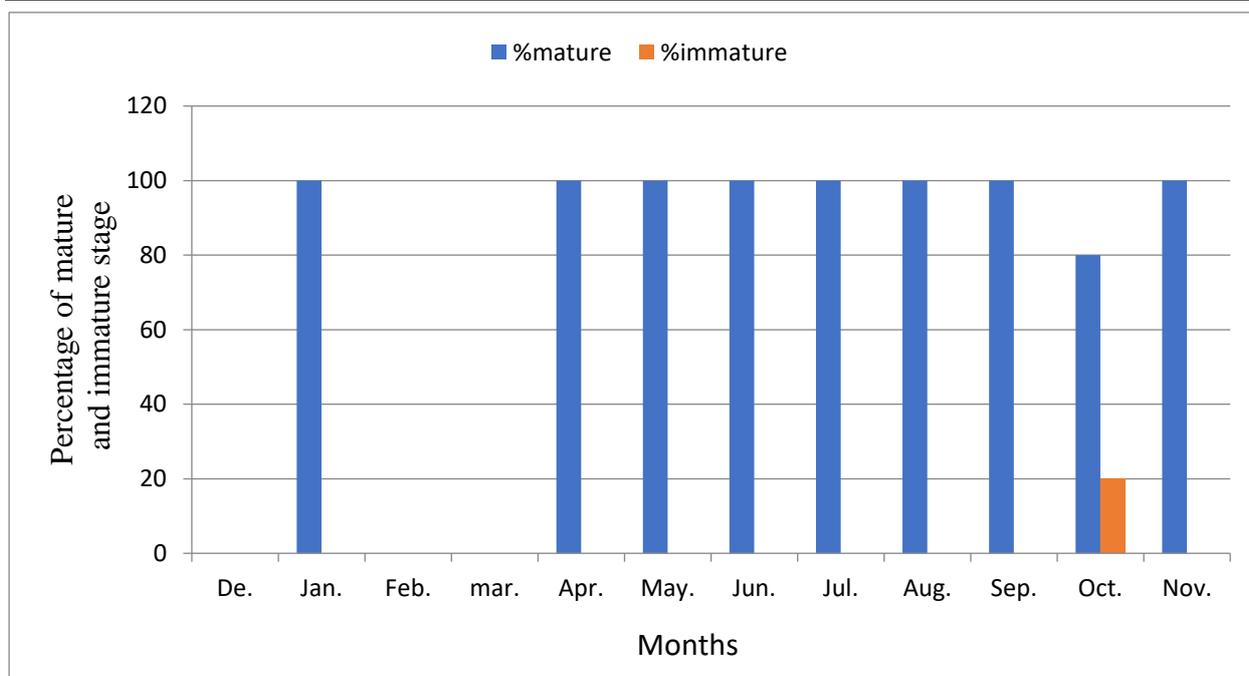


Figure 6. Maturity status of *A. niloticus* the in Abydos area 2021/2022.

From Table 2,7,8 this type of *A. niloticus* ranked third in terms of abundance, as the total number of rodents caught reached 5.90% during the year 2021:2022. The highest density was recorded according to the trap index in autumn, 0.017%, and the lowest in Winter 0.004%, the data recorded the highest population density in October and the lowest density in December, February, and March because there were no trapped rodents in agreement with the statement of Maher et al. (1974) and Abdel- Gawad (1979).

From Table 7,8 and Figure 5,6, his sex ratio shows that the number of males exceeded females in all months except January, May, August, and November, where the number of males is equal to the number of females

The males outnumbered the females because the males preferred to stay outside the nests to obtain food and the females, preferred to stay inside the nests to take care of their young.

The percentage of females was recorded in all months except for April, July, June, and September, as there were no trapped females

From Table 7,8 and Figure 5,6, the mature stage exceeded the immature stage.

Table 9. Monthly fluctuation, trap index, and sex ratio of *R. rattus* in Abydos.

Months	Maturity status					
	Males		Females		Total	
	Immature %	Mature %	Immature %	Mature %	Immature %	Mature %
Dec.	0.00	100	0.00	100	0.00	100
Ian.	0.00	100	0.00	0.00	0.00	100
Feb.	0.00	0.00	0.00	0.00	0.00	0.00
March	0.00	0.00	0.00	0.00	0.00	0.00
April	0.00	100	0.00	100	0.00	100
May	0.00	100	0.00	0.00	0.00	100
June	50	50	0.00	100	25	75
July	0.00	100	0.00	0.00	0.00	100
Aug.	0.00	100	0.00	100	0.00	100

Sep.	0.00	0.00	0.00	0.00	0.00	0.00
Oct.	0.00	0.00	0.00	0.00	0.00	0.00
Nov.	0.00	0.00	0.00	0.00	0.00	100

Table 10. Maturity status of *R. rattus* the in Abydos area 2021/2022.

Months	No. Of Rodent	Trap index	Sex Ratio	
			Males %	Females %
Dec.	2	0.012	50	50
Ian.	1	0.006	100	0.00
Feb.	0	0.00	0.00	0.00
March	0	0.00	0.00	0.00
April	2	0.012	50	50
May	1	0.006	100	0.00
June	3	0.018	66.67	33.33
July	1	0.006	100	0.00
Aug.	2	0.012	50	50
Sep.	0	0.00	0.00	0.00
Oct.	0	0.00	0.00	0.00
Nov.	1	0.006	100	0.00

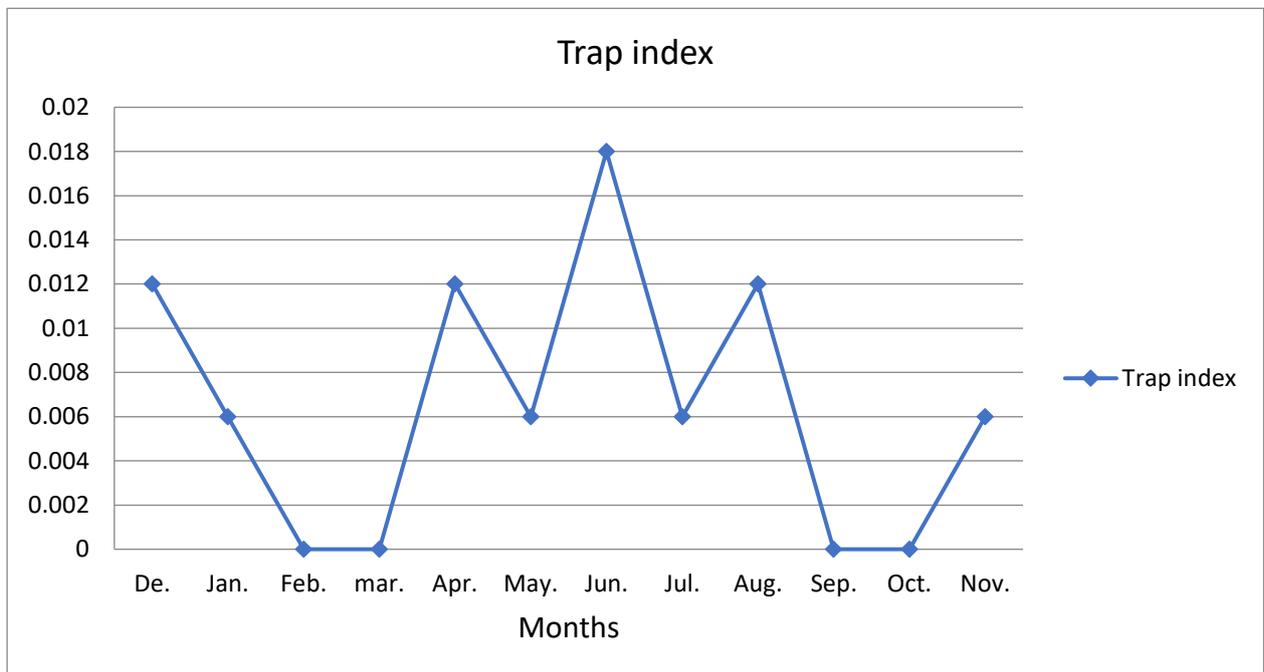


Figure 7. Monthly distribution of *R. rattus* the in Abydos area 2021/2022

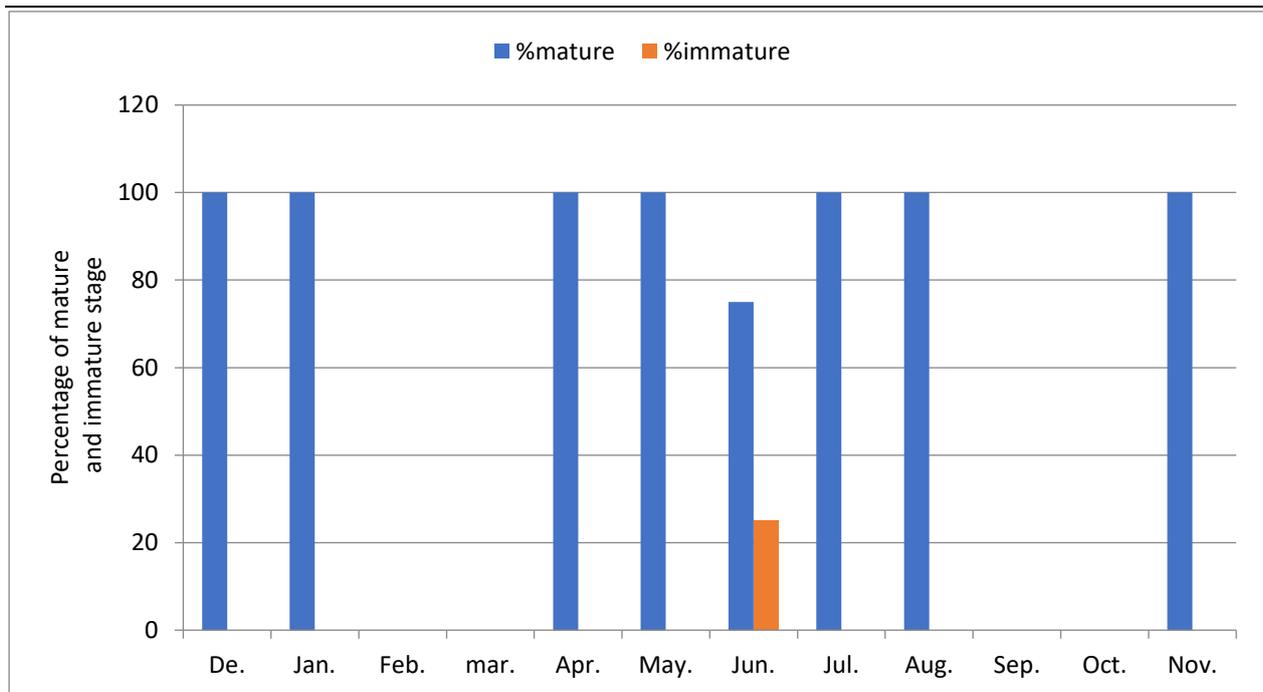


Figure 8. Maturity status of *R. rattus* the in Abydos area 2021/2022.

From Table 2,9,10 This type of *R. rattus* ranked last in terms of abundance, as the total number of caught rodents reached 4.17% during the year 2021:2022. The highest density was recorded according to the trap index in the summer,0.01%, and the lowest in the autumn was 0.002%, and the data recorded the highest. the population density in July and the lowest density in February, March, September, and October because there are no trapped rodents From Table 9,10 and Figure 7,8 the sex ratio shows that the number of males exceeded the number of females in all months except for December, April, and August when the number of males equals the number of females. The percentage of females was recorded in all months except January, May, and June, as there were no trapped females From Table 9,10 and Figure 7,8 the mature stage exceeded the immature stage The highest density of the immature stage was recorded in June and this may be due to the highest pregnancy rate at this time and may be due to the difference in environment and weather factors. A study showed that the highest density was observed during the summer and the lowest density was observed during the winter. This may be due to the suitable weather for breeding during the summer, or it may be due to the nature of rodent species that prefer to stay in burrows or nests during the winter season to avoid the cold weather. These results are consistent with the data obtained from Abd al-Gawad et al. (1987) and al-Baghdadi (2006)

4. Conclusions

Identification of rodent species in the study to be used in a future plan in the control strategy and to develop integrated control programs for rodents in tourist and archaeological systems, public places, universities, and modern constructions in Egypt.

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حصر والكثافة العددية لأنواع القوارض في منطقة أبيدوس بمحافظة سوهاج، مصر

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الهدف من هذا العمل هو التعرف على انتشار أنواع القوارض ودراسة كثافتها السكانية في منطقة معبد أبيدوس جنوب محافظة سوهاج خلال عام 2022/2021. كشفت التجربة عن تحديد أربعة أنواع من الفئران وهي جرذ النخيل ذو البطن الأبيض وجرذ السكندري وجرذ الحقل النيلي وجرذ الاسود. كما أظهرت النتائج أن الكثافة السكانية تزداد خلال فصلي الصيف والربيع وتنخفض خلال الشتاء والخريف. ويرجع ذلك إلى وفرة العناصر الغذائية خلال تلك الفترة، وتوافر درجات الحرارة والرطوبة التي تساعد القوارض على التكيف خلال فصلي الصيف والربيع، وارتفاع النسبة الجنسية خلال تلك الفترة، وقلة هذه الظروف خلال فصل الشتاء. تحديد أنواع القوارض في الدراسة لاستخدامها في خطة مستقبلية في استراتيجية مكافحة ولتطوير برامج مكافحة المتكاملة للقوارض في النظم السياحية والأثرية والأماكن العامة والجامعات والمنشآت الحديثة في مصر.

الكلمات الأساسية: معبد ابيدوس، جرذ النخيل ذو البطن الأبيض، جرذ السكندري، جرذ الحقل النيلي، جرذ لأسود.